PROJECT MANUAL

FOR

CITY OF KEY COLONY BEACH

NEW CITY HALL

PROJECT NO. 201913

JULY 2022

ARCHITECTURE . ENGINEERING . PLANNING . INTERIOR DESIGN

CITY OF KEY COLONY BEACH
PROJECT MANUAL

TABLE OF CONTENTS

REPORT OF SUBSURFACE EXPLORATION & GEOTECHNICAL ENGINEERING EVALUATION OF SUBSURFACE CONDITIONS

Project:

NEW CITY HALL
600 West Ocean Drive
Key Colony Beach, Monroe County, Florida

WLI Order No. 21-1227

Issued: **JUNE 2021**

Prepared for:

City of Key Colony Beach
600 West Ocean Drive
Key Colony Beach, Florida 33051

WINGERTER LABORATORIES INC.
Professional Engineering & Testing
Established 1949

WINGERTER LABORATORIES, INC.
1820 N.E. 144th Street
North Miami, Florida 33181

WINGERTER
LABORATORIES INC.

Professional Engineering & Testing
Established 1949

June 21, 2021

City of Key Colony Beach
Attention: Gerard Roussin, Building Official
600 West Ocean Drive
Key Colony Beach, Florida 33051

Reference: Report of Subsurface Soil Exploration, Soil Permeability Tests and Geotechnical Engineering Evaluation of Subsurface Conditions
Project: New City Hall
Location: 600 West Ocean Drive
Key Colony Beach, Monroe County, Florida
WLI Order No. 21-1227

Gentlemen:

We are pleased to present this report of our subsurface soil exploration, soil permeability tests and geotechnical engineering evaluation for the subject site. These services were performed in general accordance with the Professional Services Agreement dated June 2, 2021. This report presents our evaluation and specific recommendations for the proposed construction together with the field data.

This report was prepared in compliance with the 7th Edition of the Florida Building Code (2020).

We appreciate this opportunity to be of service to you during this phase of the project. If you have any questions or comments regarding the information contained in this report, please contact the undersigned.

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,
WINGERTER LABORATORIES, INC.

6/22/21

Donald J. Flood Jr., P.E.
Florida Registration No. 44847

enc: Report

In accordance with Rule 61G15-23.001 of the Florida Administrative Code, an original signature is hereby provided for the owner (or owner's representative) and the building official.

1820 N.E. 144th Street • North Miami, FL 33181 • (305) 944-3401 • 1-800-345-SOIL • Fax: (305) 949-8698
Broward: (954) 764-0472 • Dispatch Fax: (305) 949-1328

TABLE OF CONTENTS

INTRODUCTION

Wingerter Laboratories, Inc. (WLI) is pleased to present this report of our subsurface soil exploration, soil permeability tests and geotechnical engineering evaluation for the subject site. The purpose of this investigation was to obtain specific subsurface data in order to provide an engineering evaluation of the subsurface conditions including recommendations for foundation design for the support of the proposed new City Hall building on the existing City Hall subject property.

Our subsurface exploration consisted of a total of four (4) Standard Penetration Test Borings and two (2) Standard SFWMD/FDOT Percolation Tests performed at locations throughout the subject property, including adjacent to the existing City Hall and in associated driveways/parking and playground areas. These locations are shown on the annotated site plan provided in Appendix C.

The following presents a review of the project information provided to us; a discussion of the subsurface conditions; detailed geotechnical engineering recommendations; our Report of Test Boring Numbers B-1 through B-4, and our Report of Percolation Test Numbers P-1 and P-2.

PROJECT INFORMATION

Google Maps website was reviewed. Key Colony Beach is a peninsula located east of Marathon on the Atlantic Ocean side of the Florida Keys. The Sadowski Causeway extends south of generally east-west extending Overseas Highway (U.S. Highway A1A). The peninsula is developed with single family residences on streets separated by finger canals, with a golf course in the central area, and beaches, condominiums and restaurants on the south side. The subject property is located at the south end of the Sadowski Causeway in the south-central area of the peninsula.

The Monroe County Property Appraiser website was reviewed. The subject property is an irregular rectangular configuration situated in the south-central area of the peninsula, bounded by the south terminus of a canal on the north side, Sadowski Causeway on the east side, West Ocean Drive on the south side, and 7th Street on the west side. The subject property consists of 1.47 acres. A rectangular configured single story building with a westward-extending wing, having approximately 8,000 square feet of space, is located in the northeast area of the property. Other improvements include a seawall, paved driveways and parking areas, and a playground with walkways in the southwest area.

We have not been provided with proposed construction plans as of this writing. We have not been informed where the location of the new building is proposed, but it assumed to be on the site or include the site of the existing building.

A site reconnaissance was conducted prior to our work commencement in order to observe and document the existing surface conditions, and to establish the testing locations. This information was used in our interpretation of the subsurface data and also to detect any conditions which could affect our evaluation of the site.

The proposed locations were provided to us on two notated aerial photographs of the site. The proposed testing locations were marked with white flags and paint, approximately as shown in the notated aerial photographs provided in Appendix C of this report. Sunshine 811 was contacted to provide utility location services. Once obtained, the work was scheduled to commence.

INVESTIGATIVE PROCEDURES

Standard Penetration Test Borings

The test boring locations were accessible with the truck-mounted drill rig, and the standard penetration test borings were advanced with this equipment. Soil samples (disturbed) were obtained in accordance with ASTM D-1586 utilizing a 2-foot long, 2-inch diameter split spoon sampler which is advanced by successive blows of a 140 pound hammer free-falling 30 inches. The number of blows for each 6 inches of penetration is recorded. The sum of the second and third blow counts for each 2-foot sampling interval constitutes the Standard Penetration Resistance in blows per foot, which is referred to as the "N" Value. The following tables may be used in interpreting the consistency of the materials based on the "N" Value:

SOIL CONSISTENCY vs. "N VALUE"					
Cohesionless Soils		**Cohesive Soils**		**Rock and Gravels**	
"N Value" (blows/ft)	Consistency Designation	"N Value" (blows/ft)	Consistency Designation	"N Value" (blows/ft)	Consistency Designation
0 to 4	Very Loose	0 to 2	Very Soft	0 to 25	Loose or Soft
5 to 10	Loose	3 to 4	Soft	26 to 50	Medium Dense
11 to 30	Medium Dense	5 to 8	Medium	51 to 90	Dense
31 to 50	Dense	9 to 15	Stiff	-	-
50 or More	Very Dense	16 to 30	Very Stiff	-	-
-	-	31 or More	Hard	-	-

The Standard Penetration Test, "N" value curve shown on the boring logs indicates the general variation of the "N" value throughout the depth of the boring. This curve is plotted in a straight line which connects each "N" value. However, it should not be assumed that the changes in the "N" value are a linear function. The graphical representations shown on the boring logs should not be substituted for the actual material descriptions included in the logs.

Soil samples will be retained by **WLI** for a period of 30 days. Elevations were not established for the test boring locations. Depths reported on the logs represent depths below ground surface as they existed on the date drilled. The client is cautioned that if subsequent filling or excavation of the site occurs, the reported depth must be so adjusted. **WLI** can not assume responsibility for the accuracy of reported depths if the site is disturbed subsequent to the date drilled.

Soil Permeability Tests

For each SFWMD/FDOT percolation test, an eight inch diameter hole was advanced to 15 feet below land surface. At this depth, water was added to the test hole to the top, until the head was constantly maintained. Then a five gallon container of water was slowly emptied into the hole. The time it took to add the five gallons of water to the hole while maintaining a constant head was recorded. This test was performed in three runs, then the times were averaged. When the tests were completed, the holes were refilled.

TESTING PROGRAM AND CONDITIONS REVEALED

Our subsurface exploration consisted of a total of four (4) Standard Penetration Test Borings conforming to the requirements of ASTM D-1586 and two (2) Percolation Tests (FDOT/SFWMD) that were performed at the subject property on June 3 & June 15, 2021. Please refer to Appendix A for our individual Reports of Test Borings for detailed description of the materials encountered and the depth intervals at which they were encountered. Please refer to Appendix B for our individual Soil Permeability Test Reports. The Test Boring and Soil Permeability Test locations are shown on the testing locations maps in Appendix C of this report.

Standard Penetration Test Borings (ASTM D-1586)

The number, location and depth of the test borings were determined by WLI and the client, taking into consideration the requirements of the project, site accessibility and the subsurface conditions revealed. The discussions, opinions and recommendations contained in this report are based upon the conditions revealed in the referenced test borings.

The boring logs for Test Boring Number B-1, located at the south-central area adjacent to the building's west wing, had surficial medium dense layers of silty sand to two feet below existing land surface. Following were loose layers of sandy silt, followed by layers of silt to four feet deep. Then very loose/soft layers of clayey silt were found to 20 feet deep, then very loose/soft layers of sandy silt to 24 feet. Thereafter, very dense layers of fragmented limestone were encountered to the maximum explored depth of 30 feet below existing land surface. The ground water level at the time of our investigation was encountered at the depth of two feet (2'-0") below the existing land surface at the test boring location.

The boring logs for Test Boring Number B-2, located in the playground area west of the building's southwest corner, had medium dense to loose layers of silty sand to six feet below existing land surface. Following were very loose/soft layers of silt that were found to 20 feet deep, then very loose/soft layers of silty sand to 24 feet. Thereafter, very dense layers of fragmented limestone were encountered to the maximum explored depth of 30 feet below existing land surface. The ground water level at the time of our investigation was encountered at the depth of two feet, six inches (2'-6") below the existing land surface at the test boring location.

The boring logs for Test Boring Number B-3, located south adjacent to the building's southwest corner, had surficial medium dense to loose layers of silty sand to four feet below existing land surface. Following were loose/soft layers of clayey silt to ten feet deep, then layers of silty sand to 15 feet deep were found. Then very loose/soft layers of clayey silt were found to 24 feet deep. Thereafter, very dense layers of fragmented limestone were encountered to the maximum explored depth of 30 feet below existing land surface. The ground water level at the time of our investigation was encountered at the depth of two feet (2'-0") below the existing land surface at the test boring location.

The boring logs for Test Boring Number B-4, located at the central area adjacent to the building's west side, had surficial medium dense to loose layers of limesand to two feet below existing land surface. Following, very loose/soft layers of clayey silt were found to 24 feet deep. Thereafter, very dense layers of fragmented limestone were encountered to the maximum explored depth of 30 feet below existing land surface. The ground water level at the time of our investigation was encountered at the depth of three feet (3'-0") below the existing land surface at the test boring location.

The ground water level at the time of our investigation was encountered at depths ranging from two feet to three feet (2'-0" to 3'-0") below the existing land surface at the test boring locations. Fluctuations in the ground water level should be expected due to seasonal climatic changes, tidal action, rainfall variation, surface runoff, construction activity and other site specific factors.

Soil Permeability Tests

Percolation tests (FDOT/SFWMD)

The number and location of the percolation tests were determined by the client and **WLI,** taking into consideration the requirements of the project and site accessibility. Percolation Test Nos. P-1 and P-2 were advanced on June 15, 2021 at the notated locations shown on the provided aerial photograph. The Hydraulic Conductivity (K) of the percolation test sites are as follows:

P-1: K = 7.05 E-06 cfs/ft^2 per foot of head.
Testing location at east-central area of property, east of building's east wall.

P-2: K = 7.24 E-06 cfs/ft^2 per foot of head.
Testing location at south-central area of property, south side of playground.

GEOTECHNICAL ENGINEERING EVALUATION

Evaluation of the subsurface data obtained from the test boring logs, using accepted geotechnical engineering criteria, indicates that the existing subsurface soil conditions are not recommended for the proposed structure if founded upon the existing soils. The test borings revealed the presence of medium dense silty sand extending from the surface to two feet deep, then the strata following consists of very loose gray clayey silt or very loose gray silt extending to 24 feet in depth. The strata then becomes a very dense fragmented limestone that continues to the boring termination depth of 30 feet deep. The expected structure size and proximity to open water requires uplift resistance as well as axial loading. The groundwater table was encountered at depths of two and three feet.

Based on the above description, it is our recommendation that the foundations be supported on concrete pile foundations to a depth of 30 feet. Piles will not only transfer the axial loads to the limestone formation, but also provide some uplift resistance in the case of hurricane force stormwater surge.

Foundation data for **14 Inch, 16 Inch and 18 Inch Diameter Augercast Piles** is included herein. Evaluation was done using these cast-in-place piles set to a depth of 30 feet below existing land surface. Both the bearing and uplift capacities were evaluated expecting six foot embedment in very dense tan and gray fragmented limestone. The pile depth is predicated on the four obtained 28 to 30 foot deep test borings and an evaluation of soil conditions within the general project area. The bearing is expected to continue through a depth of 30 feet.

Our recommendation for augercast piles is based upon 30 foot deep, 14 inch, 16 inch and 18 inch diameter pile types installed in strata noted on boring logs for Test Boring Nos. B-1 through B-4. The design values for these piles are listed below.

Due to the axial load capacity of the 14 inch diameter piles being less than 40 tons, a pile load test is not required by the Florida Building Code 1810.3.3.1.1. The 16 inch and 18 inch diameter piles have an axial load capacity above 40 tons, and therefore will require a load test.

Installation of these piles requires the presence of a geotechnical inspector to monitor and record the pile data. The inspector should be a licensed geotechnical engineer's designated representative.

ENGINEERING RECOMMENDATIONS

Auger Cast (Cast-In-Place) Pile Foundations

Augercast Piles			
Shaft Diameter:	14 inch diameter (round)	16 inch diameter (round)	18 inch diameter (round)
Compressive Capacity:	36 tons	72 tons	104 tons
Tension Capacity:	21 kips	24 kips	28 kips
Lateral Capacity:	15 kips	17 kips	20 kips
Total Pile Length:	30 feet	30 feet	30 feet
Rock Embedment:	6 feet into Limestone	6 feet into Limestone	5 to 16 feet into Limestone
Center to Center Spacing:	42 inches	48 inches	54 inches
Concrete Compressive Strength:	5,000 psi	5,000 psi	5,000 psi
Load Test Required:	No	Yes	Yes

Auger Cast (Cast-In-Place) Pile Foundations

1. Installation Specifications

1.1. Augered shaft shall remain plumb within one-eighth of the shaft diameter, that is within 1.75 inches for a 14 inch diameter, 2.0 inches for a 16 inch diameter or 2.25 inches for a 18 inch diameter pile.

1.2. Augering and pumping equipment, and technique shall be at the contractor's discretion on a performance basis by using acceptable installation procedures to deliver an integral pile.

1.3. The volume of grout per linear foot of pile shall exceed the theoretical pile volume with a minimum grout factor of 1.15.

1.4. Grout shall be a mixture of Portland cement, fine aggregate, and water with proportions and admixtures at the contractor's discretion on a performance basis. A design mix with confirming strength test results shall be submitted to the project structural engineer for approval prior to installation of the piles. The minimum 28-day compressive strength of the grout shall be no less than 5000 psi.

1.5. Grouting shall be performed in a continuous operation. During extraction of the auger, should volume of grout-take markedly increase and/or injection pressure markedly decrease, auger shall be reinserted to a minimum five (5) feet below the point in question, and grouting resumed. The procedure shall be repeated as frequently as necessary to insure vertical continuity of the grout shaft.

1.6. Down-shaft reinforcing details shall be at the discretion of the contractor on a performance basis; however, reinforcing details shall be presented to the project structural engineer for approval prior to installation of the piles. It is, however, recommended that a reinforcing cage consisting of a minimum of four #6 bars, grade 60, full depth of the pile with three centralizers along the full depth of pile to detect any "necking" action.

1.7. Piles shall be installed in a sequence so that the grout in adjacent piles has had time to set such that adjacent piles are not disturbed.

2. Testing and Inspection:

2.1. Section 1810.3.3.1.1. of the Florida Building Code. Requires that pile capacities in excess of 40 tons be substantiated by a static load test performed on site. At the recommended capacity, a static load test for the 14 inch diameter pile is not required. At the recommended capacities, a static load test for the 16 inch and 18 inch diameter piles is required. The test pile location shall be directed by the Geotechnical Engineer. The test pile shall be loaded to twice their design capacity as required by the Florida Building Code. Acceptance criteria shall be as per the Florida Building Code. The load test shall be performed under the direction of the Geotechnical Engineer. The pile contractor shall provide and install all testing equipment, reference beams, calibrated jack with pump and pressure gauge or a calibrated load cell, protection from the sun and rain, adequate lighting, adequate support for the load testing apparatus and cooperate with the Geotechnical Engineer in the performance of the load test.

8.2. Pile installation shall be witnessed and logged by the geotechnical inspector. Geotechnical inspector shall confirm shaft plumbness, compliance with depth requirements, continuity of grouting, and reinforcing details; inspector's log shall include the preceding and all other pertinent data including pile identification.

8.3. Grout shall be sampled and test cylinders or cubes shall be cast for 28-day strength confirmation at the frequency of no less than one sampling per 50 cubic yards placed, but at least one sampling in each sustained grouting operation.

Fill and Compaction, if needed

1. Placing fill:

1.1. Fill shall be placed in lifts not greater than 12-inches loose thickness for material compacted by heavy compaction equipment, and not more than six inches loose thickness for material compacted by hand-operated tampers.

1.2. Suitable fill material is defined for the engineering purposes of this report to be a clean select material, containing no more than five percent by weight organic matter and no man-made debris of any description, which meets the requirement of ASTM D 2487 Unified Classifications GW, GP, GP-GM or SW.

1.3. Since large size particles interfere with compaction of the finer soil fraction, all backfill and fill materials shall be free of rock or gravel larger than three inches or 50 percent of the compacted layer thickness, whichever is the lesser.

2. Compaction:

2.1. The cleared surface and each fill lift shall be compacted to a minimum relative compaction of 98 percent. Relative compaction is defined as the ratio, expressed as a percent, of the dry soil density as determined in the field by ASTM D 2922 (nuclear method) with a probe depth of 12-inches, divided by the maximum dry soil density as determined in the laboratory by ASTM D 1557 ("Modified Proctor"). Compaction shall be verified by the geotechnical inspector who shall also confirm that the fill material being placed is the same material as tested in the laboratory. To avoid delay during compaction operations, candidate fill material should be supplied to the geotechnical inspector a minimum 72 hours in advance of placement.

2.2. Compaction of suitable fill as defined herein is most readily achieved by the use of vibratory rollers when space allows. For small restricted areas, mechanical hand-operated tampers usually perform satisfactorily. Prior to commencing compaction, the moisture content of the fill material shall be adjusted to within plus/minus two percent of the optimum moisture determined by ASTM D 1557; by so wetting or drying the fill material, the amount of compactive energy required to attain compaction is minimized. Attempting compaction of fill material which is more than five percent below or three percent above optimum moisture will generally yield unsatisfactory results.

2.3. A minimum of one in-place field density test shall be performed for each 2500 square feet, or fraction thereof, for each lift of compacted soil for building pad or slab area.

GEOTECHNICAL INSPECTOR

Experience indicates that the actual subsoil conditions at a site could vary from those generated on the basis of test borings made at specific locations. Therefore, it is essential that a geotechnical engineer be retained to provide soil engineering services during the site foundation phase of the proposed project. This is to observe compliance with the design concepts, specifications and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

The geotechnical inspector as referenced hereinbefore shall be a Registered Professional Engineer licensed in the State of Florida and experienced in the practice of geotechnical engineering, or his designated field agent. The results of all inspections by the geotechnical inspector shall be submitted on report or log forms duly signed and sealed in accordance with Rule 61G15-23.001 of the Florida Administrative Code. The geotechnical inspector shall be retained by the owner, the project architect, or the project structural engineer.

SPECIAL REMARKS & ANNOTATIONS

In dealing with the unseen subsurface dimension, a prudent test boring program acts to identify the general range of conditions and to reduce, but not eliminate, the risks of unknown conditions. Therefore, **WLI** cannot offer a warranty, expressed or implied, that materials or conditions other than those revealed in the test borings will not be encountered, nor that the relative proportions and density of the materials will not vary from those reported.

Furthermore, **WLI** assumes no responsibility for the accuracy of the reported depths should any excavation, filling or alteration of the site grade occur, subsequent to the date of the drilling operation, without surveying the existing conditions.

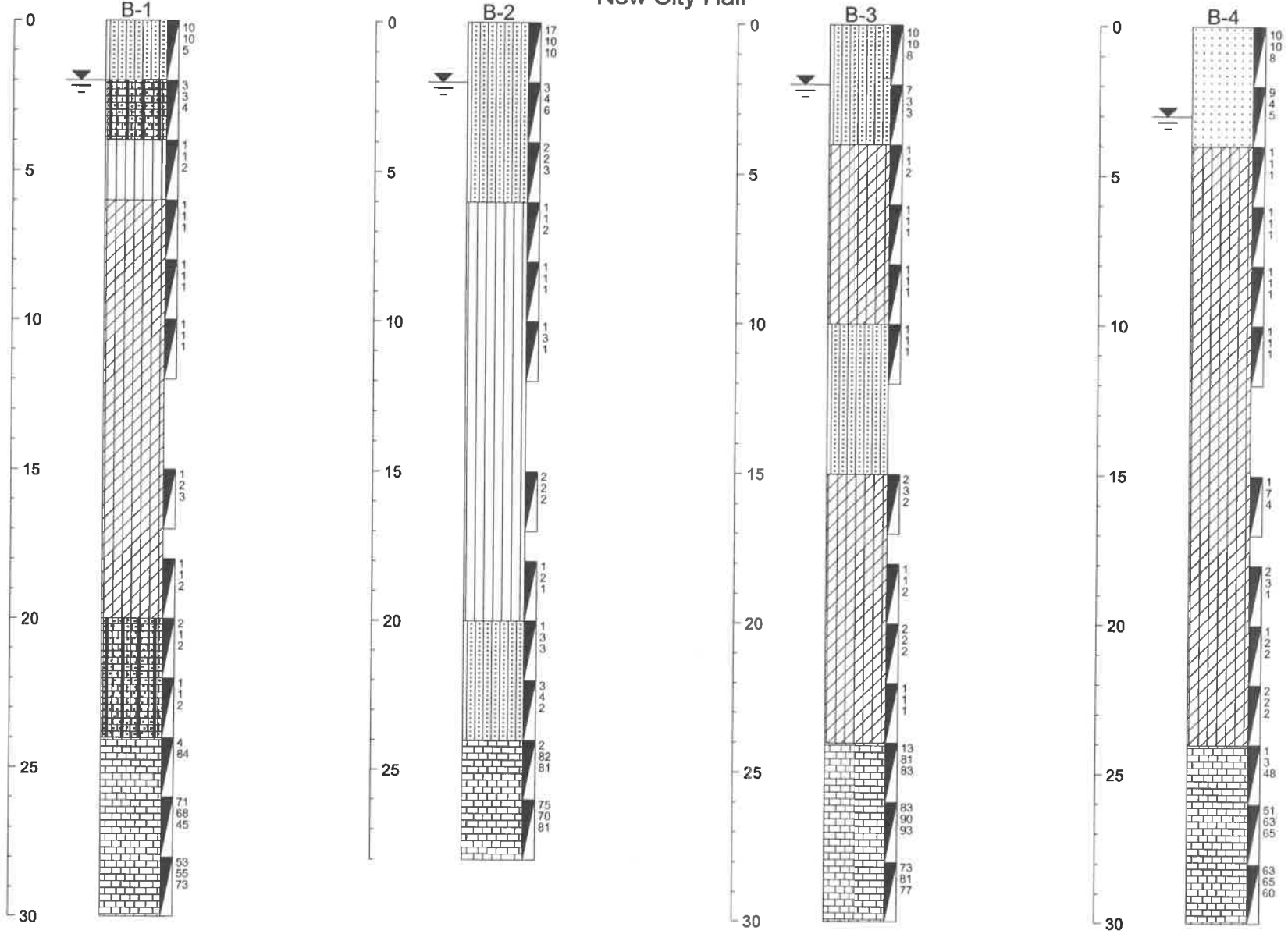
Also, since the criteria furnished to **WLI** constitutes our total knowledge and understanding of the project; inaccuracies, deviations or alterations of the criteria may invalidate these recommendations to the extent they impact the magnitude, distribution, and elevation of applied loads, or impact the nature of the construction.

APPENDIX A

TEST BORING LOGS

LOG OF BORINGS

New City Hall



Wingerter Laboratories, Inc.

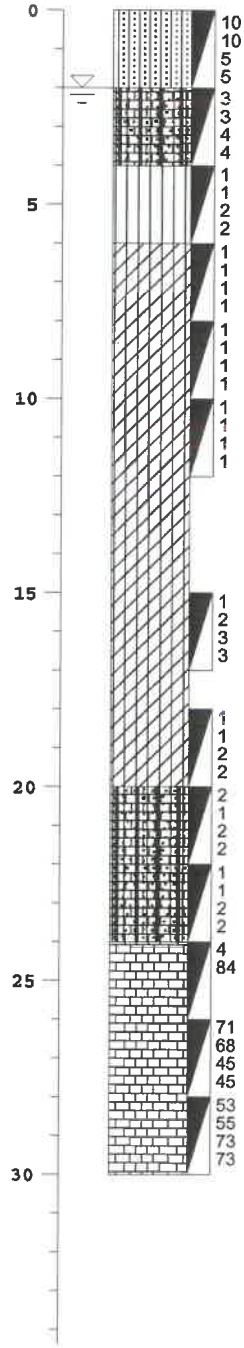
WINGERTER LABORATORIES INC.
Professional Engineering & Testing

LOG OF TEST BORING

BORING NO.: B-1

PROJECT: *New City Hall*
CLIENT: *City of Key Colony Beach*
LOCATION: *600 West Ocean Drive, Key Colony Beach FL*
DRILLER: *E.Thomas*
DRILL RIG: *257*
DEPTH TO WATER> INITIAL *2'-0"* **:** *2'-0"*

PROJECT NO.: *21-1227*
DATE DRILLED: *6/03/2021*
ELEVATION: *existing*
LOGGED BY:



ELEVATION/ DEPTH	Description	STANDARD PENETRATION TEST SAMPLE NO.	DEPTH	N
	Tan SILTY SAND	1	0.0-2.0	15
	Gray SANDY SILT	2	2.0-4.0	7
	SILT	3	4.0-6.0	3
	Gray CLAYEY SILT	4	6.0-8.0	2
		5	8.0-10.0	2
		6	10.0-12.0	2
		7	15.0-17.0	5
		8	18.0-20.0	3
	Brown SANDY SILT	9	20.0-22.0	3
		10	22.0-24.0	3
	Gray FRAGMENTED LIMESTONE	11	24.0-26.0	84
		12	26.0-28.0	113
		13	28.0-30.0	128
	Boring terminated at 30 feet below existing land surface.			

N-Value Curve: 10 20 30 40 50 60; 84; 113; 128

Test boring located at south-central area adjacent to existing building's west wing.

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

WINGERTER LABORATORIES, INC. 1820 N.E. 144th Street * North Miami, FL 33181 (305) 944-3401 1-800-345-SOIL

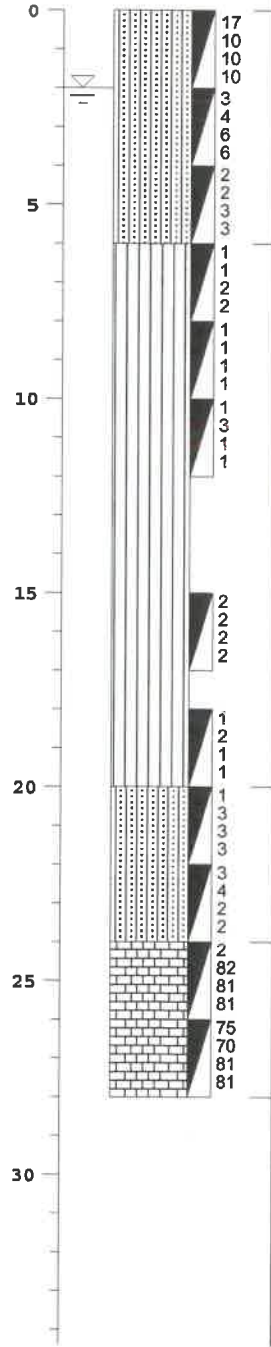
WINGERTER LABORATORIES INC.
Professional Engineering & Testing

LOG OF TEST BORING

BORING NO.: B-2

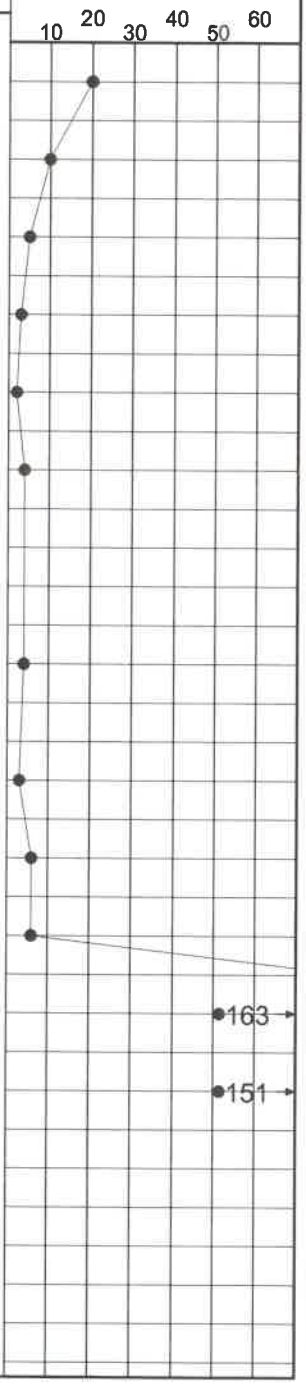
PROJECT: *New City Hall*
CLIENT: *City of Key Colony Beach*
LOCATION: *600 West Ocean Drive, Key Colony Beach FL*
DRILLER: *E.Thomas*
DRILL RIG: *257*
DEPTH TO WATER> INITIAL *2'-6" : 2'-6"*

PROJECT NO.: *21-1227*
DATE DRILLED: *6/03/2021*
ELEVATION: *existing*
LOGGED BY:



Description	SAMPLE NO.	DEPTH	N
Tan SILTY SAND	1	0.0-2.0	20
	2	2.0-4.0	10
	3	4.0-6.0	5
Gray SILT	4	6.0-8.0	3
	5	8.0-10.0	2
	6	10.0-12.0	4
	7	15.0-17.0	4
	8	18.0-20.0	3
Gray SILTY SAND	9	20.0-22.0	6
	10	22.0-24.0	6
Tan FRAGMENTED LIMESTONE	11	24.0-26.0	163
	12	26.0-28.0	151
Boring terminated at 28 feet below existing land surface.			

STANDARD PENETRATION TEST



Test boring located in playground area west of existing building's southwest corner.

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

WINGERTER LABORATORIES, INC. 1820 N.E. 144th Street * North Miami, FL 33181
(305) 944-3401 1-800-345-SOIL

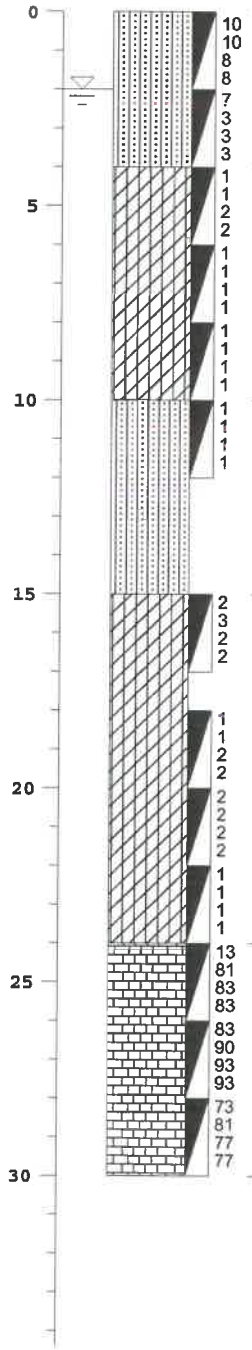
WINGERTER LABORATORIES INC.
Professional Engineering & Testing

LOG OF TEST BORING

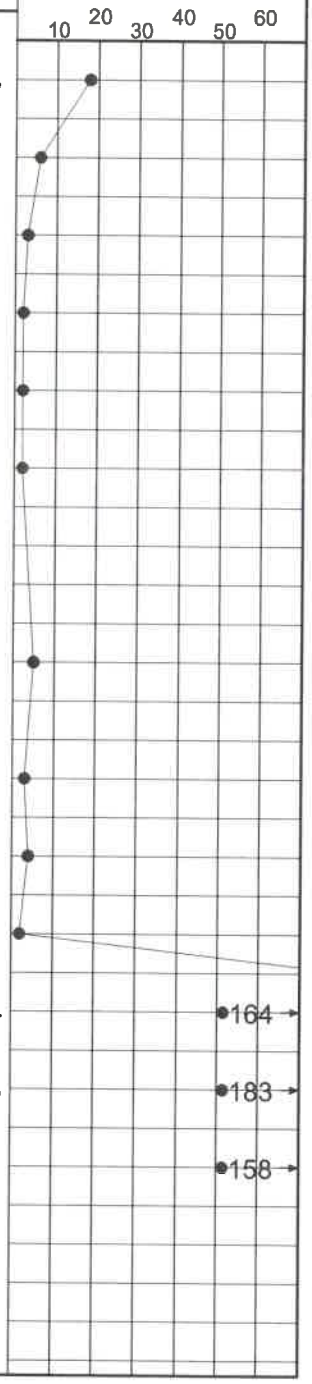
BORING NO.: B-3

PROJECT: *New City Hall*
CLIENT: *City of Key Colony Beach*
LOCATION: *600 West Ocean Drive, Key Colony Beach FL*
DRILLER: *E.Thomas*
DRILL RIG: *257*
DEPTH TO WATER> INITIAL *2'-0" : 2'-0"*

PROJECT NO.: *21-1227*
DATE DRILLED: *6/03/2021*
ELEVATION: *existing*
LOGGED BY:



ELEVATION/ DEPTH	Description	STANDARD PENETRATION TEST SAMPLE NO.	DEPTH	N
	Tan SILTY SAND	1	0.0-2.0	18
		2	2.0-4.0	6
5	Gray CLAYEY SILT	3	4.0-6.0	3
		4	6.0-8.0	2
		5	8.0-10.0	2
10	Tan SILTY SAND	6	10.0-12.0	2
15	Gray CLAYEY SILT	7	15.0-17.0	5
		8	18.0-20.0	3
20		9	20.0-22.0	4
		10	22.0-24.0	2
25	Tan FRAGMENTED LIMESTONE	11	24.0-26.0	164
		12	26.0-28.0	183
		13	28.0-30.0	158
30	Boring terminated at 30 feet below existing land surface.			



Test boring located south adjacent to existing building's southwest corner.

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

WINGERTER LABORATORIES, INC. 1820 N.E. 144th Street * North Miami, FL 33181 (305) 944-3401 1-800-345-SOIL

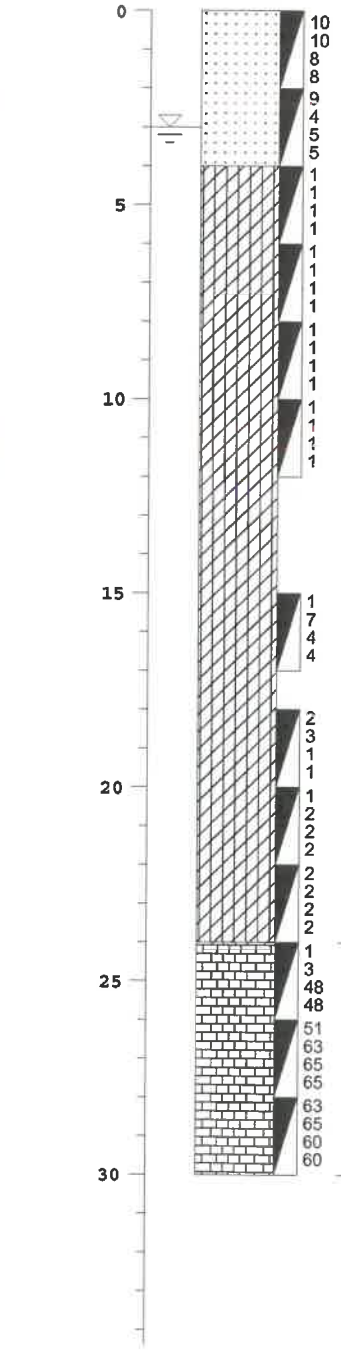
WINGERTER LABORATORIES INC.
Professional Engineering & Testing

LOG OF TEST BORING

BORING NO.: B-4

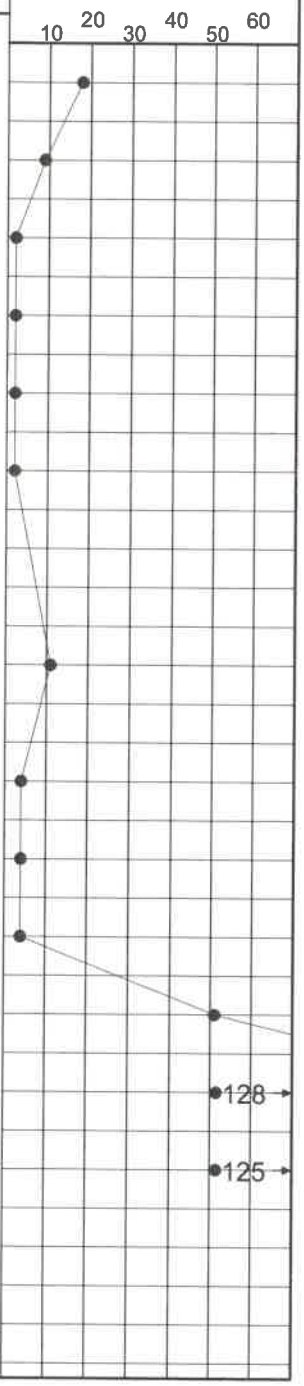
PROJECT: *New City Hall*
CLIENT: *City of Key Colony Beach*
LOCATION: *600 West Ocean Drive, Key Colony Beach FL*
DRILLER: *E.Thomas*
DRILL RIG: *257*
DEPTH TO WATER> INITIAL *3'-0"* **:** *3'-0"*

PROJECT NO.: *21-1227*
DATE DRILLED: *6/03/2021*
ELEVATION: *existing*
LOGGED BY:



ELEVATION/ DEPTH	Description	SAMPLE NO.	DEPTH	N
	Tan LIMESAND	1	0.0-2.0	18
		2	2.0-4.0	9
	Gray CLAYEY SILT	3	4.0-6.0	2
		4	6.0-8.0	2
		5	8.0-10.0	2
		6	10.0-12.0	2
		7	15.0-17.0	11
		8	18.0-20.0	4
		9	20.0-22.0	4
		10	22.0-24.0	4
	Tan FRAGMENTED LIMESTONE	11	24.0-26.0	51
		12	26.0-28.0	128
		13	28.0-30.0	125
	Boring terminated at 30 feet below existing land surface.			

STANDARD PENETRATION TEST



Test boring located in central area adjacent to existing building's west side.

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

WINGERTER LABORATORIES, INC. 1820 N.E. 144th Street * North Miami, FL 33181
(305) 944-3401 1-800-345-SOIL

KEY TO SYMBOLS

Description

Strata symbols

 Silty sand

 Sandy silt

 Silt

 Clayey silt

 Limestone

 Sand

Misc. Symbols

 Water table during drilling

Soil Samplers

 Standard penetration test

APPENDIX B

SOIL PERMEABILITY TEST REPORTS

WINGERTER LABORATORIES, INC.

Engineering Testing & Inspection Services
1820 N.E. 144th Street, North Miami, Florida 33181
Phone: (305) 944-3401 Fax: (305) 949-8698

REPORT: **SOIL PERMEABILITY TEST**
S.F.W.M.D./D.O.T PERCOLATION EXFILTRATION
USUAL CONDITION TEST METHOD

CLIENT: City of Key Colony Beach
PROJECT: New City Hall
PROJECT LOCATION: 600 West Ocean Drive, Key Colony Beach FL
TEST LOCATION: East-central area of property, east of building's east wall
REPORTED TO: City of Key Colony Beach
Attention: Gerard Roussin, Building Offi
600 West Ocean Drive
Key Colony Beach, Florida 33051

DATE: 6/15/2021
TEST NO: P-1
W.O. NO: 21-1227

Permeability test was performed by drilling the test hole to a depth of fifteen feet (15'). At this depth, water was added to the test hole at an average stabilized rate of 0.4 gallon per minute (gpm) for a period of 30 minutes in order to maintain a constant head at the ground surface level. The Hydraulic Conductivity was calculated as follows:

H = Depth to Groundwater Level: 5. Ft
d = Diameter of Test Hole: 8 Inches
K = Hydraulic Conductivity = $\frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \frac{1}{448.8}$ (Conversion Factor gpm to cfs)

Depth of Test Hole	Saturated Depth (Ds)	Stabilized Flow Rate (Q)	Hydraulic Conductivity (K)
15.0 Ft	10.0 Ft	0.42 Gal/Min	**7.05E-06 cfs/ft^2 per foot of head**

SUBSURFACE PROFILE :

Depth	**Soil Description**
0' - 3'	Limestone fill
3' -15'	Gray silt with organics

Field Technician: JC/ET

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully Submitted,
WINGERTER LABORATORIES, INC.
6/21/21
Donald J. Flood, Jr., P.E.
Florida Registration No. 44847

WINGERTER LABORATORIES, INC.
Engineering Testing & Inspection Services
1820 N.E. 144th Street, North Miami, Florida 33181
Phone: (305) 944-3401 Fax: (305) 949-8698

REPORT:	**SOIL PERMEABILITY TEST** **S.F.W.M.D./D.O.T PERCOLATION EXFILTRATION** **USUAL CONDITION TEST METHOD**
CLIENT:	City of Key Colony Beach
PROJECT:	New City Hall
PROJECT LOCATION:	600 West Ocean Drive, Key Colony Beach FL
TEST LOCATION:	South-central area of property, south side of playground
REPORTED TO:	City of Key Colony Beach Attention: Gerard Roussin, Building Offi 600 West Ocean Drive Key Colony Beach, Florida 33051

DATE: 6/15/2021
TEST NO: P-2
W.O. NO: 21-1227

Permeability test was performed by drilling the test hole to a depth of fifteen feet (15'). At this depth, water was added to the test hole at an average stabilized rate of 0.4 gallon per minute (gpm) for a period of 30 minutes in order to maintain a constant head at the ground surface level. The Hydraulic Conductivity was calculated as follows:

H = Depth to Groundwater Level: 5. Ft
d = Diameter of Test Hole: 8 Inches
K = Hydraulic Conductivity =

$$\frac{4Q}{\pi d(2H^2 + 4HDs + dH)} \quad \frac{1}{448.8}$$

448.8 (Conversion Factor gpm to cfs)

Depth of Test Hole	Saturated Depth (Ds)	Stabilized Flow Rate (Q)	Hydraulic Conductivity (K)
15.0 Ft	10.0 Ft	0.43 Gal/Min	**7.24E-06 cfs/ft^2 per foot of head**

SUBSURFACE PROFILE :

Depth	**Soil Description**
0' - 2'	Limestone fill with sand
2' -15'	Gray silt

Field Technician: JC/ET

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

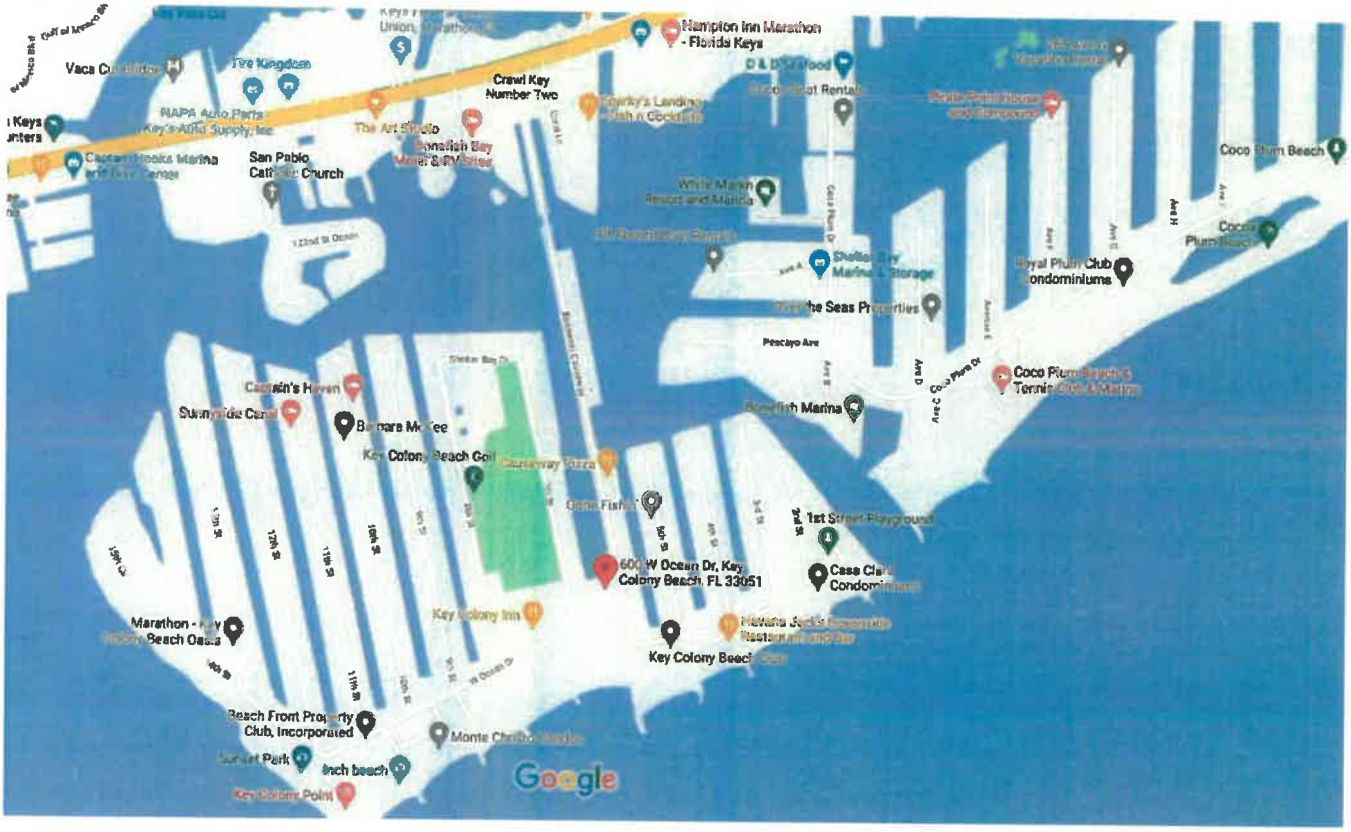
Respectfully Submitted,
WINGERTER LABORATORIES, INC.

6/21/21
Donald J. Flood Jr., P.E.
Florida Registration No. 44847

APPENDIX C

SITE AND TESTING LOCATIONS MAPS

SITE LOCATION MAP



WINGERTER LABORATORIES INC.

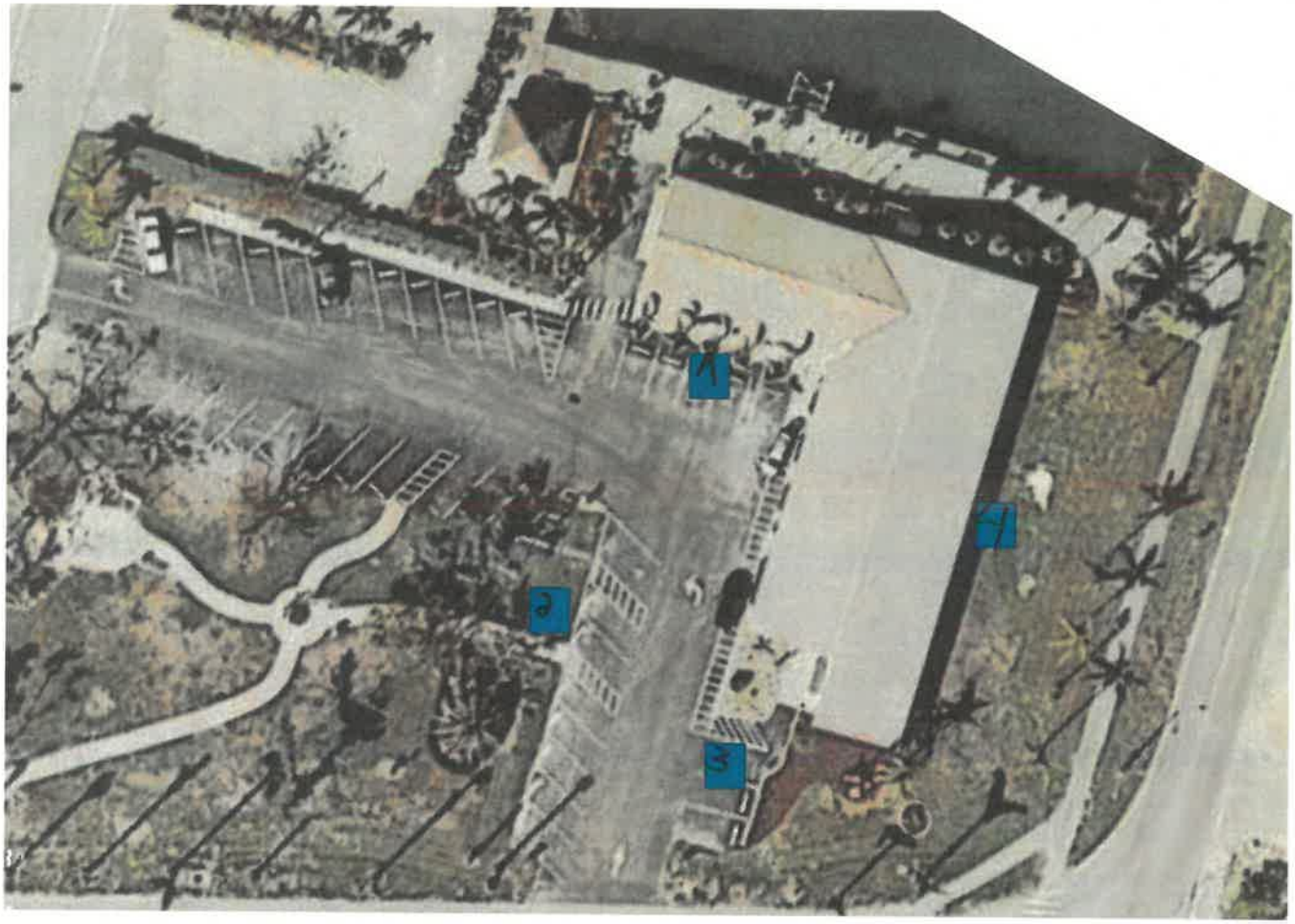
Professional Engineering & Testing

1820 N.E. 144th Street, North Miami, Florida 33181

City of Key Colony Beach
Project: New Town Hall
Location: 600 West Ocean Drive
Key Colony Beach, Monroe County, Florida

WLI Order No. 21-1227

TEST BORING LOCATIONS MAP



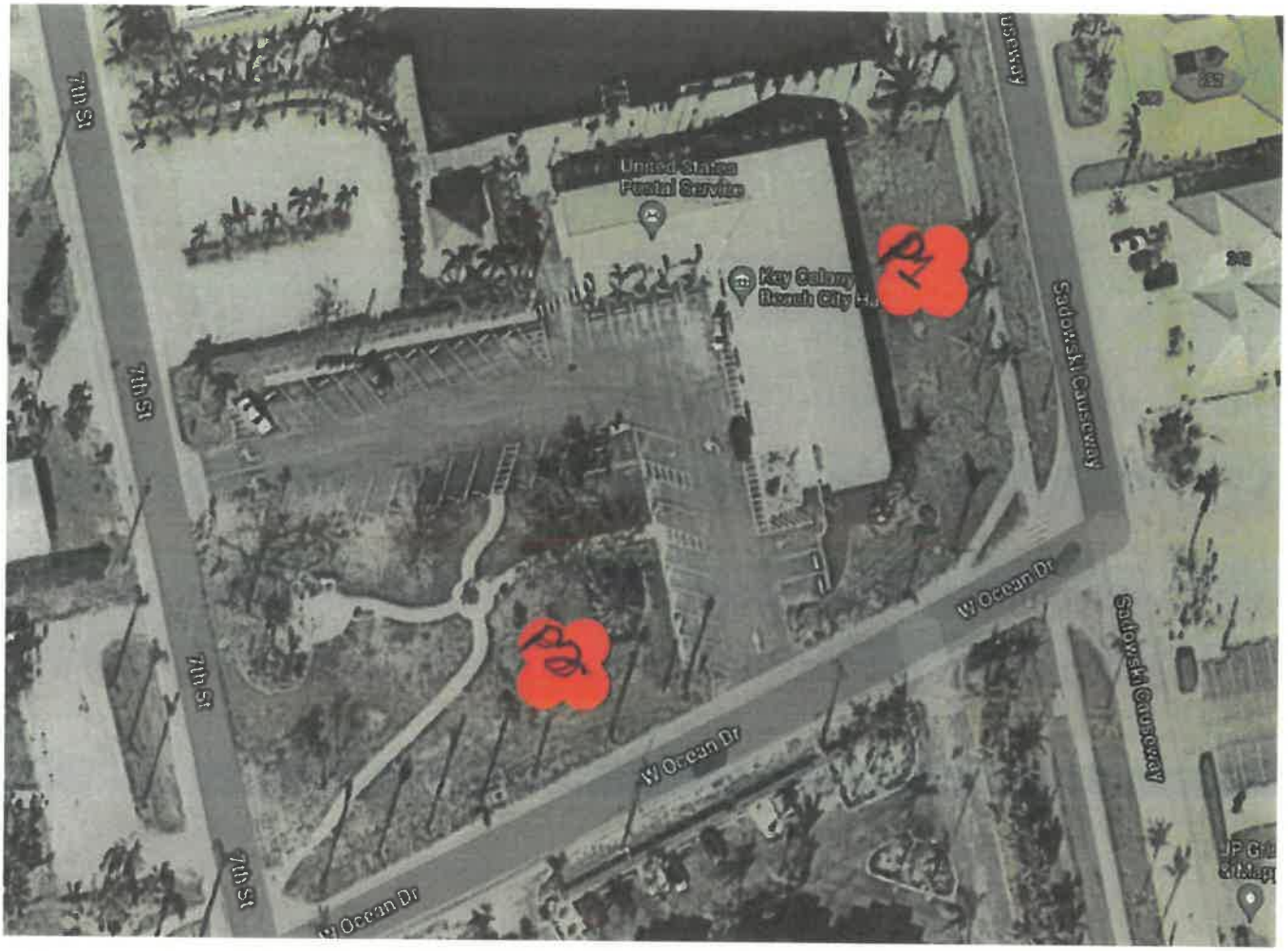
● Standard Penetration Test Boring Location

WINGERTER LABORATORIES INC.
Professional Engineering & Testing
1820 N.E. 144th Street, North Miami, Florida 33181

City of Key Colony Beach
Project: New Town Hall
Location: 600 West Ocean Drive
Key Colony Beach, Monroe County, Florida

WLI Order No. 21-1227

PERCOLATION TESTING LOCATIONS MAP



■ Standard Percolation Test Location

WINGERTER LABORATORIES INC.

Professional Engineering & Testing

1820 N.E. 144th Street, North Miami, Florida 33181

City of Key Colony Beach
Project: New Town Hall
Location: 600 West Ocean Drive
Key Colony Beach, Monroe County, Florida

WLI Order No. 21-1227

WINGERTER
LABORATORIES INC.
Professional Engineering & Testing
Established 1949

October 18, 2021

City of Key Colony Beach
Attention: Gerard Roussin, Building Official
600 West Ocean Drive
Key Colony Beach, Florida 33051

Reference: Addendum to Report of Subsurface Soil Exploration, Soil Permeability Tests and Geotechnical Engineering Evaluation of Subsurface Conditions
Project: New City Hall
Location: 600 West Ocean Drive
Key Colony Beach, Monroe County, Florida
WLI Order No. 21-1227 Addendum

Gentlemen:

We are pleased to present this addendum to our previously issued report of our subsurface soil exploration, soil permeability tests and geotechnical engineering evaluation for the subject site. These services were performed in general accordance with the Professional Services Agreement dated June 2, 2021. This addendum along with our report issued June 21, 2021 present our evaluation and specific recommendations for the proposed construction together with the field data.

This report was prepared in compliance with the 7th Edition of the Florida Building Code (2020).

We appreciate this opportunity to be of service to you during this phase of the project. If you have any questions or comments regarding the information contained in this report, please contact the undersigned.

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,
WINGERTER LABORATORIES, INC.

10/19/21

Donald J. Flood, Jr., P.E.
Florida Registration No. 44847

enc: Report

In accordance with Rule 61G15-23.001 of the Florida Administrative Code, an original signature is hereby provided for the owner (or owner's representative) and the building official.

1820 N.E. 144th Street • North Miami, FL 33181 • (305) 944-3401 • 1-800-345-SOIL • Fax: (305) 949-8698
Broward: (954) 764-0472 • Dispatch Fax: (305) 949-1328

GEOTECHNICAL ENGINEERING EVALUATION

This Addendum Letter was requested in order to change the pile type from augercast piles to driven precast concrete piles for the new City Hall project in Key Colony Beach, Marathon. The current design is considering 14 inch diameter piles. However, only 16 inch diameter piles are allowed if the project is within the Florida Keys floodplain. We have received confirmation from the project architect that the subject site is within the floodplain. Therefore, only 16 inch precast concrete piles are specified as follows.

Also note that it is not advisable to shorten the pilings even though the capacity is higher, due to the very soft silt layer above the fragmented limestone.

ENGINEERING RECOMMENDATIONS

14 Inch Driven Precast Concrete Piles

1. **Specifications:**

Shaft Diameter:	16 inch diameter (square/tapered)
Compressive Capacity:	39 tons
Tension Capacity:	32 kips
Lateral Capacity:	17 kips
Total Pile Length:	30 feet
Rock Embedment:	6 feet into Limestone
Center to Center Spacing:	48 inches
Concrete Compressive Strength:	5,000 psi
Load Test Required:	No

Installation Specifications

1. The minimum center to center spacing of piles shall be not less than three times the diameter or width of the pile. No reduction for group action is required at this spacing.

2. Driving depth:

    2.1. Piles shall be driven to a depth that satisfies the dynamic driving formula as stated in Section 1810.3.3.1.1 of the Florida Building Code.

    2.2. Piles are expected to attain the recommended bearing capacity for the dynamic formula when driven to an estimated depth range of six feet into the limestone.

3. Testing and Inspection:

    3.1. At the recommended capacity, a static load test is not required by Section 1810.3.3.1.1 of the Florida Building Code.

    3.3. The geotechnical inspector shall witness and log all piles driven (test piles and production piles). Logs shall include pile identification, pile size, depth, blow count per foot, required capacity, actual capacity per the referenced dynamic formula, and compliance with the minimum blow count established by the test pile.

End of Addendum

KEY COLONY BEACH CITY HALL

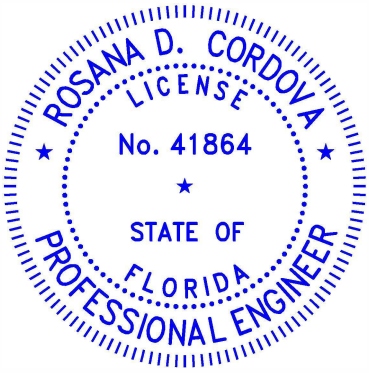
600 W Ocean Dr. Key Colony Beachm FL 33051

STORMWATER MANAGEMENT CALCULATIONS

Jul-22

Prepared By:
Cordova Rodriguez & Assoc., Inc.
Prepared: July 23, 2015

6941 SW 196 Ave., Suite 28
Pembroke Pines, FL 33332
954-655-4573
rcordova@craengineering.com
Auth. No. 8459



Rosana D. Cordova, P.E.
FL License No.: 41864

This item has been electronically signed and sealed by Rosana D. Cordova on the date adjacent to the seal using a SHA authentication code. Printed copies of this document are not considered signed and sealed and the SHA authentication code must be verified on any elctronic copies.

Key Colony Beach City Hall

July 1, 2022

The subject project is a 1.66-acre site located at 600 W Ocean Dr., Key Colony Beach, FL 33051. The site is currently the city hall, police department, and administrative building, and houses other city functions. The site will be demolished, and a new city hall will be constructed.

Also, a new post office and community center will be constructed on the site. The post office and community center will be set at a finished floor elevation that is 2' above the new FEMA map elevation. The City Hall and emergency operations will be on the second floor.

The project will utilize catch basins, exfiltration trenches, a drainage exfiltration pit, and an injection well to treat the required volume and to drain the site. The site will also utilize an existing shallow injection well, however, there is not enough information on the well to incorporate in the calculations.

The drainage system will consist of 790 linear feet of exfiltration trench, a new injection well with a weir, and an existing shallow injection well. The site will be graded to direct stormwater into the catch basins which are connected to 790 linear feet of exfiltration trench, exceeding the requirement based on treatment calculations. The exfiltration trenches serve as a medium to allow stormwater to transfer from the surface to the porous limestone base. The outfall control structure has been designed to hold back the water so that is first treated in the exfiltration trenches, then overflows into the injection well side of the structure.

The finished floor elevation is set at 11.5' NGVD29, which is well above the routed 100-yr-3-day elevation of 6.74' NGVD29.

PROJECT No.:20-211.04 Date: July 1, 2022 *Revised*	KEY COLONY BEACH PRE	Cordova Rodriguez & Assoc., Inc.	Rosana D. Cordova, P.E. #41864 6941 SW 196th Ave. #28 Pembroke Pines, FL 33332

I. GIVEN

A. AREAS

Lakes/Wetlands:	0.00	ac.
Roofs:	0.19	ac.
Asphalt/Concrete:	0.64	ac.
Detention Bottom	0.00	ac.
Green Area:	0.83	ac.
Open Space Area	0.00	ac.
Detention Bank	0.00	ac.
Project Total =	1.66	ac.

B. OTHER

NAVD88 plus 1.43 = NGVD29

1.	SFWMD Criteria	N/A	
2.	100-year Food Encroachment Elev.:	N/A	ft. NGVD29
3.	Flood Zone	AE 7	ft. NGVD29
4.	Min. Road Crown 10-yr 1day:	N/A	ft. NGVD29
5.	Receiving Body:	N/A	
6.	Control Elevation:	1.50	ft. NGVD29
7.	Allowable Discharge Per Permit:	per SFWMD	cfs
8.	Total Area Per Permit:	1.66	ac.
9.	Allowable Discharge For This Site:		

II. DESIGN CRITERIA

A. QUALITY

1. Whichever is greater:
   a. First inch from the entire site
   b. 2.5 inches times the percentage of imperviousness

2. Allowable discharge rate for this site is = n/a

B. QUANTITY

1. Design Event and Rainfall Amounts

   a. Design Event for Quality

Frequency:	5 year			10 year
Duration:	1 day			1 day
Amount:	7	6.0	in.	7.38

   b. Design Event for Minimum Road Elevation: (if not specified by Local Districts)

Frequency:	N/A	
Duration:		
Amount:		in.
Flood Contour:		

c. Design Event for Discharge:

Frequency:	25 year	
Duration:	72 hour	
Amount:	10.90	in.
Flood Contour:	n/a	

d. Design Event for Minimum Finish Floor Elevation:

Frequency:	100 year	
Duration:	72 hour	
Amount:	14.00	in.
Flood Contour:	n/a	

Frequency:	500 year	
Duration:	72 hour	
Amount:	22.80	in.

III. COMPUTATIONS

A. QUALITY N/A

1. Provide water quality for the first 1 inch of runoff from the developed project:

= 1.00 inch X 1.66 ac. X 1 ft./12 in.
= 0.14 ac.-ft. for the first inch of runoff.

2. Compute 2.5 inch times the percentage of imperviousness:

a. Site area for water quality pervious/impervious calculations only:
= total project - (water surface + roof)
= 1.66 ac. - (0.00 ac. + 0.19 ac.)
= 1.47 ac. site area, for water quality pervious/impervious.

b. Impervious area for water quality pervious/impervious calculations only:
= (site area for water quality pervious/impervious) - pervious
= 1.47 ac. - 0.83 ac.
= 0.64 ac. impervious area, for water quality pervious/impervious.

c. Percentage of imperviousness for water quality:
= (impervious area for water quality) / (site area for water quality) x 100%
= 0.64 ac. / 1.47 ac. X 100%
= 43.54%

d. For 2.5 in. times the percentage impervious.
= 2.50 in. X 43.54%
= 1.09 in. to be treated.

e. Compute volume required for quality detention:
= inches to be treated x (total project - lakes)
= 1.09 in. X (1.66 ac. - 0.00) X 1 ft./12 in.
= 0.15 ac.- ft. 1.81 ac-in

3. Summary

The first 1 inch of runoff from the developed project:	0.14	ac.- ft.
Volume required for 2.5 in. times the % imperviousness:	0.15	ac.- ft.

Therefore,

The volume	0.15	ac.- ft. controls.

B. SCS CURVE NUMBER

1. Average water table elevation:
   = control elevation
   = 1.50 ft. NGVD

2. Average finished site grade for pervious areas:

Item	Avg.Elev.	Area	Avg. Depth to W.T.	Percent	Area%
Detention Bottom	3.00	0.00	1.50	0%	0.00
Green Area:	5.00	0.83	3.50	100%	3.50
Detention Bank	3.30	0.00	1.80	0%	0.00
		0.83		100%	

3. Average depth to water table: 3.50 feet

4. From the soil storage table in the SFWMD Vol. IV manual, assuming Coastal Soils and 3.50 ft. to the water table, S' = 6.57 inches can be stored

5. Compute available soil storage:
   = storage available X pervious areas
   = 6.57 in. X 0.83 ac. X 1 ft./12 in.
   = 0.45 ac.- ft.

6. Convert available soil storage to site-wide moisture storage, S
   = available soil storage on-site/site area
   = 0.45 ac.- ft. / 1.66 ac. X 12 in./1 ft.
   = 3.28 in. of site-wide storage, S.

7. The SCS Curve Number, CN
   = 1000/(S+10)
   = 75 SCS curve number, CN

C. PROJECT SURFACE STORAGE

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Detention Bottom		0.00	V	3.00	N/A	N/A
Roofs:		0.19	V	8.50	N/A	N/A
Detention Bank		0.00	L	4.00	5.40	1.40
Green Area:		0.83	L	5.00	6.50	1.50
Open Space Area		0.00	L	5.50	8.50	3.00
Lakes/Wetlands:		0.00	V	4.00	N/A	N/A
Asphalt/Concrete:		0.64	L	4.14	7.44	3.30
		1.66				

2. Stage vs Storage curve data.

STAGE (ft.)	Detention Bottom	Open Space Area	Detention Bank	Green Area:	Lakes/Wetlands:	Asphalt/Concrete:	TOTAL (ac.- ft.)
1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.01	0.01
5.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
5.50	0.00	0.00	0.00	0.07	0.00	0.18	0.25
6.00	0.00	0.00	0.00	0.28	0.00	0.34	0.61
6.50	0.00	0.00	0.00	0.62	0.00	0.54	1.16
7.00	0.00	0.00	0.00	1.04	0.00	0.79	1.83
7.50	0.00	0.00	0.00	1.45	0.00	1.09	2.55
8.00	0.00	0.00	0.00	1.87	0.00	1.41	3.28
8.50	0.00	0.00	0.00	2.28	0.00	1.73	4.02
9.00	0.00	0.00	0.00	2.70	0.00	2.05	4.75
9.50	0.00	0.00	0.00	3.11	0.00	2.37	5.49
10.00	0.00	0.00	0.00	3.53	0.00	2.69	6.22
10.50	0.00	0.00	0.00	3.94	0.00	3.01	6.96
11.00	0.00	0.00	0.00	4.36	0.00	3.33	7.69
11.50	0.00	0.00	0.00	4.77	0.00	3.65	8.43
12.00	0.00	0.00	0.00	5.19	0.00	3.97	9.16
12.50	0.00	0.00	0.00	5.60	0.00	4.29	9.90
13.00	0.00	0.00	0.00	6.02	0.00	4.61	10.63
13.50	0.00	0.00	0.00	6.43	0.00	4.93	11.37

3. Stage vs Storage curve

D. Compute zero discharge stage

1. Runoff from the design storm (25-year 3-day).

   a. Rainfall amount for three-day event
   = 10.90 in. rainfall in three days.

   b. Runoff in inches (Q)
   = $(P - (0.2 \times S))^2/(P + (0.8 \times S))$
   = (10.90 in. - (0.2 x 3.28 in.))
   (10.90 in.+ (0.8 x 3.28 in.))
   = 7.76 in. of runoff from 25-year 3-day storm.

   c. Runoff volume
   = inches of runoff x site area
   = 7.76 in. x 1.66 ac. x 1 ft./12 in.
   = 1.07 ac.- ft. runoff volume.

4. Per Flood Routing - The zero-discharge stage = 6.38 ft. NGVD

1. Runoff from the design storm (100-year 3-day).

   a. Rainfall amount for three-day event
      = 14.00 in. rainfall in three days.

   b. Runoff in inches (Q)
      = $(P - (0.2 \times S))^2/(P + (0.8 \times S))$
      = $\frac{(14.00 \text{ in.} - (0.2 \times 3.28 \text{ in.}))}{(14.00 \text{ in.} + (0.8 \times 3.28 \text{ in.}))}$
      = 10.71 in. of runoff from 25-year 3-day storm.

   c. Runoff volume
      = inches of runoff x site area
      = 10.71 in. x 1.66 ac. x 1 ft./12 in.
      = 1.48 ac.- ft. runoff volume.

4. Per Flood Routing - The zero-discharge stage = 6.72 ft. NGVD

Therefore:

25-year, 3-day :	Pre =	6.38 NGVD
	Post =	6.34 NGVD
100-year, 3-day :	Pre =	6.72 NGVD
	Post =	6.74 NGVD

PROJECT No.:20-211.04 Date: July 1, 2022 *Revised*	KEY COLONY BEACH CITY HALL POST	Cordova Rodriguez & Assoc., Inc.	Rosana D. Cordova, P.E. #41864 6941 SW 196th Ave. #28 Pembroke Pines, FL 33332

I. GIVEN

A. AREAS

Lakes/Wetlands:	0.00	ac.
Roofs:	0.15	ac.
Asphalt/Concrete:	0.85	ac.
Detention Area	0.00	ac.
Green Area:	0.58	ac.
Open Space Area	0.00	ac.
Drainfield Area	0.08	ac.
Project Total =	1.66	ac.

B. OTHER

NAVD88 plus 1.43 = NGVD29

1. SFWMD Criteria	N/A		
2. 100-year Food Encroachment Elev.:	N/A	ft. NGVD29	
3. Flood Zone	AE 7	ft. NGVD29	Prel Map AE 8' NAVD88
4. Min. Road Crown 10-yr 1day:	N/A	ft. NGVD29	8 + 2 = 10 NAVD88
5. Receiving Body:	N/A		Prop FFE = 10.00' NAVD88
6. Control Elevation:	1.50	ft. NGVD29	= 11.43 NGVD29
7. Allowable Discharge Per Permit:	per SFWMD	cfs	11.50 NGVD29
8. Total Area Per Permit:	1.66	ac.	
9. Allowable Discharge For This Site:			

II. DESIGN CRITERIA

A. QUALITY

1. Whichever is greater:
   a. First inch from the entire site
   b. 2.5 inches times the percentage of imperviousness

2. Allowable discharge rate for this site is = n/a

B. QUANTITY

1. Design Event and Rainfall Amounts

   a. Design Event for Quality

Frequency:	5 year			10 year
Duration:	1 day			1 day
Amount:	7	6.0	in.	7.38

   b. Design Event for Minimum Road Elevation: (if not specified by Local Districts)

Frequency:	N/A	
Duration:		
Amount:		in.
Flood Contour:		

c. Design Event for Discharge:

Frequency:	25 year	
Duration:	72 hour	
Amount:	10.90	in.
Flood Contour:	n/a	

d. Design Event for Minimum Finish Floor Elevation:

Frequency:	100 year	
Duration:	72 hour	
Amount:	14.00	in.
Flood Contour:	n/a	

Frequency:	500 year	
Duration:	72 hour	
Amount:	22.80	in.

III. COMPUTATIONS

A. QUALITY N/A

1. Provide water quality for the first 1 inch of runoff from the developed project:

= 1.00 inch X 1.66 ac. X 1 ft./12 in.
= 0.14 ac.-ft. for the first inch of runoff.

2. Compute 2.5 inch times the percentage of imperviousness:

a. Site area for water quality pervious/impervious calculations only:
= total project - (water surface + roof)
= 1.66 ac. - (0.00 ac. + 0.15 ac.)
= 1.51 ac. site area, for water quality pervious/impervious.

b. Impervious area for water quality pervious/impervious calculations only:
= (site area for water quality pervious/impervious) - pervious
= 1.51 ac. - 0.66 ac.
= 0.85 ac. impervious area, for water quality pervious/impervious.

c. Percentage of imperviousness for water quality:
= (impervious area for water quality) / (site area for water quality) x 100%
= 0.85 ac. / 1.51 ac. X 100%
= 56.29%

d. For 2.5 in. times the percentage impervious.
= 2.50 in. X 56.29%
= 1.41 in. to be treated.

e. Compute volume required for quality detention:
= inches to be treated x (total project - lakes)
= 1.41 in. X (1.66 ac. - 0.00) X 1 ft./12 in.
= 0.19 ac.- ft. 2.34 ac-in 8480.02 cf

3. Summary

The first 1 inch of runoff from the developed project:	0.14	ac.- ft.
Volume required for 2.5 in. times the % imperviousness:	0.19	ac.- ft.

Therefore,

The volume	0.19	ac.- ft. controls.

B. SCS CURVE NUMBER

1. Average water table elevation:
   = control elevation
   = 1.50 ft. NGVD

2. Average finished site grade for pervious areas:

Item	Avg. Elev.	Area	Avg. Depth to W.T.	Percent	Area%
Detention Area	5.00	0.00	3.50	0%	0.00
Green Area:	5.00	0.58	3.50	88%	3.08
Drainfield Area	5.00	0.08	3.50	12%	0.42
		0.66		100%	

3. Average depth to water table: 3.50 feet

4. From the soil storage table in the SFWMD Vol. IV manual, assuming Coastal Soils and 3.50 ft. to the water table, S' = 6.57 inches can be stored

5. Compute available soil storage:
   = storage available X pervious areas
   = 6.57 in. X 0.66 ac. X 1 ft./12 in.
   = 0.36 ac.- ft.

6. Convert available soil storage to site-wide moisture storage, S
   = available soil storage on-site/site area
   = 0.36 ac.- ft. / 1.66 ac. X 12 in./1 ft.
   = 2.61 in. of site-wide storage, S.

7. The SCS Curve Number, CN
   = 1000/(S+10)
   = 79 SCS curve number, CN

C. PROJECT SURFACE STORAGE

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Detention Area		0.00	V	5.00	N/A	N/A
Roofs:		0.15	V	11.50	N/A	N/A
Drainfield Area		0.08	L	5.00	6.00	1.00
Green Area:		0.58	L	4.00	6.50	2.50
Open Space Area		0.00	L	5.50	8.50	3.00
Lakes/Wetlands:		0.00	V	2.00	N/A	N/A
Asphalt/Concrete:		0.85	L	4.75	8.50	3.75
		1.66				

2. Stage vs Storage curve data.

STAGE (ft.)	Detention Area	Open Space Area	Drainfield Area	Green Area:	Lakes/Wetlands:	Asphalt/Concrete:	TOTAL (ac.- ft.)
1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.03	0.00	0.00	0.03
5.00	0.00	0.00	0.00	0.12	0.00	0.01	0.12
5.50	0.00	0.00	0.01	0.26	0.00	0.06	0.33
6.00	0.00	0.00	0.04	0.46	0.00	0.18	0.68
6.50	0.00	0.00	0.08	0.73	0.00	0.35	1.15
7.00	0.00	0.00	0.12	1.02	0.00	0.57	1.71
7.50	0.00	0.00	0.16	1.31	0.00	0.86	2.32
8.00	0.00	0.00	0.20	1.60	0.00	1.20	2.99
8.50	0.00	0.00	0.24	1.89	0.00	1.59	3.72
9.00	0.00	0.00	0.28	2.18	0.00	2.02	4.47
9.50	0.00	0.00	0.32	2.47	0.00	2.44	5.23
10.00	0.00	0.00	0.36	2.76	0.00	2.87	5.98
10.50	0.00	0.00	0.40	3.05	0.00	3.29	6.74
11.00	0.00	0.00	0.44	3.34	0.00	3.72	7.49
11.50	0.00	0.00	0.48	3.63	0.00	4.14	8.25
12.00	0.00	0.00	0.52	3.92	0.00	4.57	9.00
12.50	0.00	0.00	0.56	4.21	0.00	4.99	9.76
13.00	0.00	0.00	0.60	4.50	0.00	5.42	10.51
13.50	0.00	0.00	0.64	4.79	0.00	5.84	11.27

3. Stage vs Storage curve

D. Compute zero discharge stage

1. Runoff from the design storm (25-year 3-day).

   a. Rainfall amount for three-day event
   = 10.90 in. rainfall in three days.

Provide 790 LF of exfiltration trench.

To account for drainfield volume, the rainfall amount will be reduced by 0.87 in. which is the volume treated in exfiltration (0.12 AF/1.66ac*12in=0.87 in) over the entire site. 0.87 in.

   = 10.03

   b. Runoff in inches (Q)
   = $(P - (0.2 \times S))^2/(P + (0.8 \times S))$
   = (10.03 in. - (0.2 x 2.61 in.))
   (10.03 in.+ (0.8 x 2.61 in.))
   = 7.46 in. of runoff from 25-year 3-day storm.

   c. Runoff volume
   = inches of runoff x site area
   = 7.46 in. x 1.66 ac. x 1 ft./12 in.
   = 1.03 ac.- ft. runoff volume.

4. Per Flood Routing - The zero-discharge stage = 6.34 ft. NGVD

1. Runoff from the design storm (100-year 3-day).

a. Rainfall amount for three-day event

= 14.00 in. rainfall in three days.

Provide 790 LF of exfiltration trench.

To account for drainfield volume, the rainfall amount will be reduced by 0.87 in. which is the volume treated in exfiltration (0.12 AF/1.66ac*12in=0.87 in) over the entire site. 0.87 in.

= 13.13

b. Runoff in inches (Q)

= $(P - (0.2 \times S))^2/(P + (0.8 \times S))$

= (13.13 in. - (0.2 x 2.61 in.))

(13.13 in.+ (0.8 x 2.61 in.))

= 10.45 in. of runoff from 25-year 3-day storm.

c. Runoff volume

= inches of runoff x site area

= 10.45 in. x 1.66 ac. x 1 ft./12 in.

= 1.44 ac.- ft. runoff volume.

4. Per Flood Routing - The zero-discharge stage = 6.74 ft. NGVD

Therefore:

25-year, 3-day :	Pre =	6.38 NGVD
	Post =	6.34 NGVD
100-year, 3-day :	Pre =	6.72 NGVD
	Post =	6.74 NGVD

Project Name: Pre-KCB-100-yr-3-day
Reviewer: RDC
Project Number: 20-211.04
  Period Begin: Jan 01, 2000;0000 hr End: Jan 07, 2000;0600 hr Duration: 150 hr
  Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

  Method: Santa Barbara Unit Hydrograph
  Rainfall Distribution: SFWMD - 3day
  Design Frequency: 100 year
  3 Day Rainfall: 14 inches
  Area: 1.66 acres
  Ground Storage: 3.28 inches
  Time of Concentration: 0.167 hours
  Initial Stage: 1.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
1.50	0.00
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.07
6.00	0.61
7.00	1.82
8.00	3.26
9.00	4.72
10.00	6.18
11.00	7.64
11.50	8.37
12.00	9.10
12.50	9.83
13.00	10.56
13.50	11.29
14.00	12.02
14.50	12.75
15.00	13.48
15.50	14.21

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	1.50
4000.00	1.50

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	6.72	73.60	1.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	1.48	0.00	0.00	0.00	1.48	0.00

Project Name: Pre-KCB-25-yr-3-day
Reviewer: RDC
Project Number: 20-211.04
  Period Begin: Jan 01, 2000;0000 hr End: Jan 07, 2000;0600 hr Duration: 150 hr
  Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

  Method: Santa Barbara Unit Hydrograph
  Rainfall Distribution: SFWMD - 3day
  Design Frequency: 25 year
  3 Day Rainfall: 10.9 inches
  Area: 1.66 acres
  Ground Storage: 3.28 inches
  Time of Concentration: 0.167 hours
  Initial Stage: 1.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
1.50	0.00
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.07
6.00	0.61
7.00	1.82
8.00	3.26
9.00	4.72
10.00	6.18
11.00	7.64
11.50	8.37
12.00	9.10
12.50	9.83
13.00	10.56
13.50	11.29
14.00	12.02
14.50	12.75
15.00	13.48
15.50	14.21

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	1.50
4000.00	1.50

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	6.38	73.80	1.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	1.07	0.00	0.00	0.00	1.07	0.00

Project Name: Post-KCB-100-yr-3-day
Reviewer: RDC
Project Number: 20-211.04
  Period Begin: Jan 01, 2000;0000 hr End: Jan 07, 2000;0600 hr Duration: 150 hr
  Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

  Method: Santa Barbara Unit Hydrograph
  Rainfall Distribution: SFWMD - 3day
  Design Frequency: 100 year
  3 Day Rainfall: 13.13 inches
  Area: 1.66 acres
  Ground Storage: 2.61 inches
  Time of Concentration: 0.167 hours
  Initial Stage: 1.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
1.50	0.00
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.12
6.00	0.68
7.00	1.71
8.00	2.99
9.00	4.47
10.00	5.98
11.00	7.49
11.50	8.25
12.00	9.00
12.50	9.76
13.00	10.51
13.50	11.27
14.00	12.02
14.50	12.78
15.00	13.53
15.50	14.29

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	1.50
4000.00	1.50

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	6.74	73.60	1.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	1.44	0.00	0.00	0.00	1.44	0.00

Project Name: Post-KCB-25-yr-3-day
Reviewer: RDC
Project Number: 20-211.04
  Period Begin: Jan 01, 2000;0000 hr End: Jan 07, 2000;0600 hr Duration: 150 hr
  Time Step: 0.2 hr, Iterations: 10

Basin 1: Site

  Method: Santa Barbara Unit Hydrograph
  Rainfall Distribution: SFWMD - 3day
  Design Frequency: 25 year
  3 Day Rainfall: 10.03 inches
  Area: 1.66 acres
  Ground Storage: 2.61 inches
  Time of Concentration: 0.167 hours
  Initial Stage: 1.5 ft NGVD

Stage (ft NGVD)	Storage (acre-ft)
1.50	0.00
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.12
6.00	0.68
7.00	1.71
8.00	2.99
9.00	4.47
10.00	5.98
11.00	7.49
11.50	8.25
12.00	9.00
12.50	9.76
13.00	10.51
13.50	11.27
14.00	12.02
14.50	12.78
15.00	13.53
15.50	14.29

Offsite Receiving Body: Offsite1

Time (hr)	Stage (ft NGVD)
0.00	1.50
4000.00	1.50

STRUCTURE MAXIMUM AND MINIMUM DISCHARGES

Struc	Max (cfs)	Time (hr)	Min (cfs)	Time (hr)

BASIN MAXIMUM AND MINIMUM STAGES

Basin	Max (ft)	Time (hr)	Min (ft)	Time (hr)
Site	6.34	73.60	1.50	0.00

BASIN WATER BUDGETS (all units in acre-ft)

Basin	Total Runoff	Structure Inflow	Structure Outflow	Initial Storage	Final Storage	Residual
Site	1.03	0.00	0.00	0.00	1.03	0.00

KEY COLONY BEACH CITY HALL

5/25/2022 Revised:

EXFILTRATION TRENCH CALCULATIONS

A. Volume to be treated

V = 0.19 ac-ft 2.28 ac-in **1.36 ac-in**

Subtract 0.92 ac-in volume provided in exfiltration pits

B. Determine length of trench required

Per SFWMD Volume IV for Ds > Du

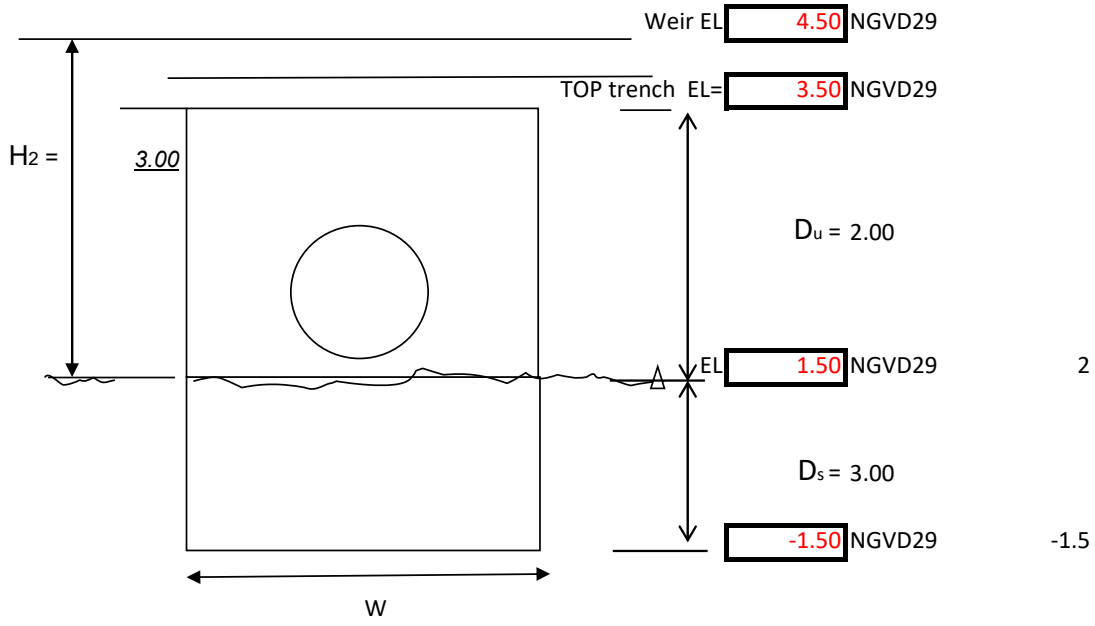
$$L = \frac{V}{K(2H2Du - Du^2 + 2H2Ds) + 0.000139WDu}$$

V =	1.36	ac-in			
K =	7.15E-06	cfs/sf-ft head	avg. k-value		7.05E-06
H_2 =	3.00	ft			7.24E-06
W =	6.00	ft		Avg K	7.15E-06
D_u =	2.00	ft			
D_s =	3.00	ft			

H_2W	18.00		
$2H_2Du$=	12.00		
Du^2=	4.00		
$2H_2D_s$=	18.00		
K(2H2Du-Du^2 + 2H2Ds)		=	0.00019
0.000139WDu =			0.00167

Lr = 736 lineal feet required

Lp = 790 lineal feet provided



Volume Provided = 1.46 ac-in = 0.12 ac-ft

Eastern
Engineering Group

CITY OF KEY COLONY BEACH

Job. No: 21-0580

600 W OCEAN DR, KEY COLONY, FL 33051

STRUCTURAL CALCULATION

Prepared By:
☐ Raissa Lopez, PE
Lic. No. 59399
CAN # 26655

3401 NW 82nd Ave, Suite 370, Miami, Florida 33122
Telf. (305) 599–8133 / Email: info@easterneg.com

Eastern
Engineering Group

DESIGN CRITERIA:

Calculations based on:

1. 2020 Florida Building Code
2. Minimum Design Loads for Buildings and Other Structures ASCE 7-16
3. Building Code Requirements for Structural Concrete ACI 318-14
4. American Institute of Steel Construction AISC-14ed
5. Aluminum Design Manual 2015
6. Specifications for the Design of Cold-Formed Stainless Steel Structural Members SEI/ASCE8-02

CALCULATION INDEX:

CALCULATION STATEMENT:

To the best of my knowledge, ability, belief and professional judgment, I hereby attest that the manual calculations and computer-generated calculations are in compliance with the existing governing codes.

Prepared By:
☐ Raissa Lopez, PE

3401 NW 82nd Ave, Suite 370, Miami, Florida 33122
Telf. (305) 599-8133 / Email: info@easterneg.com

MecaWind v2405

Calculations Prepared by:
Date: Jun 15, 2022

File Location:
N:\EEG ACTIVE\Work in Progress\2021\21 0580 City of Key Colony Beach\Calc\Wind\
Main Building\21-0580 Main Building V01.wnd

Basic Wind Parameters

Wind Load Standard	= ASCE 7-16	Exposure Category	= D
Wind Design Speed	= 200.0 mph	Risk Category	= IV
Structure Type	= Building	Building Type	= Enclosed

General Wind Settings

Incl_LF	= Include ASD Load Factor of 0.6 in Pressures	= True
DynType	= Dynamic Type of Structure	= Rigid
Zg	= Altitude (Ground Elevation) above Sea Level	= 0.000 ft
Bdist	= Base Elevation of Structure	= 0.000 ft
SDB	= Simple Diaphragm Building	= True
Reacs	= Show the Base Reactions in the output	= False
MWFRSType	= MWFRS Method Selected	= Ch 27 Pt 1

Topographic Factor per Fig 26.8-1

Topo	= Topographic Feature	= None
Kzt	= Topographic Factor	= 1.000

Building Inputs

RoofType:	Building Roof Type	= Hipped	W	: Width Perp to Ridge	= 147.580 ft
L	: Length Along Ridge	= 184.200 ft	EHt	: Eave Height	= 29.000 ft
Hip	: Ridge Hipped Length	= 120.600 ft	RE	: Roof Entry Method	= Ridge
RHt	: Ridge Height	= 50.000 ft	Theta	: Roof Slope	= 15.17 Deg
Par	: Is there a Parapet	= False			

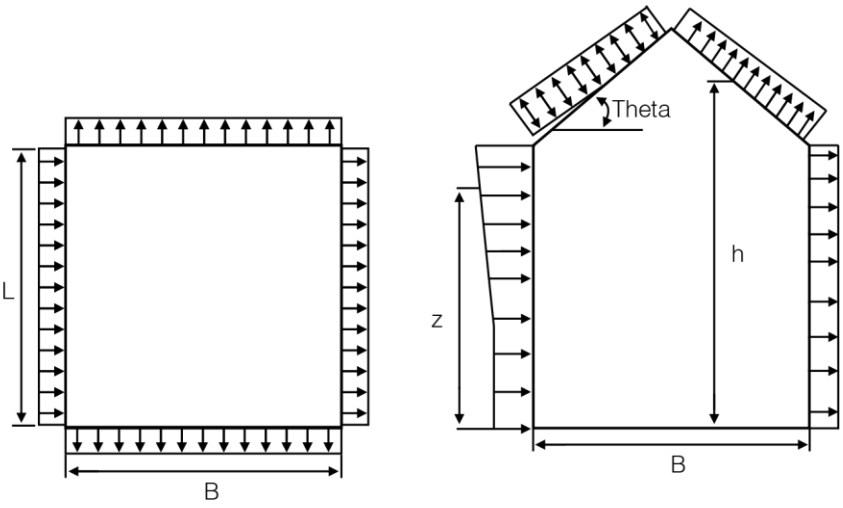
Exposure Constants per Table 26.11-1:

Alpha:	Table 26.11-1 Const	= 11.500	Zg:	Table 26.11-1 Const	= 700.000 ft
At:	Table 26.11-1 Const	= 0.087	Bt:	Table 26.11-1 Const	= 1.070
Am:	Table 26.11-1 Const	= 0.111	Bm:	Table 26.11-1 Const	= 0.800
C:	Table 26.11-1 Const	= 0.150	Eps:	Table 26.11-1 Const	= 0.125

Overhang Inputs:

Std	= Overhangs on all sides are the same	= True
OHType	= Type of Roof Wall Intersections	= Sofit
OH	= Overhang of Roof Beyond Wall	= 3.670 ft

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:



h	= Mean Roof Height above grade	= 39.500 ft
Kh	= 15 ft [4.572 m]< Z <Zg -->(2.01*(Z/zg)^(2/Alpha) {Table 26.10-1}	= 1.219
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
Kd	= Wind Directionality Factor per Table 26.6-1	= 0.85
Zg	= Elevation above Sea Level	= 0.000 ft
Ke	= Ground Elevation Factor: Ke = e^-(0.0000362*Zg) {Table 26.9-1}	= 1.000

GCPi = Ref Table 26.13-1 for Enclosed Building = +/-0.18
RA = Roof Area = 29997.79 sq ft
LF = Load Factor based upon ASD Design = 0.60
qh = (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF = 63.67 psf
qin = For Negative Internal Pressure of Enclosed Building use qh*LF = 63.67 psf
qip = For Positive Internal Pressure of Enclosed Building use qh*LF = 63.67 psf

Gust Factor Calculation:

Gust Factor Category I Rigid Structures - Simplified Method
G1 = For Rigid Structures (Nat. Freq.>1 Hz) use 0.85 = 0.85
Gust Factor Category II Rigid Structures - Complete Analysis
Zm = Max(0.6 * Ht, Zmin) = 23.700 ft
Izm = Cc * (33 / Zm) ^ 0.167 = 0.159
Lzm = L * (Zm / 33) ^ Eps = 623.652
B = Structure Width Normal to Wind = 184.200 ft
Q = (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5 = 0.867
G2 = 0.925*((1+0.7*Izm*3.4*Q)/(1+0.7*3.4*Izm)) = 0.866
Gust Factor Used in Analysis
G = Lessor Of G1 Or G2 = 0.850

MWFRS Wind Normal to Ridge (Ref Fig 27.3-1)

h = Mean Roof Height Of Building = 39.500 ft
RHt = Ridge Height Of Roof = 50.000 ft
B = Horizontal Dimension Of Building Normal To Wind Direction = 184.200 ft
L = Horizontal Dimension Of building Parallel To Wind Direction = 147.580 ft
L/B = Ratio Of L/B used For Cp determination = 0.801
h/L = Ratio Of h/L used For Cp determination = 0.268
Slope = Slope of Roof = 15.17 Deg
OH_Top_+Y = Overhang Top +Y (Leeward) = -0.5, -0.5
OH_Top_-Y = Overhang Top Windward Edge = -0.01, -0.51
OH_X = Overhang Top +/-X Coeff (0 to h/2) (0.000 ft to 3.670 ft) = -0.18, -0.9
OH_X = Overhang Top +/-X Coeff (0 to h/2) (3.670 ft to 19.750 ft) = -0.18, -0.9
OH_X = Overhang Top +/-X Coeff (h/2 to h) (19.750 ft to 39.500 ft) = -0.18, -0.9
OH_X = Overhang Top +/-X Coeff (h to 2h) (39.500 ft to 77.460 ft) = -0.18, -0.5
OH_X = Overhang Top +/-X Coeff (h to 2h) (77.460 ft to 79.000 ft) = -0.18, -0.5
OH_X = Overhang Top +/-X Coeff (>2h) (>79.000 ft) = -0.18, -0.3
OH_X = Overhang Top +/-X Coeff (>2h) (>151.250 ft) = -0.18, -0.3
Roof_LW = Roof (Leeward) = -0.5, -0.5
Roof_WW = Roof (Windward) = -0.01, -0.51
Roof_X = Roof +/-X Coeff (0 to h/2) (3.670 ft to 19.750 ft) = -0.18, -0.9
Roof_X = Roof +/-X Coeff (h/2 to h) (19.750 ft to 39.500 ft) = -0.18, -0.9
Roof_X = Roof +/-X Coeff (h to 2h) (39.500 ft to 79.000 ft) = -0.18, -0.5
Roof_X = Roof +/-X Coeff (>2h) (>79.000 ft) = -0.18, -0.3
Sofit_-Y = Overhang Sofit -Y = 0.8, 0.8

Cp_WW = Windward Wall Coefficient (All L/B Values) = 0.80
Cp_LW = Leward Wall Coefficient using L/B = -0.50
Cp_SW = Side Wall Coefficient (All L/B values) = -0.70
GCpn_WW = Parapet Combined Net Pressure Coefficient (Windward Parapet) = 1.50
GCpn_LW = Parapet Combined Net Pressure Coefficient (Leeward Parapet) = -1.00

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Normal to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
29.00	1.155	1.000	60.34	0.18	29.57	-38.52	-49.34	68.09	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Normal to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
29.00	1.155	1.000	60.34	-0.18	52.49	-15.60	-26.42	68.09	9.60

Notes Wall Pressures:
Kz = Velocity Press Exp Coeff Kzt = Topographical Factor
qz = 0.00256*Kz*Kzt*Kd*V^2 GCPi = Internal Press Coefficient
Side = qh * G * Cp_SW - qip * +GCPi Windward = qz * G * Cp_WW - qip * +GCPi
Leeward = qh * G * Cp_LW - qip * +GCPi Total = Windward Press - Leeward Press
* Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Normal to Ridge

All wind pressures include a load factor of 0.6

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
OH_Top_+Y	N/A	N/A	-0.500	-0.500	0.180	-15.60	-38.52	-15.60	-38.52
OH_Top_+Y	N/A	N/A	-0.500	-0.500	0.180	-15.60	-38.52	-15.60	-38.52
OH_Top_-Y	N/A	N/A	-0.010	-0.510	0.180	10.92	-12.00	-16.14	-39.06
OH_Top_-Y	N/A	N/A	-0.010	-0.510	0.180	10.92	-12.00	-16.14	-39.06
OH_X (+X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (-X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (+X)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (-X)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (+X)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (-X)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_X (+X)	39.500	77.460	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_X (-X)	39.500	77.460	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_X (+X)	77.460	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_X (-X)	77.460	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_X (+X)	79.000	151.250	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_X (-X)	79.000	151.250	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_X (+X)	151.250	154.920	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_X (-X)	151.250	154.920	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
Roof_LW	N/A	N/A	-0.500	-0.500	0.180	-15.60	-38.52	-15.60	-38.52
Roof_WW	N/A	N/A	-0.010	-0.510	0.180	10.92	-12.00	-16.14	-39.06
Roof_X (+X)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof_X (-X)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof_X (+X)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof_X (-X)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof_X (+X)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
Roof_X (-X)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
Roof_X (+X)	79.000	151.250	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
Roof_X (-X)	79.000	151.250	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
Sofit_-Y	N/A	N/A	0.800	0.800	0.180	54.76	31.84	54.76	31.84

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
Cp_Max = Largest Coefficient Magnitude Cp_Min = Smallest Coefficient Magnitude
Pp_max = qh*G*Cp_max - qip*(+GCPi) Pn_max = qh*G*Cp_max - qin*(-GCpi)
Pp_min* = qh*G*Cp_min - qip*(+GCPi) Pn_min* = qh*G*Cp_min - qin*(-GCPi)
OH = Overhang X = Dir along Ridge Y = Dir Perpendcular to Ridge Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

MWFRS Wind Parallel to Ridge (Ref Fig 27.3-1}

h	= Mean Roof Height Of Building	= 39.500 ft
RHt	= Ridge Height Of Roof	= 50.000 ft
B	= Horizontal Dimension Of Building Normal To Wind Direction	= 147.580 ft
L	= Horizontal Dimension Of building Parallel To Wind Direction	= 184.200 ft
L/B	= Ratio Of L/B used For Cp determination	= 1.248
h/L	= Ratio Of h/L used For Cp determination	= 0.214
Slope	= Slope of Roof	= 15.17 Deg
Hip_End	= Hipped End Coeff (0 to h/2) (3.670 ft to 19.750 ft)	= -0.18, -0.9
Hip_End	= Hipped End Coeff (h/2 to h) (19.750 ft to 35.470 ft)	= -0.18, -0.9
Hip_End	= Hipped End Coeff (>2h) (>156.070 ft)	= -0.18, -0.3
OH_Bot	= Sofit (Windward Face Only)	= 0.8, 0.8
OH_Top	= Overhang Top Coeff (0 to h/2) (0.000 ft to 3.670 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (0 to h/2) (3.670 ft to 19.750 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (h/2 to h) (19.750 ft to 39.500 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (h to 2h) (39.500 ft to 79.000 ft)	= -0.18, -0.5
OH_Top	= Overhang Top Coeff (>2h) (>79.000 ft)	= -0.18, -0.3
OH_Top	= Overhang Top Coeff (>2h) (>95.770 ft)	= -0.18, -0.3
OH_Top	= Overhang Top Coeff (>2h) (>187.870 ft)	= -0.18, -0.3
Roof	= Roof Coeff (0 to h/2) (3.670 ft to 19.750 ft)	= -0.18, -0.9
Roof	= Roof Coeff (h/2 to h) (19.750 ft to 39.500 ft)	= -0.18, -0.9
Roof	= Roof Coeff (h to 2h) (39.500 ft to 79.000 ft)	= -0.18, -0.5
Roof	= Roof Coeff (>2h) (>79.000 ft)	= -0.18, -0.3
Cp_WW	= Windward Wall Coefficient (All L/B Values)	= 0.80
Cp_LW	= Leward Wall Coefficient using L/B	= -0.45
Cp_SW	= Side Wall Coefficient (All L/B values)	= -0.70
GCpn_WW	= Parapet Combined Net Pressure Coefficient (Windward Parapet)	= 1.50
GCpn_LW	= Parapet Combined Net Pressure Coefficient (Leeward Parapet)	= -1.00

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
29.00	1.155	1.000	60.34	0.18	29.57	-35.83	-49.34	65.40	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
29.00	1.155	1.000	60.34	-0.18	52.49	-12.91	-26.42	65.40	9.60

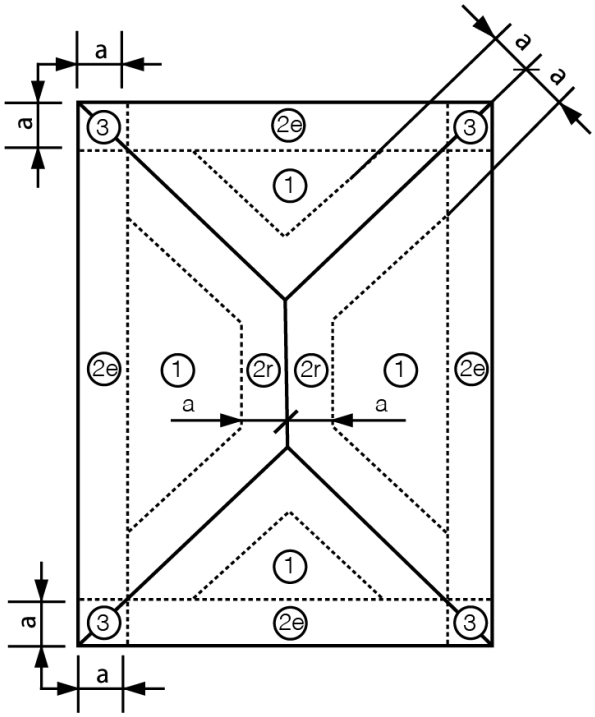
Notes Wall Pressures:
Kz = Velocity Press Exp Coeff Kzt = Topographical Factor
qz = 0.00256*Kz*Kzt*Kd*V^2 GCPi = Internal Press Coefficient
Side = qh * G * Cp_SW - qip * +GCPi Windward = qz * G * Cp_WW - qip * +GCPi
Leeward = qh * G * Cp_LW - qip * +GCPi Total = Windward Press - Leeward Press
* Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

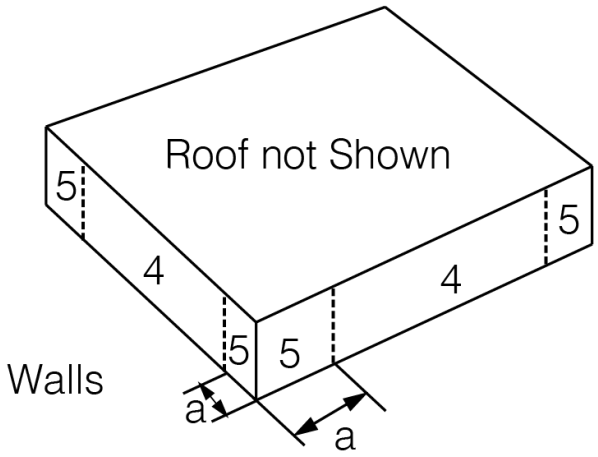
Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
Hip_End (-X)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Hip_End (-X)	19.750	35.470	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Hip_End (+X)	156.070	187.870	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Bot	N/A	N/A	0.800	0.800	0.180	54.76	31.84	54.76	31.84
OH_Top (-X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-X)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (+Y)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-Y)	0.000	3.670	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (+Y)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-Y)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (+Y)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (-Y)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
OH_Top (+Y)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_Top (-Y)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
OH_Top (+Y)	79.000	95.770	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (-Y)	79.000	95.770	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+Y)	95.770	187.870	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (-Y)	95.770	187.870	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+X)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+X)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+X)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+X)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (+Y)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
OH_Top (-Y)	187.870	191.540	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
Roof (+Y)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof (-Y)	3.670	19.750	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof (+Y)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof (-Y)	19.750	39.500	-0.180	-0.900	0.180	1.72	-21.20	-37.25	-60.17
Roof (+Y)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
Roof (-Y)	39.500	79.000	-0.180	-0.500	0.180	1.72	-21.20	-15.60	-38.52
Roof (+Y)	79.000	187.870	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70
Roof (-Y)	79.000	187.870	-0.180	-0.300	0.180	1.72	-21.20	-4.78	-27.70

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
Cp_Max = Largest Coefficient Magnitude Cp_Min = Smallest Coefficient Magnitude
Pp_max = qh*G*Cp_max - qip*(+GCPi) Pn_max = qh*G*Cp_max - qin*(-GCpi)
Pp_min* = qh*G*Cp_min - qip*(+GCPi) Pn_min* = qh*G*Cp_min - qin*(-GCPi)
OH = Overhang X = Dir along Ridge Y = Dir Perpendcular to Ridge Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined
with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Components and Cladding (C&C) Calculations per Ch 30 Part 1:





h/W	= Ratio of mean roof height to building width	= 0.268
h/L	= Ratio of mean roof height to building length	= 0.214
h	= Mean Roof Height above grade	= 39.500 ft
Kh	= 15 ft [4.572 m]< Z <Zg -->(2.01*(Z/zg)^(2/Alpha) {Table 26.10-1}	= 1.219
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
Kd	= Wind Directionality Factor per Table 26.6-1	= 0.85
GCPi	= Ref Table 26.13-1 for Enclosed Building	= +/-0.18
LF	= Load Factor based upon ASD Design	= 0.60
qh	= (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF	= 63.67 psf
LHD	= Least Horizontal Dimension: Min(B, L)	= 147.580 ft
a1	= Min(0.1 * LHD, 0.4 * h)	= 14.758 ft
a	= Max(a1, 0.04 * LHD, 3 ft [0.9 m])	= 14.758 ft
h/B	= Ratio of mean roof height to least hor dim: h / B	= 0.268

Wind Pressures for C&C Ch 30 Pt 1
All wind pressures include a load factor of 0.6

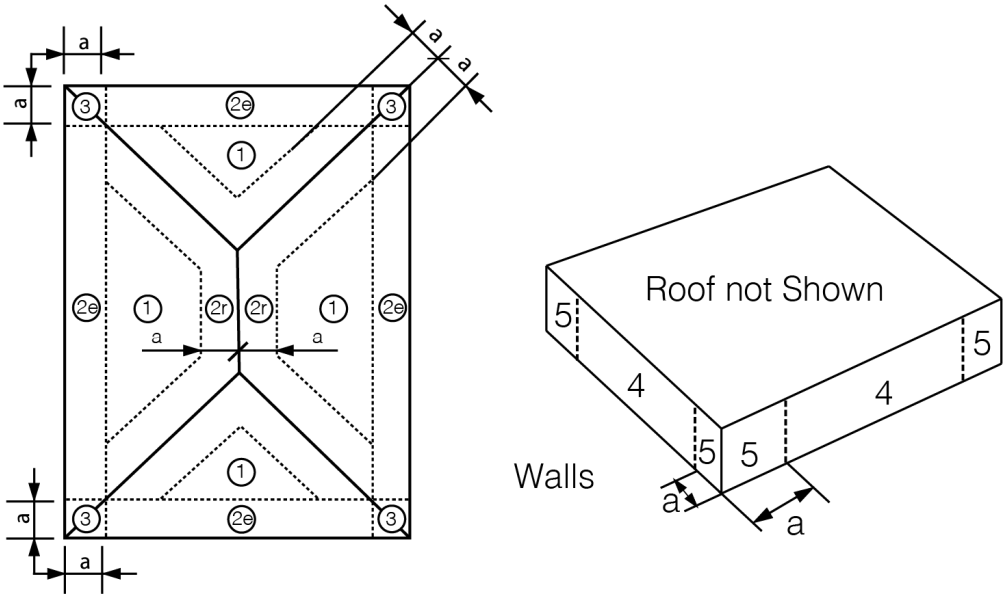
Description	Zone	Width	Span	Area	1/3 Rule	Ref Fig	GCp Max	GCp Min	p Max	p Min
		ft	ft	sq ft					psf	psf
Zone 1	1	10.000	1.000	10.00	No	30.3-2E	0.700	-1.300	56.03	-94.23
Zone 1	1	20.000	1.000	20.00	No	30.3-2E	0.580	-1.300	48.36	-94.23
Zone 1	1	50.000	1.000	50.00	No	30.3-2E	0.420	-1.129	38.23	-83.36
Zone 2e	2e	10.000	1.000	10.00	No	30.3-2E	0.700	-1.800	56.03	-126.07
Zone 2e	2e	20.000	1.000	20.00	No	30.3-2E	0.580	-1.638	48.36	-115.75
Zone 2e	2e	50.000	1.000	50.00	No	30.3-2E	0.420	-1.424	38.23	-102.12
Zone 3	3	10.000	1.000	10.00	No	30.3-2E	0.700	-1.800	56.03	-126.07
Zone 3	3	20.000	1.000	20.00	No	30.3-2E	0.580	-1.638	48.36	-115.75
Zone 3	3	50.000	1.000	50.00	No	30.3-2E	0.420	-1.424	38.23	-102.12
Zone 2r	2r	10.000	1.000	10.00	No	30.3-2E	0.700	-2.400	56.03	-164.27
Zone 2r	2r	20.000	1.000	20.00	No	30.3-2E	0.580	-2.145	48.36	-148.06
Zone 2r	2r	50.000	1.000	50.00	No	30.3-2E	0.420	-1.809	38.23	-126.64
Zone 4	4	10.000	1.000	10.00	No	30.3-1	1.000	-1.100	75.13	-81.50
Zone 4	4	20.000	1.000	20.00	No	30.3-1	0.947	-1.047	71.75	-78.11
Zone 4	4	50.000	1.000	50.00	No	30.3-1	0.877	-0.977	67.27	-73.64
Zone 5	5	10.000	1.000	10.00	No	30.3-1	1.000	-1.400	75.13	-100.60
Zone 5	5	20.000	1.000	20.00	No	30.3-1	0.947	-1.294	71.75	-93.83
Zone 5	5	50.000	1.000	50.00	No	30.3-1	0.877	-1.153	67.27	-84.88
Zone 5	5	150.000	1.000	150.00	No	30.3-1	0.792	-0.985	61.91	-74.15
Zone 4	4	150.000	1.000	150.00	No	30.3-1	0.792	-0.892	61.91	-68.28

Area = Span Length x Effective Width
1/3 Rule = Effective width need not be less than 1/3 of the span length
GCp = External Pressure Coefficients taken from Figures 30.3-1 through 30.3-7
p = Wind Pressure: qh*(GCp - GCpi) [Eqn 30.3-1]*

* Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}

Components and Cladding (C&C) Overhang Calculations per Section 30.9:

h = Mean Roof Height above grade = 39.500 ft
Kh = 15 ft [4.572 m]< Z <Zg -->(2.01*(Z/zg)^(2/Alpha) {Table 26.10-1}= 1.219
Kzt = Topographic Factor is 1 since no Topographic feature specified = 1.000
Kd = Wind Directionality Factor per Table 26.6-1 = 0.85
GCPi = Ref Table 26.13-1 for Enclosed Building = +/-0.18
LF = Load Factor based upon ASD Design = 0.60
qh = (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF = 63.67 psf

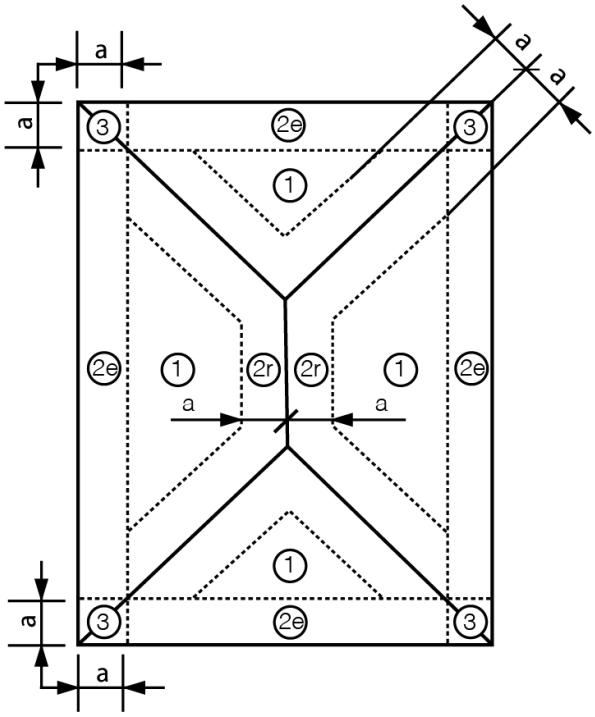


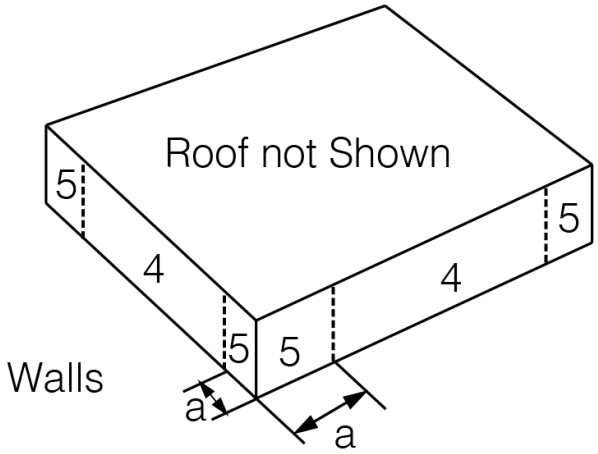
Wind Pressures for C&C per Section 30.9 & Figure 30.3-2
All wind pressures include a load factor of 0.6

Description	Zone	Width ft	Span Length ft	Area sq ft	1/3 Rule	Ref Fig	GCpi +/-	GCp Max	GCp Min	p Max psf	p Min psf
Zone 1-OHS	1_OHS	10.000	1.000	10.00	No	30.3-2F	0.18	0.000	-1.800	9.60	-126.07
Zone 1-OHS	1_OHS	20.000	1.000	20.00	No	30.3-2F	0.18	0.000	-1.860	9.60	-129.90
Zone 1-OHS	1_OHS	50.000	1.000	50.00	No	30.3-2F	0.18	0.000	-1.940	9.60	-134.97
Zone 2e-OHS	2e_OHS	10.000	1.000	10.00	No	30.3-2F	0.18	0.000	-2.300	9.60	-157.90
Zone 2e-OHS	2e_OHS	20.000	1.000	20.00	No	30.3-2F	0.18	0.000	-2.254	9.60	-154.96
Zone 2e-OHS	2e_OHS	50.000	1.000	50.00	No	30.3-2F	0.18	0.000	-2.193	9.60	-151.06
Zone 2r-OHS	2r_OHS	10.000	1.000	10.00	No	30.3-2F	0.18	0.000	-2.900	9.60	-196.10
Zone 2r-OHS	2r_OHS	20.000	1.000	20.00	No	30.3-2F	0.18	0.000	-2.761	9.60	-187.26
Zone 2r-OHS	2r_OHS	50.000	1.000	50.00	No	30.3-2F	0.18	0.000	-2.578	9.60	-175.58
Zone 3-OHS	3_OHS	10.000	1.000	10.00	No	30.3-2F	0.18	0.000	-2.900	9.60	-196.10
Zone 3-OHS	3_OHS	20.000	1.000	20.00	No	30.3-2F	0.18	0.000	-2.599	9.60	-176.95
Zone 3-OHS	3_OHS	50.000	1.000	50.00	No	30.3-2F	0.18	0.000	-2.202	9.60	-151.64

#_OHS = Zone # on Overhang w/ Sofit w/ Buildings Internal Pressure (GCPi = +/-0.18)
Area = Span Length x Effective Width
1/3 Rule = Effective width need not be less than 1/3 of the span length
p = Wind Pressure: qh*(GCp - GCpi)*LF [Eqn 30.3-1]*
* Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}
Values of GCp for overhangs include contributions from both upper and lower surfaces.

Components and Cladding (C&C) Zone Summary per Ch 30 Pt 1:





h/W	= Ratio of mean roof height to building width		= 0.268
h/L	= Ratio of mean roof height to building length		= 0.214
h	= Mean Roof Height above grade		= 39.500 ft
Kh	= 15 ft [4.572 m]< Z <Zg -->(2.01*(Z/zg)^(2/Alpha) {Table 26.10-1}		= 1.219
Kzt	= Topographic Factor is 1 since no Topographic feature specified		= 1.000
Kd	= Wind Directionality Factor per Table 26.6-1		= 0.85
GCPi	= Ref Table 26.13-1 for Enclosed Building		= +/-0.18
LF	= Load Factor based upon ASD Design		= 0.60
qh	= (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF		= 63.67 psf
LHD	= Least Horizontal Dimension: Min(B, L)		= 147.580 ft
a1	= Min(0.1 * LHD, 0.4 * h)		= 14.758 ft
a	= Max(a1, 0.04 * LHD, 3 ft [0.9 m])		= 14.758 ft
h/B	= Ratio of mean roof height to least hor dim: h / B		= 0.268

Wind Pressure Summary for C&C Zones based Upon Areas Ch 30 Pt 1 (Table 1 of 2)
All wind pressures include a load factor of 0.6

Zone	Figure	A <= 10.00 sq ft psf	A = 20.00 sq ft psf	A = 50.00 sq ft psf
1	30.3-2E	56.03 -94.23	48.36 -94.23	38.23 -83.36
1_OH	30.3-2F	9.60 -114.61	9.60 -118.44	9.60 -123.51
1_OHS	30.3-2F	9.60 -126.07	9.60 -129.90	9.60 -134.97
2e	30.3-2E	56.03 -126.07	48.36 -115.75	38.23 -102.12
2e_OH	30.3-2F	9.60 -146.44	9.60 -143.49	9.60 -139.60
2e_OHS	30.3-2F	9.60 -157.90	9.60 -154.96	9.60 -151.06
2r	30.3-2E	56.03 -164.27	48.36 -148.06	38.23 -126.64
2r_OH	30.3-2F	9.60 -184.64	9.60 -175.80	9.60 -164.12
2r_OHS	30.3-2F	9.60 -196.10	9.60 -187.26	9.60 -175.58
3	30.3-2E	56.03 -126.07	48.36 -115.75	38.23 -102.12
3_OH	30.3-2F	9.60 -184.64	9.60 -165.49	9.60 -140.18
3_OHS	30.3-2F	9.60 -196.10	9.60 -176.95	9.60 -151.64
4	30.3-1	75.13 -81.50	71.75 -78.11	67.27 -73.64
5	30.3-1	75.13 -100.60	71.75 -93.83	67.27 -84.88

Wind Pressure Summary for C&C Zones based Upon Areas Ch 30 Pt 1 (Table 2 of 2)
All wind pressures include a load factor of 0.6

Zone	Figure	A = 100.00 sq ft psf	A = 200.00 sq ft psf	A > 500.00 sq ft psf
1	30.3-2E	30.56 -75.13	30.56 -75.13	30.56 -75.13
1_OH	30.3-2F	9.60 -127.34	9.60 -127.34	9.60 -127.34
1_OHS	30.3-2F	9.60 -138.80	9.60 -138.80	9.60 -138.80
2e	30.3-2E	30.56 -91.81	30.56 -81.50	30.56 -81.50
2e_OH	30.3-2F	9.60 -136.65	9.60 -133.71	9.60 -133.71
2e_OHS	30.3-2F	9.60 -148.11	9.60 -145.17	9.60 -145.17

2r	30.3-2E	30.56 -110.44	30.56 -94.23	30.56 -94.23
2r_OH	30.3-2F	9.60 -155.28	9.60 -146.44	9.60 -146.44
2r_OHS	30.3-2F	9.60 -166.74	9.60 -157.90	9.60 -157.90
3	30.3-2E	30.56 -91.81	30.56 -81.50	30.56 -81.50
3_OH	30.3-2F	9.60 -121.02	9.60 -101.87	9.60 -101.87
3_OHS	30.3-2F	9.60 -132.48	9.60 -113.33	9.60 -113.33
4	30.3-1	63.89 -70.26	60.50 -66.87	56.03 -62.40
5	30.3-1	63.89 -78.11	60.50 -71.34	56.03 -62.40

* A is effective wind area for C&C: Span Length * Effective Width
* Effective width need not be less than 1/3 of the span length
* Maximum and minimum values of pressure shown.
* + Pressures acting toward surface, - Pressures acting away from surface
* _OH represents an Overhang in the zone specified
* Overhang pressures calculated per Para 30.9
* Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}
* Interpolation can be used for values of A that are between those values shown.

MecaWind v2405

Calculations Prepared by:
EEG
3401 NW
82nd. Ave.
Doral, FL, 33122
Date: Jun 15, 2022

Project #: 21-0580
Location: Key Colony
Description:
600 W

File Location:
N:\EEG ACTIVE\Work in Progress\2021\21 0580 City of Key Colony Beach\Calc\Wind\Tower\
21-0580 Key ColonyV01.wnd

Basic Wind Parameters

Wind Load Standard	= ASCE 7-16	Exposure Category	= D
Wind Design Speed	= 200.0 mph	Risk Category	= IV
Structure Type	= Building	Building Type	= Enclosed

General Wind Settings

Incl_LF	= Include ASD Load Factor of 0.6 in Pressures	= True
DynType	= Dynamic Type of Structure	= Rigid
Zg	= Altitude (Ground Elevation) above Sea Level	= 0.000 ft
Bdist	= Base Elevation of Structure	= 0.000 ft
SDB	= Simple Diaphragm Building	= True
Reacs	= Show the Base Reactions in the output	= False
O_Kd	= Override the Directionality Factor 'Kd'	= 0.850
O_G	= Override the Gust Factor 'G'	= 0.850
MWFRSType	= MWFRS Method Selected	= Ch 27 Pt 1

Topographic Factor per Fig 26.8-1

Topo	= Topographic Feature	= None
Kzt	= Topographic Factor	= 1.000

Building Inputs

RoofType	: Building Roof Type	= Flat	RfHt	: Roof Height	= 52.000 ft
W	: Building Width	= 26.000 ft	L	: Building Length	= 26.000 ft
Par	: Is there a Parapet	= False			

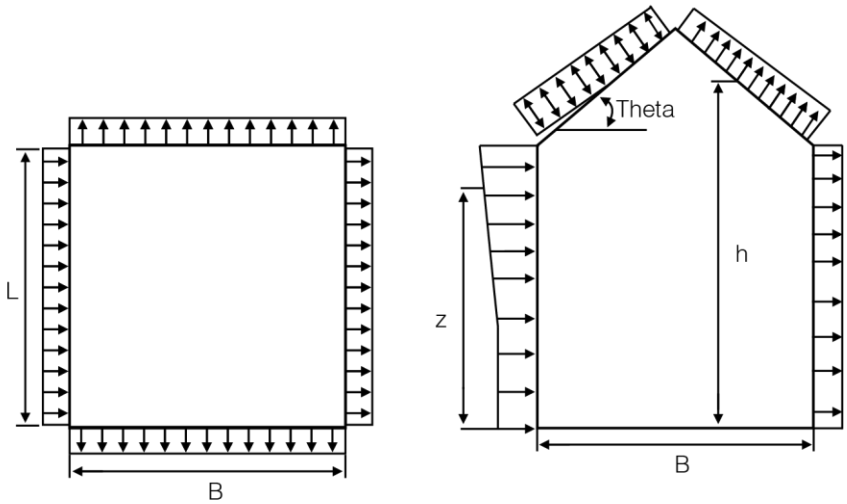
Exposure Constants per Table 26.11-1:

Alpha:	Table 26.11-1 Const	= 11.500	Zg:	Table 26.11-1 Const	= 700.000 ft
At:	Table 26.11-1 Const	= 0.087	Bt:	Table 26.11-1 Const	= 1.070
Am:	Table 26.11-1 Const	= 0.111	Bm:	Table 26.11-1 Const	= 0.800
C:	Table 26.11-1 Const	= 0.150	Eps:	Table 26.11-1 Const	= 0.125

Overhang Inputs:

Std	= Overhangs on all sides are the same	= True
OHType	= Type of Roof Wall Intersections	= Overhang
OH	= Overhang of Roof Beyond Wall	= 5.000 ft

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:



h	= Mean Roof Height above grade	= 52.000 ft
Kh	= 15 ft [4.572 m]< Z <Zg -->(2.01*(Z/zg)^(2/Alpha) {Table 26.10-1}	= 1.279

```
Kzt       = Topographic Factor is 1 since no Topographic feature specified  = 1.000
Kd        = Wind Directionality Factor Manually Specified by Designer       = 0.85
Zg        = Elevation above Sea Level                                       = 0.000 ft
Ke        = Ground Elevation Factor: Ke = e^-(0.0000362*Zg) {Table 26.9-1}  = 1.000
GCPi      = Ref Table 26.13-1 for Enclosed Building                         = +/-0.18
RA        = Roof Area                                                       = 1296.00 sq ft
LF        = Load Factor based upon ASD Design                               = 0.60
qh        = (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF                       = 66.79 psf
qin       = For Negative Internal Pressure of Enclosed Building use qh*LF   = 66.79 psf
qip       = For Positive Internal Pressure of Enclosed Building use qh*LF   = 66.79 psf
```

Gust Factor Calculation:

```
Gust Factor Category I Rigid Structures - Simplified Method
G1        = For Rigid Structures (Nat. Freq.>1 Hz) use 0.85                 = 0.85
Gust Factor Category II Rigid Structures - Complete Analysis
Zm        = Max(0.6 * Ht, Zmin)                                            = 31.200 ft
Izm       = Cc * (33 / Zm) ^ 0.167                                          = 0.151
Lzm       = L * (Zm / 33) ^ Eps                                             = 645.459
B         = Structure Width Normal to Wind                                  = 26.000 ft
Q         = (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5                    = 0.926
G2        = 0.925*((1+0.7*Izm*3.4*Q)/(1+0.7*3.4*Izm))                       = 0.893
Gust Factor Used in Analysis
G         = Lessor Of G1 Or G2                                              = 0.850

G         = User has elected to override the calculated G value             = 0.850
```

MWFRS Wind Normal to Ridge (Ref Fig 27.3-1}

```
h         = Mean Roof Height Of Building                                    = 52.000 ft
RHt       = Ridge Height Of Roof                                            = 52.000 ft
B         = Horizontal Dimension Of Building Normal To Wind Direction       = 26.000 ft
L         = Horizontal Dimension Of building Parallel To Wind Direction     = 26.000 ft
L/B       = Ratio Of L/B used For Cp determination                          = 1.000
h/L       = Ratio Of h/L used For Cp determination                          = 2.000
Slope     = Slope of Roof                                                   = 0.0 Deg
OH_Bot_-Y = Overhang Bottom -Y (Windward Face Only)                         = 0.8, 0.8
OH_Top    = **Overhang Top Coeff (0 to h/2) (0.000 ft to 26.000 ft)         = -0.18, -1.04
OH_Top    = **Overhang Top Coeff (0 to h/2) (0.000 ft to 5.000 ft)          = -0.18, -1.04
OH_Top    = Overhang Top Coeff (h/2 to h) (26.000 ft to 36.000 ft)          = -0.18, -0.7
OH_Top    = Overhang Top Coeff (h/2 to h) (31.000 ft to 36.000 ft)          = -0.18, -0.7
Roof      = **Roof Coeff (0 to h/2) (5.000 ft to 26.000 ft)                 = -0.18, -1.04
Roof      = Roof Coeff (h/2 to h) (26.000 ft to 31.000 ft)                  = -0.18, -0.7
**Includes Reduction Factor 0.8 For roof area, applied To Cp=-1.3 For h/L>=1 & (0 To h/2)

Cp_WW     = Windward Wall Coefficient (All L/B Values)                      = 0.80
Cp_LW     = Leward Wall Coefficient using L/B                               = -0.50
Cp_SW     = Side Wall Coefficient (All L/B values)                          = -0.70
GCpn_WW   = Parapet Combined Net Pressure Coefficient (Windward Parapet)    = 1.50
GCpn_LW   = Parapet Combined Net Pressure Coefficient (Leeward Parapet)     = -1.00
```

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Normal to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
52.00	1.279	1.000	66.79	0.18	33.39	-40.41	-51.76	73.80	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Normal to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
52.00	1.279	1.000	66.79	-0.18	57.44	-16.36	-27.72	73.80	9.60

```
Notes Wall Pressures:
Kz        = Velocity Press Exp Coeff        Kzt      = Topographical Factor
qz        = 0.00256*Kz*Kzt*Kd*V^2           GCPi     = Internal Press Coefficient
Side      = qh * G * Cp_SW - qip * +GCPi    Windward = qz * G * Cp_WW - qip * +GCPi
Leeward   = qh * G * Cp_LW - qip * +GCPi    Total    = Windward Press - Leeward Press
* Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface          - Pressures Acting AWAY from Surface
```

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Normal to Ridge
All wind pressures include a load factor of 0.6

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
OH_Bot_-Y	N/A	N/A	0.800	0.800	0.000	45.42	45.42	45.42	45.42
OH_Top (-X)	0.000	26.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (-Y)	0.000	5.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (+X)	0.000	26.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (-X)	26.000	36.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
OH_Top (+X)	26.000	36.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
OH_Top (+Y)	31.000	36.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
Roof (All)	5.000	26.000	-0.180	-1.040	0.180	1.80	-22.24	-47.02	-71.06
Roof (All)	26.000	31.000	-0.180	-0.700	0.180	1.80	-22.24	-27.72	-51.76

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
Cp_Max = Largest Coefficient Magnitude Cp_Min = Smallest Coefficient Magnitude
Pp_max = qh*G*Cp_max - qip*(+GCPi) Pn_max = qh*G*Cp_max - qin*(-GCpi)
Pp_min* = qh*G*Cp_min - qip*(+GCPi) Pn_min* = qh*G*Cp_min - qin*(-GCPi)
OH = Overhang X = Dir along Ridge Y = Dir Perpendcular to Ridge Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

MWFRS Wind Parallel to Ridge (Ref Fig 27.3-1}

h	= Mean Roof Height Of Building	= 52.000 ft
RHt	= Ridge Height Of Roof	= 52.000 ft
B	= Horizontal Dimension Of Building Normal To Wind Direction	= 26.000 ft
L	= Horizontal Dimension Of building Parallel To Wind Direction	= 26.000 ft
L/B	= Ratio Of L/B used For Cp determination	= 1.000
h/L	= Ratio Of h/L used For Cp determination	= 2.000
Slope	= Slope of Roof	= 0.0 Deg
OH_Bot_-X	= Overhang Bottom -X (Windward Face Only)	= 0.8, 0.8
OH_Top	= **Overhang Top Coeff (0 to h/2) (0.000 ft to 5.000 ft)	= -0.18, -1.04
OH_Top	= **Overhang Top Coeff (0 to h/2) (5.000 ft to 26.000 ft)	= -0.18, -1.04
OH_Top	= Overhang Top Coeff (h/2 to h) (26.000 ft to 31.000 ft)	= -0.18, -0.7
OH_Top	= Overhang Top Coeff (h/2 to h) (31.000 ft to 36.000 ft)	= -0.18, -0.7
Roof	= **Roof Coeff (0 to h/2) (5.000 ft to 26.000 ft)	= -0.18, -1.04
Roof	= Roof Coeff (h/2 to h) (26.000 ft to 31.000 ft)	= -0.18, -0.7

**Includes Reduction Factor 0.8 For roof area, applied To Cp=-1.3 For h/L>=1 & (0 To h/2)

Cp_WW	= Windward Wall Coefficient (All L/B Values)	= 0.80
Cp_LW	= Leward Wall Coefficient using L/B	= -0.50
Cp_SW	= Side Wall Coefficient (All L/B values)	= -0.70
GCpn_WW	= Parapet Combined Net Pressure Coefficient (Windward Parapet)	= 1.50
GCpn_LW	= Parapet Combined Net Pressure Coefficient (Leeward Parapet)	= -1.00

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
52.00	1.279	1.000	66.79	0.18	33.39	-40.41	-51.76	73.80	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Elev ft	Kz	Kzt	qz psf	GCPi	Windward Press psf	Leeward Press psf	Side Press psf	Total Press psf	Minimum Pressure* psf
52.00	1.279	1.000	66.79	-0.18	57.44	-16.36	-27.72	73.80	9.60

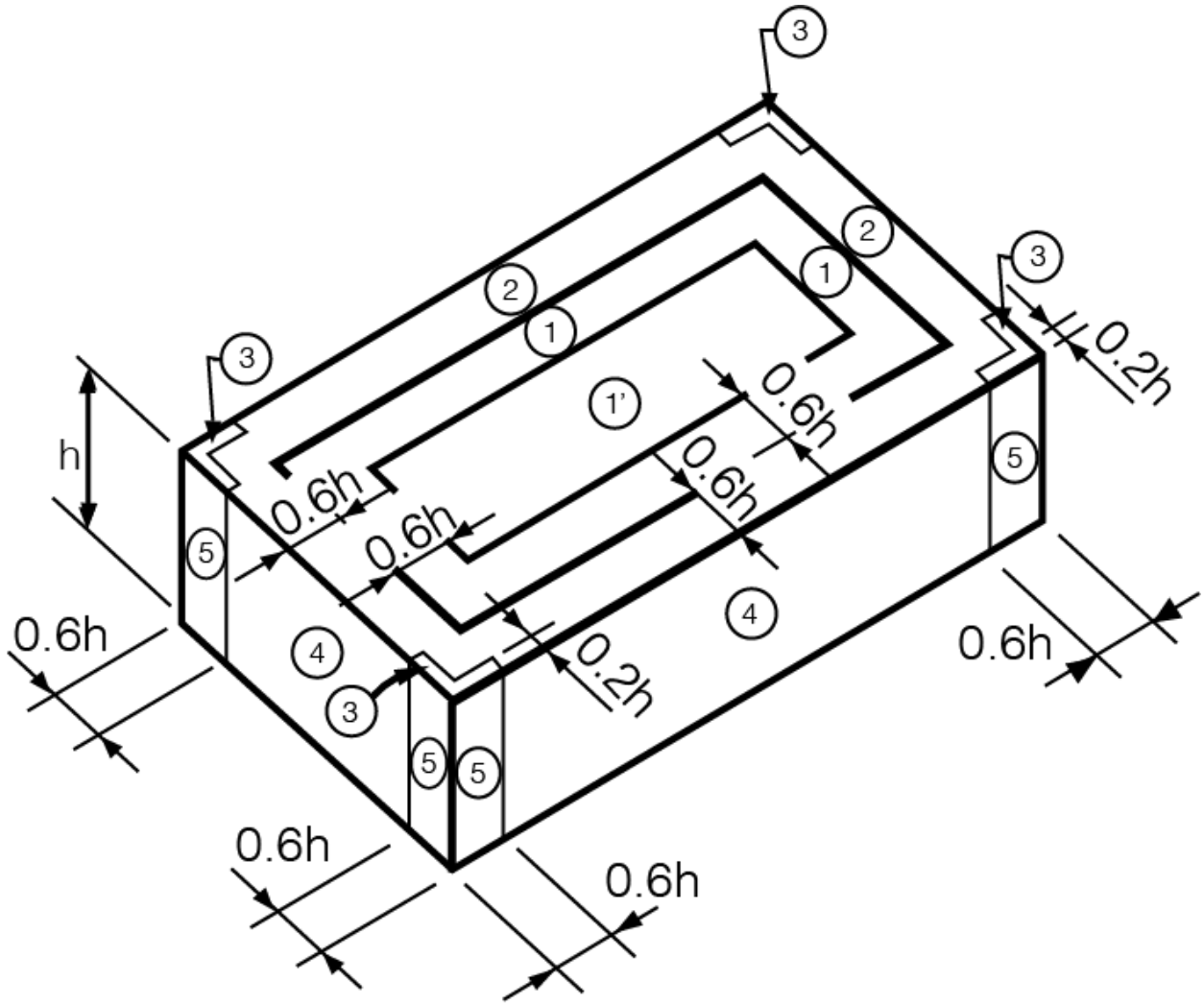
Notes Wall Pressures:
Kz = Velocity Press Exp Coeff Kzt = Topographical Factor
qz = 0.00256*Kz*Kzt*Kd*V^2 GCPi = Internal Press Coefficient
Side = qh * G * Cp_SW - qip * +GCPi Windward = qz * G * Cp_WW - qip * +GCPi
Leeward = qh * G * Cp_LW - qip * +GCPi Total = Windward Press - Leeward Press
* Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Parallel to Ridge
All wind pressures include a load factor of 0.6

Roof Var	Start Dist ft	End Dist ft	Cp_min	Cp_max	GCPi	Pressure Pn_min* psf	Pressure Pp_min* psf	Pressure Pn_max psf	Pressure Pp_max psf
OH_Bot_-X	N/A	N/A	0.800	0.800	0.000	45.42	45.42	45.42	45.42
OH_Top (-X)	0.000	5.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (-Y)	5.000	26.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (+Y)	5.000	26.000	-0.180	-1.040	0.000	-10.22	-10.22	-59.04	-59.04
OH_Top (-Y)	26.000	31.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
OH_Top (+Y)	26.000	31.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
OH_Top (+X)	31.000	36.000	-0.180	-0.700	0.000	-10.22	-10.22	-39.74	-39.74
Roof (All)	5.000	26.000	-0.180	-1.040	0.180	1.80	-22.24	-47.02	-71.06
Roof (All)	26.000	31.000	-0.180	-0.700	0.180	1.80	-22.24	-27.72	-51.76

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
Cp_Max = Largest Coefficient Magnitude Cp_Min = Smallest Coefficient Magnitude
Pp_max = qh*G*Cp_max - qip*(+GCPi) Pn_max = qh*G*Cp_max - qin*(-GCpi)
Pp_min* = qh*G*Cp_min - qip*(+GCPi) Pn_min* = qh*G*Cp_min - qin*(-GCPi)
OH = Overhang X = Dir along Ridge Y = Dir Perpendcular to Ridge Z = Vertical
* The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Components and Cladding (C&C) Calculations per Ch 30 Part 4:



Flat/Hip/Gable (0°≤Θ≤ 7°)

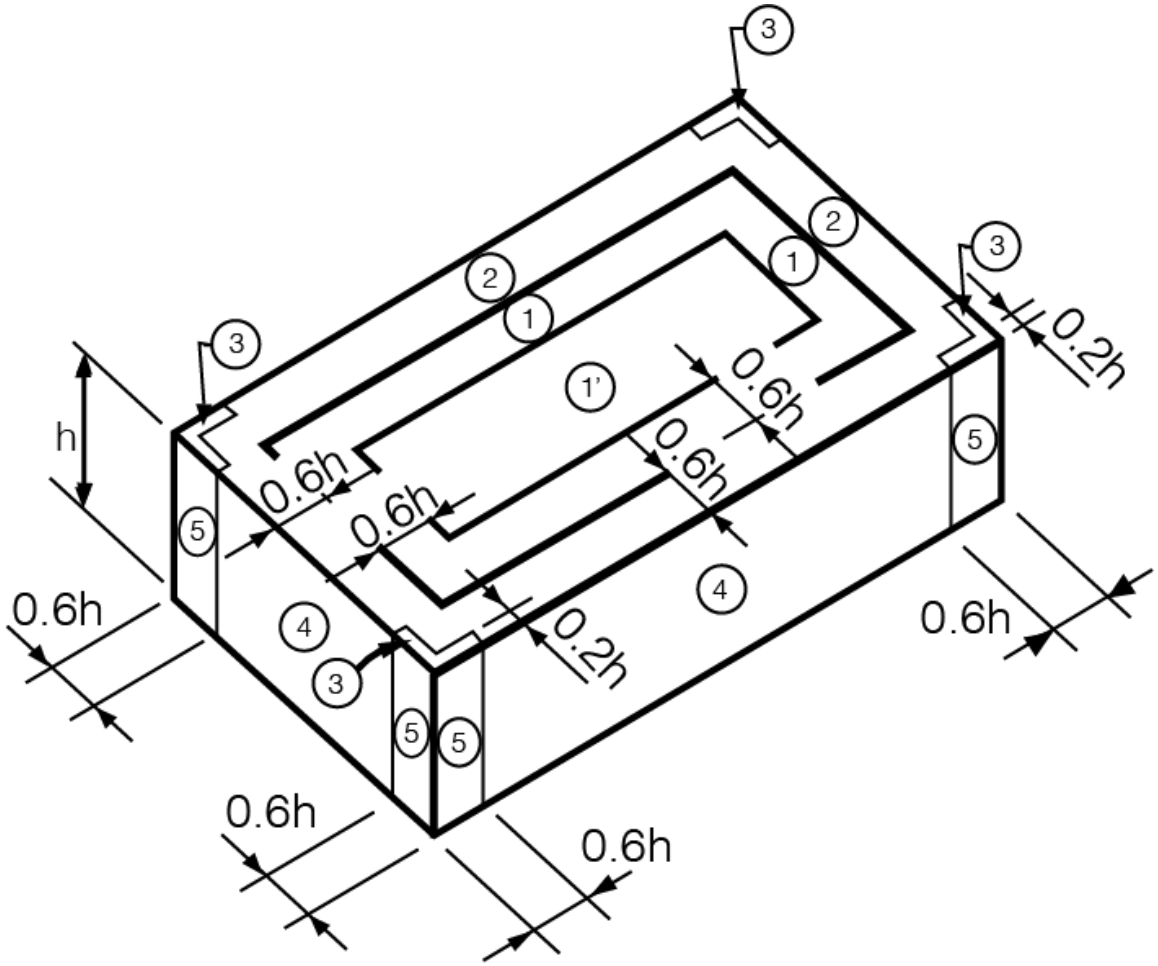
h	= Mean Roof Height	= 52.000 ft
LF	= Load Factor based upon ASD Design	= 0.60
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
EAF	= Adjustment factor per Table 30.6-2 to Fig 30.4-1 pressures	= 1.825
Slope	= Roof Slope	= 0.0 Deg
LHD	= Least Horizontal Dimension: Min(B, L)	= 26.000 ft
a1	= Min(0.1 * LHD, 0.4 * h)	= 2.600 ft
a	= Max(a1, 0.04 * LHD, 3 ft [0.9 m])	= 3.000 ft
2a	= Parameter used to define zone width: 2*a	= 6.000 ft
EAF	= Adjustment factor per Table 30.6-2 to Fig 30.4-1 pressures	= 1.825

Wind Pressures for Components and Cladding per Fig 30.4-1
All wind pressures include a load factor of 0.6

Description	Zone	Width	Span	Area	1/3 Rule	Ptable Pos	Ptable Neg	p Pos	p Neg
		ft	ft	ft		psf	psf	psf	psf
Zone 1	1	10.000	1.000	10.000	No	21.30	-84.70	23.32	-92.73
Zone 1	1	20.000	1.000	20.000	No	20.90	-78.80	22.88	-86.27
Zone 1	1	50.000	1.000	50.000	No	20.30	-72.30	22.22	-79.15
Zone 1	1	100.000	1.000	100.000	No	20.30	-72.30	22.22	-79.15
Zone 2	2	10.000	1.000	10.000	No	21.30	-111.80	23.32	-122.39
Zone 2	2	20.000	1.000	20.000	No	20.90	-105.40	22.88	-115.39
Zone 2	2	50.000	1.000	50.000	No	20.30	-96.20	22.22	-105.32
Zone 2	2	100.000	1.000	100.000	No	20.30	-96.20	22.22	-105.32
Zone 2 OH	2_OH	10.000	1.000	10.000	No	0.00	0.00	9.60	-9.60
Zone 2 OH	2_OH	20.000	1.000	20.000	No	0.00	0.00	9.60	-9.60
Zone 2 OH	2_OH	50.000	1.000	50.000	No	0.00	0.00	9.60	-9.60
Zone 2 OH	2_OH	100.000	1.000	100.000	No	0.00	0.00	9.60	-9.60
Zone 3	3	10.000	1.000	10.000	No	21.30	-151.50	23.32	-165.86
Zone 3	3	20.000	1.000	20.000	No	20.90	-138.70	22.88	-151.84
Zone 3	3	50.000	1.000	50.000	No	20.30	-118.20	22.22	-129.40
Zone 3	3	100.000	1.000	100.000	No	20.30	-118.20	22.22	-129.40
Zone 3 OH	3_OH	10.000	1.000	10.000	No	0.00	0.00	9.60	-9.60
Zone 3 OH	3_OH	20.000	1.000	20.000	No	0.00	0.00	9.60	-9.60
Zone 3 OH	3_OH	50.000	1.000	50.000	No	0.00	0.00	9.60	-9.60
Zone 3 OH	3_OH	100.000	1.000	100.000	No	0.00	0.00	9.60	-9.60
Zone 4	4	10.000	1.000	10.000	No	54.00	-57.50	59.12	-62.95
Zone 4	4	20.000	1.000	20.000	No	51.20	-54.70	56.05	-59.88
Zone 4	4	50.000	1.000	50.000	No	48.10	-51.60	52.66	-56.49
Zone 4	4	100.000	1.000	100.000	No	48.10	-51.60	52.66	-56.49
Zone 5	5	10.000	1.000	10.000	No	54.00	-72.10	59.12	-78.93
Zone 5	5	20.000	1.000	20.000	No	51.20	-66.50	56.05	-72.80
Zone 5	5	50.000	1.000	50.000	No	48.10	-60.30	52.66	-66.01
Zone 5	5	100.000	1.000	100.000	No	48.10	-60.30	52.66	-66.01

Ptable = Pressure taken from Fig 30.4-1
p = Wind Pressure: Ptable * Lambda * Kzt * LF [Eqn 30.7-1 & Table 30.6-2 Note 5]
* Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}
Pressures on overhangs include Pressure from the top and bottom surface of overhang

Components and Cladding (C&C) Zone Summary per Ch 30 Pt 4:



Flat/Hip/Gable (0°≤Θ≤ 7°)

h	= Mean Roof Height	= 52.000 ft
LF	= Load Factor based upon ASD Design	= 0.60
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
EAF	= Adjustment factor per Table 30.6-2 to Fig 30.4-1 pressures	= 1.825
Slope	= Roof Slope	= 0.0 Deg
LHD	= Least Horizontal Dimension: Min(B, L)	= 26.000 ft
a1	= Min(0.1 * LHD, 0.4 * h)	= 2.600 ft
a	= Max(a1, 0.04 * LHD, 3 ft [0.9 m])	= 3.000 ft
2a	= Parameter used to define zone width: 2*a	= 6.000 ft
EAF	= Adjustment factor per Table 30.6-2 to Fig 30.4-1 pressures	= 1.825

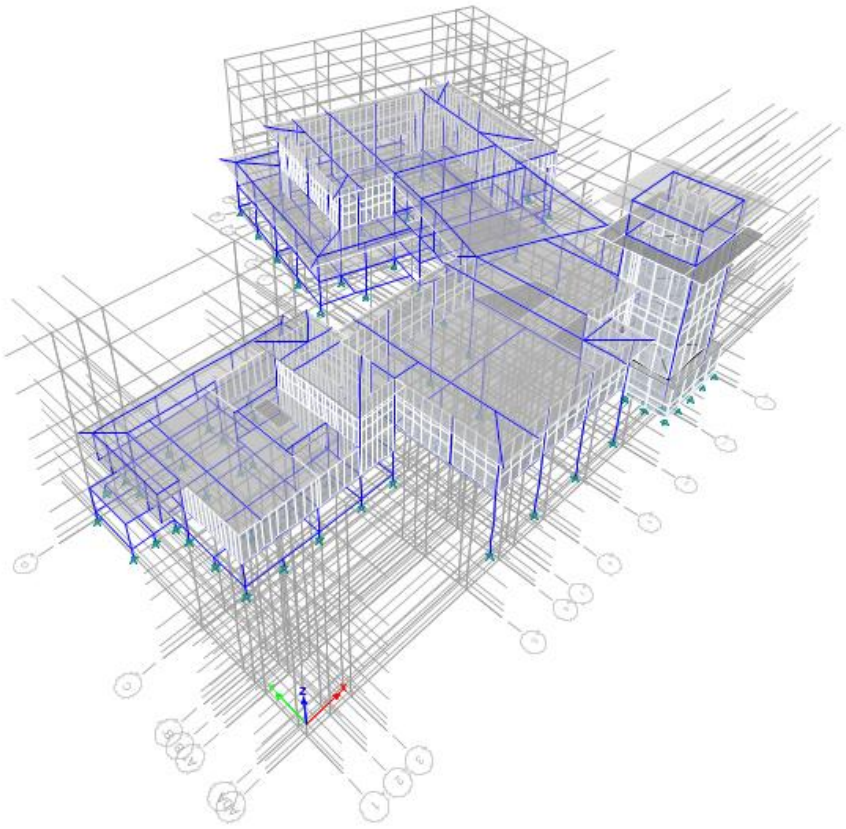
Wind Pressure Summary for C&C Zones based Upon Areas Ch 30 Pt 4
All wind pressures include a load factor of 0.6

Zone	Table	A <= 10.00 sq ft psf	A = 20.00 sq ft psf	A = 50.00 sq ft psf	A > 100.00 sq ft psf
1	30.4-1	23.32 -92.73	22.88 -86.27	22.22 -79.15	22.22 -79.15
1'	30.4-1	23.32 -53.10	22.88 -53.10	22.22 -53.10	22.22 -53.10
1_OH	30.4-1	9.60 -9.60	9.60 -9.60	9.60 -9.60	9.60 -9.60
1'_OH	30.4-1	9.60 -9.60	9.60 -9.60	9.60 -9.60	9.60 -9.60
2	30.4-1	23.32 -122.39	22.88 -115.39	22.22 -105.32	22.22 -105.32
2_OH	30.4-1	9.60 -9.60	9.60 -9.60	9.60 -9.60	9.60 -9.60
3	30.4-1	23.32 -165.86	22.88 -151.84	22.22 -129.40	22.22 -129.40
3_OH	30.4-1	9.60 -9.60	9.60 -9.60	9.60 -9.60	9.60 -9.60
4	30.4-1	59.12 -62.95	56.05 -59.88	52.66 -56.49	52.66 -56.49
5	30.4-1	59.12 -78.93	56.05 -72.80	52.66 -66.01	52.66 -66.01

* A is effective wind area for C&C: Span Length * Effective Width
* Effective width need not be less than 1/3 of the span length
* Maximum and minimum values of pressure shown.

* + Pressures acting toward surface, - Pressures acting away from surface
* _OH represents an Overhang in the zone specified
* Overhangs follow Sec 30.6.1.3, Zones as shown in Table 30.6-2 with pressures from Fig 30.4-1
* Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] {Includes LF}
* Interpolation can be used for values of A that are between those values shown.

ETABS® version 17
Integrated Building Design Software



CITY OF KEY COLONY BEACH

1 Structure Data

This chapter provides model geometry information, including items such as story levels, point coordinates, and element connectivity.

1.1 Story Data

Table 1.1 - Story Data

Name	Height in	Elevation in	Master Story	Similar To	Splice Story
TOWER ROOF	120	624	Yes	None	No
TOWER LEVEL	156	504	Yes	None	No
M.H HIGH ROOF	72	348	Yes	None	No
M.H LOW ROOF	36	276	Yes	None	No
POST OFFICE R.	60	240	Yes	None	No
2nd FLOOR	108	180	Yes	None	No
1er FLOOR	72	72	No	2nd FLOOR	No
GROUND	30	0	No	2nd FLOOR	No
GB	24	-30	No	2nd FLOOR	No
PILE	0	-54	No	None	No

1.2 Grid Data

Table 1.2 - Grid Systems

Name	Type	Story Range	X Origin ft	Y Origin ft	Rotation deg	Bubble Size in	Color
G1	Cartesian	Default	0	0	0	60	ffa0a0a0
G2	Cartesian	Default	107.66	156.5	-106	60	ffa0a0a0

Table 1.3 - Grid Lines

Grid System	Grid Direction	Grid ID	Visible	Bubble Location	Ordinate ft	X1 ft	Y1 ft	X2 ft	Y2 ft
G1	General	1	Yes	Start		0	-10	0	90
G1	General	2	Yes	Start		6	-10	6	90
G1	General	3	Yes	Start		11.75	-10	11.75	90
G1	General	5	Yes	Start		46.66	-10	46.66	90
G1	General	6	Yes	Start		57.66	-10	57.66	90
G1	General	7	Yes	Start		63.33	-10	63.33	90
G1	General	9	Yes	Start		90.66	-10	90.66	90
G1	General	10	Yes	Start		107.166	-10	107.166	90
G1	General	17	Yes	Start		147.42	-10	147.42	90
G1	General	A0	Yes	Start		-10	0	200	0
G1	General	A	Yes	Start		-10	2.5	200	2.5
G1	General	A"	Yes	Start		-10	12.33	200	12.33
G1	General	B	Yes	Start		-10	15.667	200	15.667
G1	General	C	Yes	Start		-10	33.167	200	33.167
G1	General	G	Yes	Start		-10	74.25	200	74.25
G1	General	13	Yes	Start		126.25	-10	126.25	90
G1	General	8	Yes	Start		74.166	-10	74.166	90
G1	General	B'	Yes	Start		-10	19.33	200	19.33
G2	X	Q	Yes	Start	0				
G2	X	P	Yes	Start	9.833				
G2	X	O	Yes	Start	31.667				
G2	X	N	Yes	Start	41.55				
G2	X	M'	Yes	Start	53.5				
G2	Y	20	Yes	Start	0				
G2	Y	21	Yes	Start	12.167				
G2	Y	22	Yes	Start	31.167				

Structure Data

Grid System	Grid Direction	Grid ID	Visible	Bubble Location	Ordinate ft	X1 ft	Y1 ft	X2 ft	Y2 ft
G2	Y	23	Yes	Start	48.75				
G2	Y	25	Yes	Start	76.58				
G2	Y	26	Yes	Start	86.416				
G2	Y	27	Yes	Start	93.25				

2 Properties

This chapter provides property information for materials, frame sections, shell sections, and links.

2.1 Materials

Table 2.1 - Material Properties - Summary

Name	Type	E lb/in²	v	Unit Weight lb/ft³	Design Strengths
5000Psi	Concrete	4030508.7	0.2	150	Fc=5000 lb/in²
A416Gr270	Tendon	28500000	0	490	Fy=245100 lb/in², Fu=270000 lb/in²
A500 Gr.B46	Steel	29000000	0.3	490	Fy=46000 lb/in², Fu=58000 lb/in²
A615Gr60	Rebar	29000000	0.3	490	Fy=60000 lb/in², Fu=90000 lb/in²
M1500Psi	Masonry	1350000	0.2	102	
Other	Other	3600000	0.2	150	

2.2 Frame Sections

Table 2.2 - Frame Sections - Summary

Name	Material	Shape
B-12x22 (5)	5000Psi	Concrete Rectangular
B-12x24 (5)	5000Psi	Concrete Rectangular
B-12x56 (5)	5000Psi	Concrete Rectangular
B-16x24 (5)	5000Psi	Concrete Rectangular
B-18x24 (5)	5000Psi	Concrete Rectangular
B-24x24 (5)	5000Psi	Concrete Rectangular
B-8x12 (5)	5000Psi	Concrete Rectangular
B-8x16 (5)	5000Psi	Concrete Rectangular
B-8x18 (5)	5000Psi	Concrete Rectangular
B-8x22 (5)	5000Psi	Concrete Rectangular
B-8x24 (5)	5000Psi	Concrete Rectangular
B-8x32 (5)	5000Psi	Concrete Rectangular
B-8x38 (5)	5000Psi	Concrete Rectangular
B-8x48 (5)	5000Psi	Concrete Rectangular
C-12x16 (5)	5000Psi	Concrete Rectangular
C-12x24 (5)	5000Psi	Concrete Rectangular
C-12x44 (5)	5000Psi	Concrete Rectangular
C-16x16 (5)	5000Psi	Concrete Rectangular
C-18x18 (5)	5000Psi	Concrete Rectangular
C-8x12 (5)	5000Psi	Concrete Rectangular
C-8x16 (5)	5000Psi	Concrete Rectangular
C-8x18 (5)	5000Psi	Concrete Rectangular
C-8x20 (5)	5000Psi	Concrete Rectangular
C-8X28 (5)	5000Psi	Concrete Rectangular
GB-18x24	5000Psi	Concrete Rectangular
GT-2x6	Other	Concrete Rectangular
GT-3x60	Other	Concrete Rectangular
HSS-4x4x1/4	A500 Gr.B46	Steel Tube
HSS-8x8x1/4	A500 Gr.B46	Steel Tube
NullLine$_{User}$	Other	Concrete Rectangular

2.3 Shell Sections

Table 2.3 - Shell Sections - Summary

Name	Design Type	Element Type	Material	Total Thickness in
MW 12 (1.5)	Wall	Shell-Thin	M1500Psi	12
MW 8 (1.5)	Wall	Shell-Thin	M1500Psi	8
PrecastJoist	Slab	Membrane	5000Psi	4
Slab 6 (5)	Slab	Shell-Thin	5000Psi	6
Slab 8 (5)	Slab	Shell-Thin	5000Psi	8
Slab 9 (5)	Slab	Shell-Thin	5000Psi	9
SW 8 (5)	Wall	Shell-Thin	5000Psi	8
WoodSlab	Slab	Membrane	Other	3

3 Loads

This chapter provides loading information as applied to the model.

3.1 Load Patterns

Table 3.1 - Load Patterns

Name	Type	Self Weight Multiplier	Auto Load
Dead	Dead	1	
Live	Live	0	
Roof Live	Roof Live	0	
Super Dead	Superimposed Dead	0	
Wind	Wind	0	ASCE 7-16
Flood	Other	0	
Reducible Live	Reducible Live	0	

3.2 Auto Wind Loading

Table 3.2 - Auto Wind - ASCE 7-16 (Part 1 of 2)

Load Pattern	Loading Method	Exposure Width Type	Angle deg	Cp,wind	Cp,lee	ASCE Case	e1	e2	Top Story	Bottom Story	Include Parapet
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 1	0	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 1	0	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 2	0.15	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 2	-0.15	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 2	0.15	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 2	-0.15	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 3	0	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 3	0	0	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 4	0.15	0.15	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	0	0.8	0.5	Case 4	-0.15	-0.15	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 4	0.15	0.15	2nd FLOOR	PILE	No
Wind	Diaphragms	From Diaphragms	90	0.8	0.5	Case 4	-0.15	-0.15	2nd FLOOR	PILE	No

Table 3.2 - Auto Wind - ASCE 7-16 (Part 2 of 2)

Wind Speed mph	Exposure Type	I	Kzt	G	Kd
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85
200	D	1	1	0.85	0.85

Wind Speed mph	Exposure Type	I	Kzt	G	Kd
200	D	1	1	0.85	0.85

ASCE 7-16 Auto Wind Load Calculation

This calculation presents the automatically generated lateral wind loads for load pattern Wind according to ASCE 7-16, as calculated by ETABS.

Exposure Parameters

Exposure From = Diaphragms

Exposure Category = D

Wind Direction = 0 degrees

Basic Wind Speed, V [ASCE 26.5.1]	$V = 200 \text{ mph}$
Windward Coefficient, $C_{p,wind}$ [ASCE 27.4.1]	$C_{p,wind} = \text{Varies}$
Leeward Coefficient, $C_{p,lee}$ [ASCE 27.4.1]	$C_{p,lee} = \text{Varies}$

Wind Case = All Cases

Top Story = 2nd FLOOR

Bottom Story = PILE

Include Parapet = No

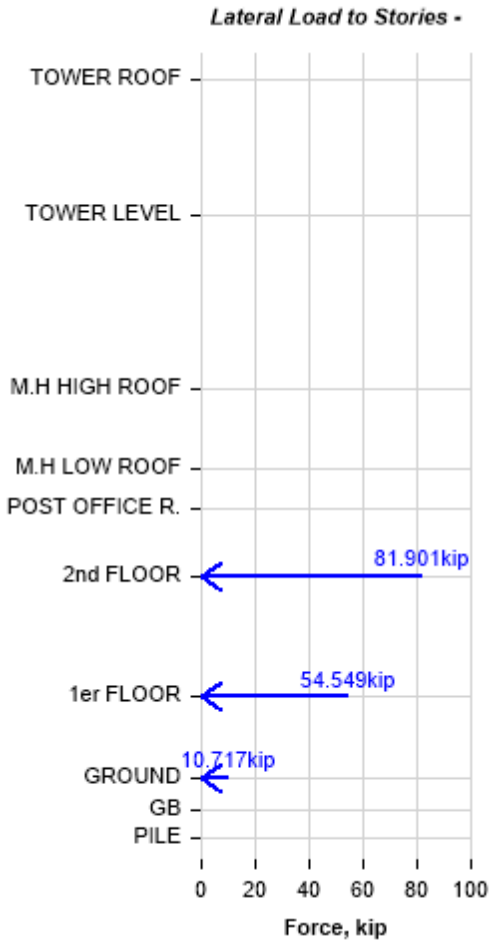
Factors and Coefficients

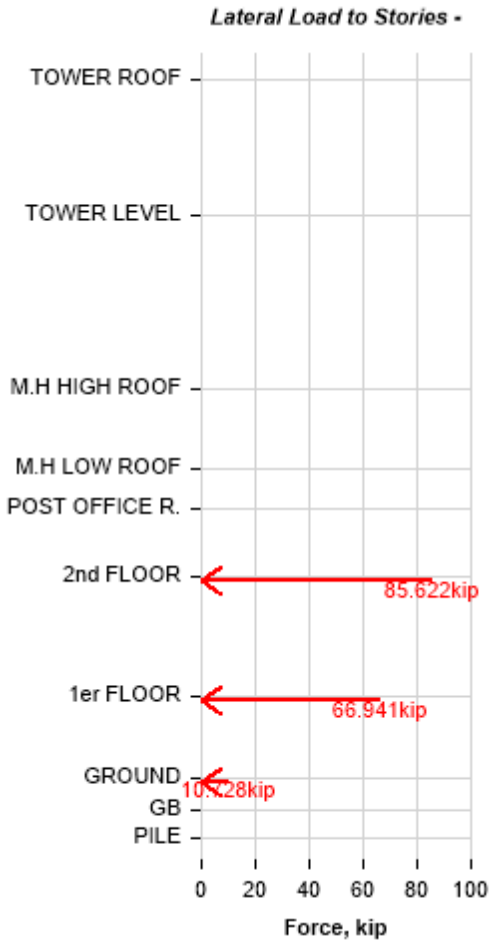
Gradient Height, z_g [ASCE Table 26.9-1]	$z_g = 700$
Emperical Exponent, α [ASCE Table 26.9-1]	$\alpha = 11.5$
Velocity Pressure Exposure Coefficient, K_z; [ASCE Table 27.3-1]	$K_z = 2.01(\frac{z}{z_g}$ for $15\text{ft} \leq z \leq z_g$
	$K_z = 2.01(\frac{15}{z_g}$ for z 15ft
Topographical Factor, K_{zt} [ASCE 26.8.2]	$K_{zt} = 1$
Directionality Factor, K_d [ASCE 26.6]	$K_d = 0.85$
Gust Effect Factor, G [ASCE 26.9]	$G = 0.85$

Lateral Loading

Velocity Pressure, q_z [ASCE 27.3.2 Eq. 27.3-1]	$q_z = 0.00256 K_z K_{zt} K_d V^2$
Design Wind Pressure, p [ASCE 27.4.2 Eq. 27.4-2]	$p = qGC_{p,wind} + q_h(GC_{p,lee})$

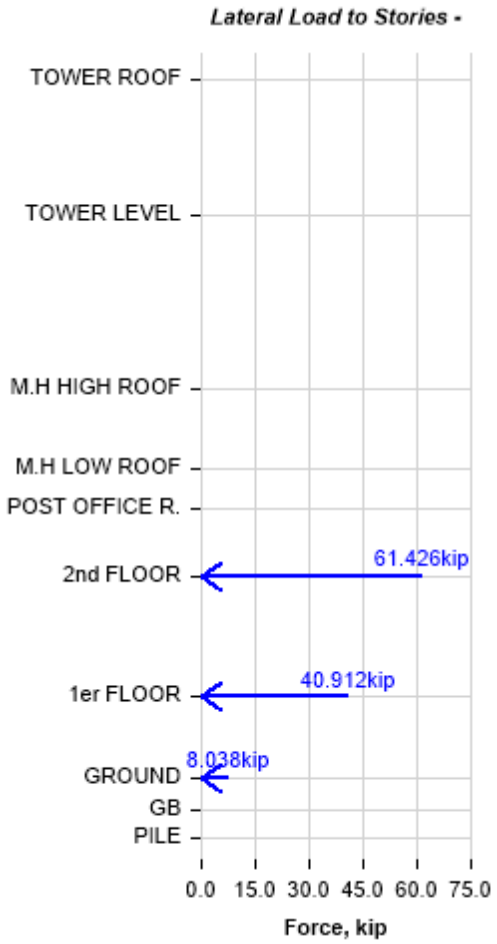
Applied Story Forces

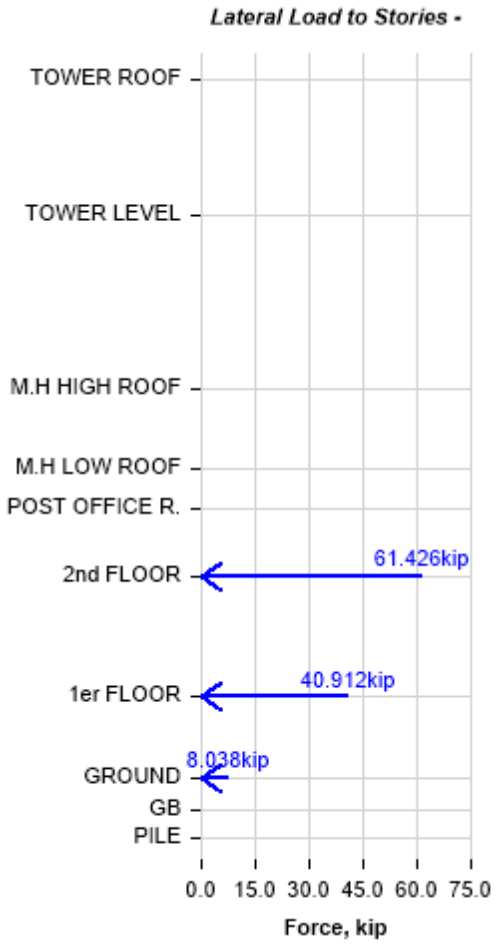




Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	81.901	0
1er FLOOR	6	54.549	0
GROUND	0	10.717	0
GB	-2.5	0	0
PILE	-4.5	0	0

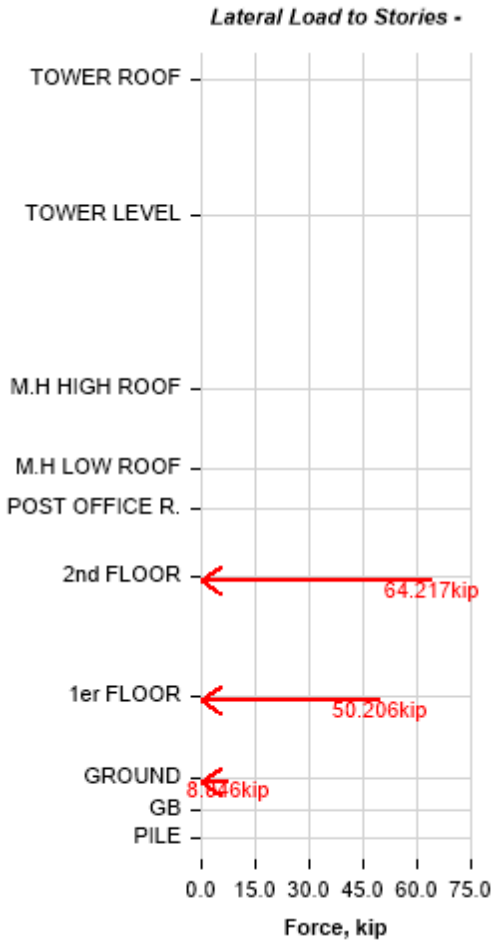
Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	0	85.622
1er FLOOR	6	0	66.941
GROUND	0	0	10.728
GB	-2.5	0	0
PILE	-4.5	0	0

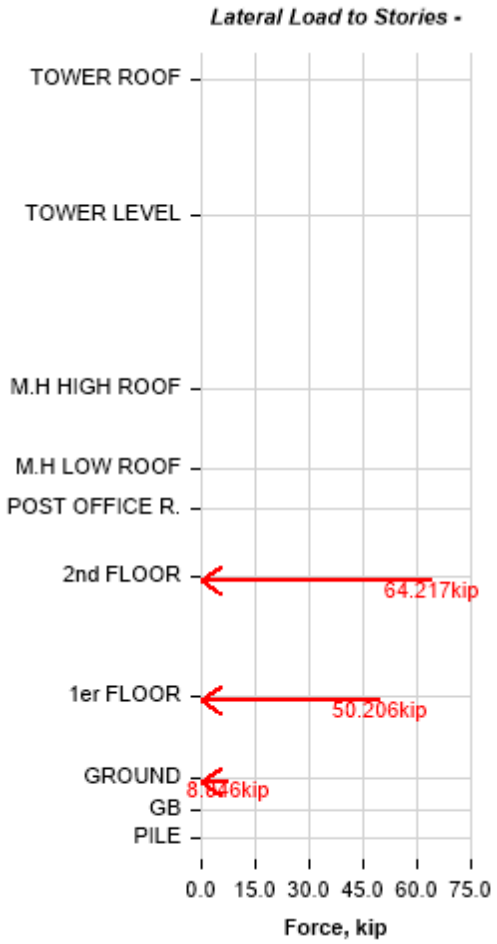




Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	61.426	0
1er FLOOR	6	40.912	0
GROUND	0	8.038	0
GB	-2.5	0	0
PILE	-4.5	0	0

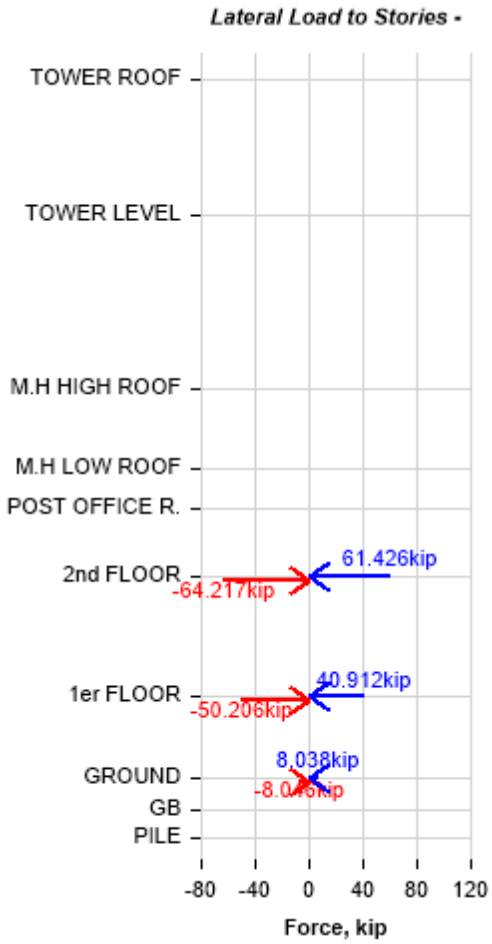
Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	61.426	0
1er FLOOR	6	40.912	0
GROUND	0	8.038	0
GB	-2.5	0	0
PILE	-4.5	0	0

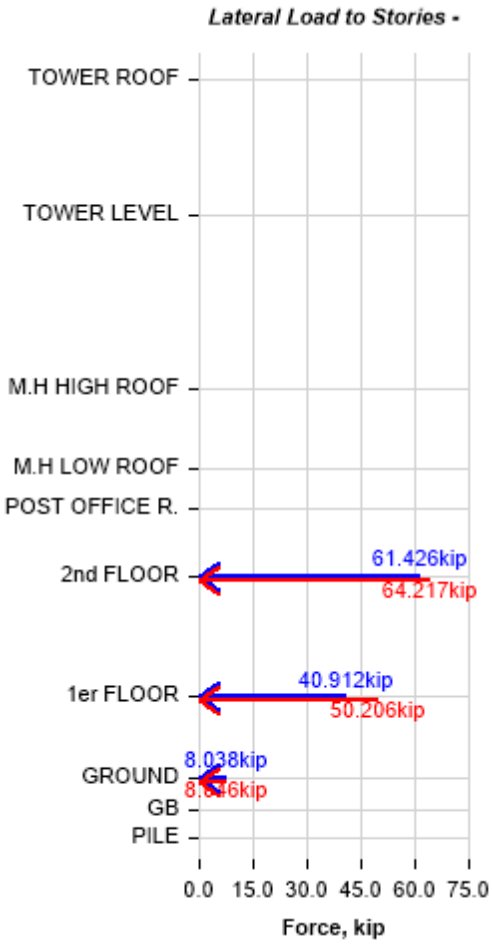




Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	0	64.217
1er FLOOR	6	0	50.206
GROUND	0	0	8.046
GB	-2.5	0	0
PILE	-4.5	0	0

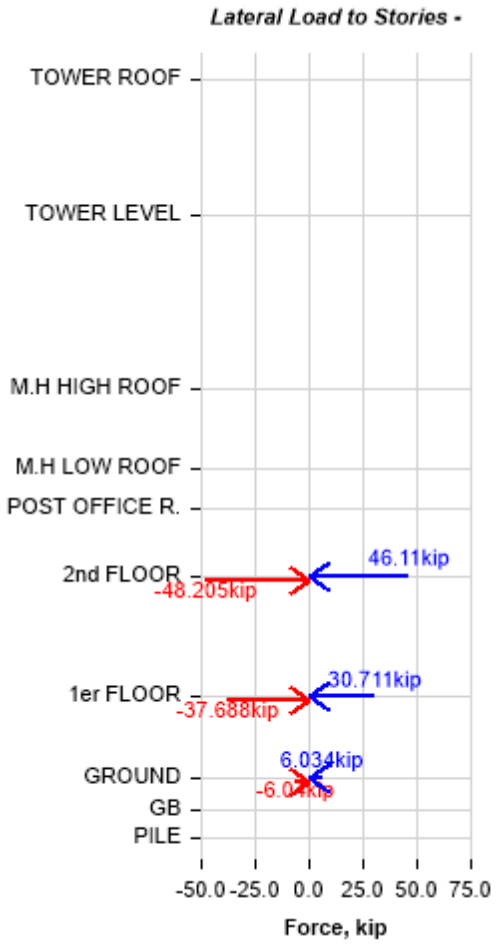
Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	0	64.217
1er FLOOR	6	0	50.206
GROUND	0	0	8.046
GB	-2.5	0	0
PILE	-4.5	0	0

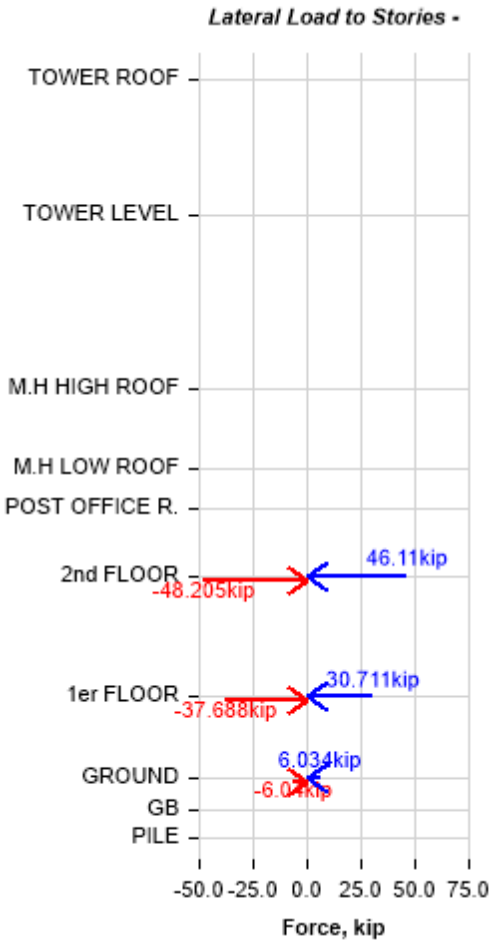




Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	61.426	-64.217
1er FLOOR	6	40.912	-50.206
GROUND	0	8.038	-8.046
GB	-2.5	0	0
PILE	-4.5	0	0

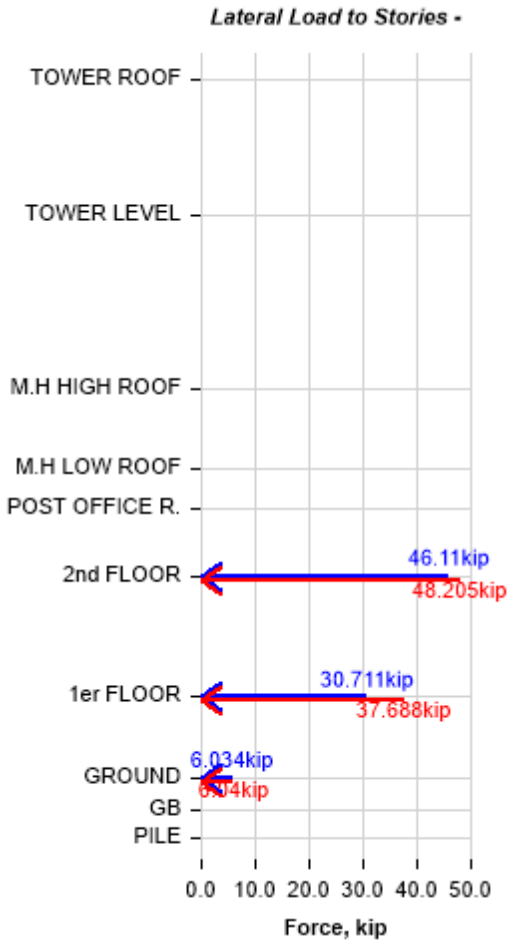
Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	61.426	64.217
1er FLOOR	6	40.912	50.206
GROUND	0	8.038	8.046
GB	-2.5	0	0
PILE	-4.5	0	0

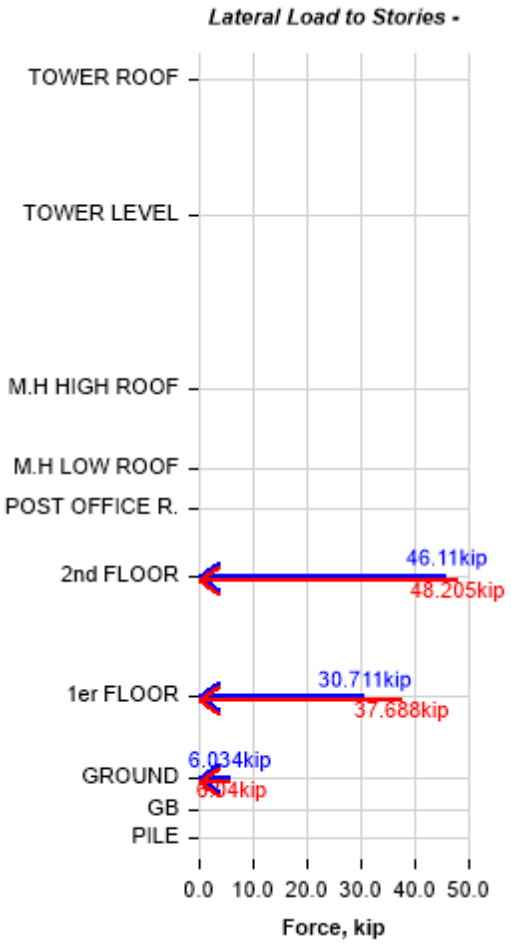




Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	46.11	-48.205
1er FLOOR	6	30.711	-37.688
GROUND	0	6.034	-6.04
GB	-2.5	0	0
PILE	-4.5	0	0

Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	46.11	-48.205
1er FLOOR	6	30.711	-37.688
GROUND	0	6.034	-6.04
GB	-2.5	0	0
PILE	-4.5	0	0





Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	46.11	48.205
1er FLOOR	6	30.711	37.688
GROUND	0	6.034	6.04
GB	-2.5	0	0
PILE	-4.5	0	0

Story	Elevation ft	X-Dir kip	Y-Dir kip
TOWER ROOF	52	0	0
TOWER LEVEL	42	0	0
M.H HIGH ROOF	29	0	0
M.H LOW ROOF	23	0	0
POST OFFICE R.	20	0	0
2nd FLOOR	15	46.11	48.205
1er FLOOR	6	30.711	37.688
GROUND	0	6.034	6.04
GB	-2.5	0	0
PILE	-4.5	0	0

3.3 Applied Loads

3.3.1 Area Loads

Table 3.4 - Shell Loads - Uniform

Story	Label	Unique Name	Load Pattern	Direction	Load lb/ft²
M.H HIGH ROOF	F15	364	Dead	Gravity	25
M.H HIGH ROOF	F19	365	Dead	Gravity	25
M.H HIGH ROOF	F20	366	Dead	Gravity	25
M.H HIGH ROOF	F21	367	Dead	Gravity	25
M.H HIGH ROOF	F32	403	Dead	Gravity	25
M.H HIGH ROOF	F34	407	Dead	Gravity	25
M.H HIGH ROOF	F35	530	Dead	Gravity	25
M.H HIGH ROOF	F33	401	Dead	Gravity	25
M.H HIGH ROOF	F36	406	Dead	Gravity	25
M.H HIGH ROOF	F37	532	Dead	Gravity	25
M.H HIGH ROOF	F45	1005	Dead	Gravity	25
M.H HIGH ROOF	F47	1009	Dead	Gravity	25
M.H HIGH ROOF	F49	1061	Dead	Gravity	25
M.H HIGH ROOF	F50	1062	Dead	Gravity	25
M.H HIGH ROOF	F51	1076	Dead	Gravity	25
M.H HIGH ROOF	F23	369	Dead	Gravity	25
M.H HIGH ROOF	F24	999	Dead	Gravity	25
M.H HIGH ROOF	F44	1003	Dead	Gravity	25
M.H HIGH ROOF	F48	1077	Dead	Gravity	25
M.H HIGH ROOF	F52	1001	Dead	Gravity	25
M.H HIGH ROOF	F22	297	Dead	Gravity	25
M.H HIGH ROOF	F30	539	Dead	Gravity	25
M.H HIGH ROOF	F43	1011	Dead	Gravity	25
M.H HIGH ROOF	F38	368	Dead	Gravity	25
GROUND	F5	256	Dead	Gravity	10
TOWER LEVEL	F2	3	Live	Gravity	100
M.H HIGH ROOF	F3	188	Live	Gravity	100
2nd FLOOR	F4	196	Live	Gravity	100
2nd FLOOR	F7	264	Live	Gravity	30
2nd FLOOR	F10	273	Live	Gravity	100
2nd FLOOR	F26	579	Live	Gravity	50
2nd FLOOR	F29	593	Live	Gravity	50
2nd FLOOR	F31	568	Live	Gravity	150
2nd FLOOR	F42	594	Live	Gravity	50
1er FLOOR	F5	254	Live	Gravity	30
1er FLOOR	F6	31	Live	Gravity	50
1er FLOOR	F1	4	Live	Gravity	100
1er FLOOR	F25	400	Live	Gravity	100
1er FLOOR	F28	404	Live	Gravity	100
GROUND	F5	256	Live	Gravity	100
TOWER ROOF	F2	2	Roof Live	Gravity	30
M.H HIGH ROOF	F15	364	Roof Live	Gravity	20
M.H HIGH ROOF	F19	365	Roof Live	Gravity	20
M.H HIGH ROOF	F20	366	Roof Live	Gravity	20
M.H HIGH ROOF	F21	367	Roof Live	Gravity	20
M.H HIGH ROOF	F32	403	Roof Live	Gravity	20
M.H HIGH ROOF	F34	407	Roof Live	Gravity	20
M.H HIGH ROOF	F35	530	Roof Live	Gravity	20
M.H HIGH ROOF	F33	401	Roof Live	Gravity	20
M.H HIGH ROOF	F36	406	Roof Live	Gravity	20
M.H HIGH ROOF	F37	532	Roof Live	Gravity	20
M.H HIGH ROOF	F45	1005	Roof Live	Gravity	20

Loads

Story	Label	Unique Name	Load Pattern	Direction	Load lb/ft²
M.H HIGH ROOF	F47	1009	Roof Live	Gravity	20
M.H HIGH ROOF	F49	1061	Roof Live	Gravity	20
M.H HIGH ROOF	F50	1062	Roof Live	Gravity	20
M.H HIGH ROOF	F51	1076	Roof Live	Gravity	20
M.H HIGH ROOF	F23	369	Roof Live	Gravity	20
M.H HIGH ROOF	F24	999	Roof Live	Gravity	20
M.H HIGH ROOF	F44	1003	Roof Live	Gravity	20
M.H HIGH ROOF	F48	1077	Roof Live	Gravity	20
M.H HIGH ROOF	F52	1001	Roof Live	Gravity	20
M.H HIGH ROOF	F22	297	Roof Live	Gravity	20
M.H HIGH ROOF	F30	539	Roof Live	Gravity	20
M.H HIGH ROOF	F43	1011	Roof Live	Gravity	20
M.H HIGH ROOF	F38	368	Roof Live	Gravity	20
POST OFFICE R.	F27	557	Roof Live	Gravity	150
2nd FLOOR	F8	67	Roof Live	Gravity	20
2nd FLOOR	F11	182	Roof Live	Gravity	20
2nd FLOOR	F12	58	Roof Live	Gravity	20
2nd FLOOR	F13	186	Roof Live	Gravity	20
2nd FLOOR	F14	269	Roof Live	Gravity	20
2nd FLOOR	F16	197	Roof Live	Gravity	20
2nd FLOOR	F18	301	Roof Live	Gravity	20
2nd FLOOR	F17	324	Roof Live	Gravity	20
2nd FLOOR	F39	548	Roof Live	Gravity	20
2nd FLOOR	F40	549	Roof Live	Gravity	20
2nd FLOOR	F41	575	Roof Live	Gravity	20
TOWER ROOF	F2	2	Super Dead	Gravity	10
TOWER LEVEL	F2	3	Super Dead	Gravity	5
M.H HIGH ROOF	F3	188	Super Dead	Gravity	5
M.H HIGH ROOF	F15	364	Super Dead	Gravity	25
M.H HIGH ROOF	F19	365	Super Dead	Gravity	25
M.H HIGH ROOF	F20	366	Super Dead	Gravity	25
M.H HIGH ROOF	F21	367	Super Dead	Gravity	25
M.H HIGH ROOF	F32	403	Super Dead	Gravity	25
M.H HIGH ROOF	F34	407	Super Dead	Gravity	25
M.H HIGH ROOF	F35	530	Super Dead	Gravity	25
M.H HIGH ROOF	F33	401	Super Dead	Gravity	25
M.H HIGH ROOF	F36	406	Super Dead	Gravity	25
M.H HIGH ROOF	F37	532	Super Dead	Gravity	25
POST OFFICE R.	F27	557	Super Dead	Gravity	30
2nd FLOOR	F4	196	Super Dead	Gravity	5
2nd FLOOR	F7	264	Super Dead	Gravity	15
2nd FLOOR	F10	273	Super Dead	Gravity	10
2nd FLOOR	F8	67	Super Dead	Gravity	25
2nd FLOOR	F11	182	Super Dead	Gravity	25
2nd FLOOR	F12	58	Super Dead	Gravity	25
2nd FLOOR	F13	186	Super Dead	Gravity	25
2nd FLOOR	F14	269	Super Dead	Gravity	25
2nd FLOOR	F16	197	Super Dead	Gravity	25
2nd FLOOR	F18	301	Super Dead	Gravity	25
2nd FLOOR	F17	324	Super Dead	Gravity	25
2nd FLOOR	F26	579	Super Dead	Gravity	25
2nd FLOOR	F29	593	Super Dead	Gravity	25
2nd FLOOR	F31	568	Super Dead	Gravity	10
2nd FLOOR	F39	548	Super Dead	Gravity	25
2nd FLOOR	F40	549	Super Dead	Gravity	25
2nd FLOOR	F41	575	Super Dead	Gravity	25

Story	Label	Unique Name	Load Pattern	Direction	Load lb/ft²
2nd FLOOR	F42	594	Super Dead	Gravity	25
1er FLOOR	F5	254	Super Dead	Gravity	10
1er FLOOR	F6	31	Super Dead	Gravity	25
1er FLOOR	F1	4	Super Dead	Gravity	25
1er FLOOR	F25	400	Super Dead	Gravity	25
1er FLOOR	F28	404	Super Dead	Gravity	25
TOWER LEVEL	A3	187	Live	Gravity	-40
TOWER LEVEL	A8	198	Live	Gravity	-40
TOWER LEVEL	A9	199	Live	Gravity	-40
TOWER LEVEL	A10	200	Live	Gravity	-40
2nd FLOOR	A5	948	Live	Gravity	100
2nd FLOOR	A7	917	Live	Gravity	100
2nd FLOOR	A11	263	Live	Gravity	100
TOWER LEVEL	A3	187	Super Dead	Gravity	10
TOWER LEVEL	A8	198	Super Dead	Gravity	10
TOWER LEVEL	A9	199	Super Dead	Gravity	10
TOWER LEVEL	A10	200	Super Dead	Gravity	10
2nd FLOOR	A1	351	Super Dead	Gravity	32
1er FLOOR	A4	265	Super Dead	Gravity	70

3.4 Load Cases

Table 3.5 - Load Cases - Summary

Name	Type
Dead	Linear Static
Live	Linear Static
Roof Live	Linear Static
Wind	Linear Static
Flood	Linear Static
Reducible Live	Linear Static

3.5 Load Combinations

Table 3.6 - Load Combinations

Name	Load Case/Combo	Scale Factor	Type	Auto
ASD1 D	Dead	1	Linear Add	No
ASD2 D+L	Dead	1	Linear Add	No
ASD2 D+L	Live	1		No
ASD2 D+L	Reducible Live	1		No
ASD3 D+Lr	Dead	1	Linear Add	No
ASD3 D+Lr	Roof Live	1		No
ASD4 D+0.75L+0.75Lr	Dead	1	Linear Add	No
ASD4 D+0.75L+0.75Lr	Live	0.75		No
ASD4 D+0.75L+0.75Lr	Roof Live	0.75		No
ASD4 D+0.75L+0.75Lr	Reducible Live	0.75		No
ASD5a-1 D+0.6W	Dead	1	Linear Add	No
ASD5a-1 D+0.6W	Wind	0.6		No
ASD5a-2 D-0.6W	Dead	1	Linear Add	No
ASD5a-2 D-0.6W	Wind	-0.6		No
ASD6a-1 D+0.75L+0.75Lr+0.45W	Dead	1	Linear Add	No
ASD6a-1 D+0.75L+0.75Lr+0.45W	Live	0.75		No
ASD6a-1 D+0.75L+0.75Lr+0.45W	Roof Live	0.75		No
ASD6a-1 D+0.75L+0.75Lr+0.45W	Wind	0.45		No
ASD6a-1 D+0.75L+0.75Lr+0.45W	Reducible Live	0.75		No
ASD6a-2 D+0.75L+0.75Lr-0.45W	Dead	1	Linear Add	No

Loads

Name	Load Case/Combo	Scale Factor	Type	Auto
ASD6a-2 D+0.75L+0.75Lr-0.45W	Live	0.75		No
ASD6a-2 D+0.75L+0.75Lr-0.45W	Roof Live	0.75		No
ASD6a-2 D+0.75L+0.75Lr-0.45W	Wind	-0.45		No
ASD6a-2 D+0.75L+0.75Lr-0.45W	Reducible Live	0.75		No
ASD7a-1 0.6D+0.6W	Dead	0.6	Linear Add	No
ASD7a-1 0.6D+0.6W	Wind	0.6		No
ASD7a-2 0.6D-0.6W	Dead	0.6	Linear Add	No
ASD7a-2 0.6D-0.6W	Wind	-0.6		No
LRFD1 1.4D	Dead	1.4	Linear Add	No
LRFD2 1.2D+1.6L+0.5Lr	Dead	1.2	Linear Add	No
LRFD2 1.2D+1.6L+0.5Lr	Live	1.6		No
LRFD2 1.2D+1.6L+0.5Lr	Roof Live	0.5		No
LRFD2 1.2D+1.6L+0.5Lr	Reducible Live	1.6		No
LRFD3 1.2D+1.0L+1.6Lr	Dead	1.2	Linear Add	No
LRFD3 1.2D+1.0L+1.6Lr	Live	1		No
LRFD3 1.2D+1.0L+1.6Lr	Roof Live	1.6		No
LRFD3 1.2D+1.0L+1.6Lr	Reducible Live	1		No
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	Dead	1.2	Linear Add	No
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	Live	1		No
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	Roof Live	0.5		No
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	Wind	1		No
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	Reducible Live	1		No
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	Dead	1.2	Linear Add	No
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	Live	1		No
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	Roof Live	0.5		No
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	Wind	-1		No
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	Reducible Live	1		No
LRFD6a-1 0.9D+1.0W	Dead	0.9	Linear Add	No
LRFD6a-1 0.9D+1.0W	Wind	1		No
LRFD6a-2 0.9D-1.0W	Dead	0.9	Linear Add	No
LRFD6a-2 0.9D-1.0W	Wind	-1		No
ASD5b-1 D+1.5Fa+0.6W	Dead	1	Linear Add	No
ASD5b-1 D+1.5Fa+0.6W	Flood	1.5		No
ASD5b-1 D+1.5Fa+0.6W	Wind	0.6		No
ASD5b-2 D+1.5Fa-0.6W	Dead	1	Linear Add	No
ASD5b-2 D+1.5Fa-0.6W	Flood	1.5		No
ASD5b-2 D+1.5Fa-0.6W	Wind	-0.6		No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Dead	1	Linear Add	No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Live	0.75		No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Roof Live	0.75		No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Flood	1.5		No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Wind	0.45		No
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	Reducible Live	0.75		No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Dead	1	Linear Add	No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Live	0.75		No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Roof Live	0.75		No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Flood	1.5		No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Wind	-0.45		No
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	Reducible Live	0.75		No

Loads

Name	Load Case/Combo	Scale Factor	Type	Auto
ASD7b-1 0.6D+1.5Fa+0.6W	Dead	0.6	Linear Add	No
ASD7b-1 0.6D+1.5Fa+0.6W	Flood	1.5		No
ASD7b-1 0.6D+1.5Fa+0.6W	Wind	0.6		No
ASD7b-2 0.6D+1.5Fa-0.6W	Dead	0.6	Linear Add	No
ASD7b-2 0.6D+1.5Fa-0.6W	Flood	1.5		No
ASD7b-2 0.6D+1.5Fa-0.6W	Wind	-0.6		No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Dead	1.2	Linear Add	No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Live	1		No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Roof Live	0.5		No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Flood	2		No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Wind	1		No
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	Reducible Live	1		No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Dead	1.2	Linear Add	No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Live	1		No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Roof Live	0.5		No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Flood	2		No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Wind	-1		No
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	Reducible Live	1		No
LRFD6b-1 0.9D+2.0Fa+1.0W	Dead	0.9	Linear Add	No
LRFD6b-1 0.9D+2.0Fa+1.0W	Flood	2		No
LRFD6b-1 0.9D+2.0Fa+1.0W	Wind	1		No
LRFD6b-2 0.9D+2.0Fa-1.0W	Dead	0.9	Linear Add	No
LRFD6b-2 0.9D+2.0Fa-1.0W	Flood	2		No
LRFD6b-2 0.9D+2.0Fa-1.0W	Wind	-1		No
ASD Envelope	ASD1 D	1	Envelope	No
ASD Envelope	ASD2 D+L	1		No
ASD Envelope	ASD3 D+Lr	1		No
ASD Envelope	ASD4 D+0.75L+0.75Lr	1		No
ASD Envelope	ASD5a-1 D+0.6W	1		No
ASD Envelope	ASD5a-2 D-0.6W	1		No
ASD Envelope	ASD6a-1 D+0.75L+0.75Lr+0.45W	1		No
ASD Envelope	ASD6a-2 D+0.75L+0.75Lr-0.45W	1		No
ASD Envelope	ASD7a-1 0.6D+0.6W	1		No
ASD Envelope	ASD7a-2 0.6D-0.6W	1		No
ASD Envelope	ASD5b-1 D+1.5Fa+0.6W	1		No
ASD Envelope	ASD5b-2 D+1.5Fa-0.6W	1		No
ASD Envelope	ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W	1		No
ASD Envelope	ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W	1		No
ASD Envelope	ASD7b-1 0.6D+1.5Fa+0.6W	1		No
ASD Envelope	ASD7b-2 0.6D+1.5Fa-0.6W	1		No
LRFD Envelope	LRFD1 1.4D	1	Envelope	No
LRFD Envelope	LRFD2 1.2D+1.6L+0.5Lr	1		No
LRFD Envelope	LRFD3 1.2D+1.0L+1.6Lr	1		No
LRFD Envelope	LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W	1		No
LRFD Envelope	LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W	1		No
LRFD Envelope	LRFD6a-1 0.9D+1.0W	1		No
LRFD Envelope	LRFD6a-2 0.9D-1.0W	1		No

Loads

Name	Load Case/Combo	Scale Factor	Type	Auto
LRFD Envelope	LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W	1		No
LRFD Envelope	LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W	1		No
LRFD Envelope	LRFD6b-1 0.9D+2.0Fa+1.0W	1		No
LRFD Envelope	LRFD6b-2 0.9D+2.0Fa-1.0W	1		No
$LRFDEnv_{WindOnly}$	Wind	1	Envelope	No
$ASDEnv_{WindOnly}$	Wind	0.6	Envelope	No

4 Analysis Results

This chapter provides analysis results.

4.1 Structure Results

Table 4.1 - Base Reactions

Load Case/Combo	FX kip	FY kip	FZ kip	MX kip-ft	MY kip-ft	MZ kip-ft	X ft	Y ft	Z ft
Dead	0	0	6656.313	460911.6022	-743115.9735	0.0199	0	0	-4.5
Live	0	0	1377.007	94549.8618	-160653.9178	0.0085	0	0	-4.5
Roof Live	0	0	427.46	33233.5306	-53589.1977	0.0005	0	0	-4.5
Wind 1	-147.167	5.957E-06	0.0001233	2.3197	-2237.1978	8376.1241	0	0	-4.5
Wind 2	5.043E-06	-163.292	0.000171	2443.4035	-4.1176	-13452.6522	0	0	-4.5
Wind 3	-110.376	0	9.561E-05	0.9448	-1676.6944	4685.3226	0	0	-4.5
Wind 4	-110.376	5.3E-06	8.929E-05	2.5346	-1679.1023	7878.8636	0	0	-4.5
Wind 5	0	-122.469	0.0001329	1831.6851	-1.7943	-11976.0089	0	0	-4.5
Wind 6	0	-122.469	0.0001237	1833.4202	-4.3821	-8202.9693	0	0	-4.5
Wind 7	-110.376	122.469	-3.583E-05	-1830.8129	-1674.8101	16371.5822	0	0	-4.5
Wind 8	-110.376	-122.469	0.0002207	1834.2924	-1680.9865	-3807.3961	0	0	-4.5
Wind 9	-82.855	91.933	-2.106E-05	-1375.5782	-1255.3491	9674.8112	0	0	-4.5
Wind 10	-82.855	91.933	-3.273E-05	-1373.0823	-1259.0992	14904.3909	0	0	-4.5
Wind 11	-82.855	-91.933	0.0001715	1375.6942	-1259.9855	-5472.8752	0	0	-4.5
Wind 12	-82.855	-91.933	0.0001599	1378.1901	-1263.7356	-243.2954	0	0	-4.5
Flood	0	0	0	0	0	0	0	0	-4.5
Reducible Live	0	0	0	0	0	0	0	0	-4.5
ASD1 D	0	0	6656.313	460911.6022	-743115.9735	0.0199	0	0	-4.5
ASD2 D+L	0	0	8033.32	555461.464	-903769.8913	0.0284	0	0	-4.5
ASD3 D+Lr	0	0	7083.773	494145.1328	-796705.1712	0.0204	0	0	-4.5
ASD4 D+0.75L+0.75Lr	0	0	8009.663	556749.1465	-903798.3101	0.0267	0	0	-4.5
ASD5a-1 D+0.6W Max	0	73.481	6656.313	462377.6443	-743117.0501	9822.9692	0	0	-4.5
ASD5a-1 D+0.6W Min	-88.3	-97.975	6656.313	459813.1144	-744458.2922	-8071.5714	0	0	-4.5
ASD5a-2 D-0.6W Max	88.3	97.975	6656.313	462010.09	-741773.6548	8071.6112	0	0	-4.5
ASD5a-2 D-0.6W Min	0	-73.481	6656.313	459445.5601	-743114.8969	-9822.9294	0	0	-4.5
ASD6a-1 D+0.75L+0.75Lr+0.45W Max	0	55.111	8009.664	557848.6781	-903799.1175	7367.2386	0	0	-4.5
ASD6a-1 D+0.75L+0.75Lr+0.45W Min	-66.225	-73.481	8009.663	555925.2807	-904805.0491	-6053.6668	0	0	-4.5
ASD6a-2 D+0.75L+0.75Lr-0.45W Max	66.225	73.481	8009.663	557573.0123	-902791.5711	6053.7201	0	0	-4.5
ASD6a-2 D+0.75L+0.75Lr-0.45W Min	0	-55.111	8009.663	555649.6149	-903797.5027	-7367.1853	0	0	-4.5
ASD7a-1 0.6D+0.6W Max	0	73.481	3993.788	278013.0035	-445870.6607	9822.9613	0	0	-4.5
ASD7a-1 0.6D+0.6W Min	-88.3	-97.975	3993.788	275448.4736	-447211.9028	-8071.5794	0	0	-4.5
ASD7a-2 0.6D-0.6W Max	88.3	97.975	3993.788	277645.4491	-444527.2654	8071.6032	0	0	-4.5
ASD7a-2 0.6D-0.6W Min	0	-73.481	3993.788	275080.9192	-445868.5075	-9822.9374	0	0	-4.5
LRFD1 1.4D	0	0	9318.838	645276.2431	-1040362	0.0278	0	0	-4.5
LRFD2 1.2D+1.6L+0.5Lr	0	0	10404.517	720990.466	-1175580	0.0378	0	0	-4.5

Analysis Results

Load Case/Combo	FX kip	FY kip	FZ kip	MX kip-ft	MY kip-ft	MZ kip-ft	X ft	Y ft	Z ft
				8					
LRFD3 1.2D+1.0L+1.6Lr	0	0	10048.519	700817.4334	-1138136	0.0332	0	0	-4.5
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W Max	5.887E-06	122.469	9578.313	666703.9533	-1079189	16371.6149	0	0	-4.5
LRFD4a-1 1.2D+1.0L+0.5Lr+1.0W Min	-147.167	-163.292	9578.313	662429.7368	-1081425	-13452.6195	0	0	-4.5
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W Max	147.167	163.292	9578.313	666091.3627	-1076950	13452.6848	0	0	-4.5
LRFD4a-2 1.2D+1.0L+0.5Lr-1.0W Min	0	-122.469	9578.313	661817.1462	-1079186	-16371.5496	0	0	-4.5
LRFD6a-1 0.9D+1.0W Max	5.586E-06	122.469	5990.682	417263.8455	-668806.1704	16371.6001	0	0	-4.5
LRFD6a-1 0.9D+1.0W Min	-147.167	-163.292	5990.681	412989.6291	-671041.5739	-13452.6343	0	0	-4.5
LRFD6a-2 0.9D-1.0W Max	147.167	163.292	5990.681	416651.2549	-666567.1784	13452.6701	0	0	-4.5
LRFD6a-2 0.9D-1.0W Min	0	-122.469	5990.681	412377.0384	-668802.5819	-16371.5643	0	0	-4.5
ASD5b-1 D+1.5Fa+0.6W Max	0	73.481	6656.313	462377.6443	-743117.0501	9822.9692	0	0	-4.5
ASD5b-1 D+1.5Fa+0.6W Min	-88.3	-97.975	6656.313	459813.1144	-744458.2922	-8071.5714	0	0	-4.5
ASD5b-2 D+1.5Fa-0.6W Max	88.3	97.975	6656.313	462010.09	-741773.6548	8071.6112	0	0	-4.5
ASD5b-2 D+1.5Fa-0.6W Min	0	-73.481	6656.313	459445.5601	-743114.8969	-9822.9294	0	0	-4.5
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W Max	0	55.111	8009.664	557848.6781	-903799.1175	7367.2386	0	0	-4.5
ASD6b-1 D+0.75L+0.75Lr+1.5Fa+0.45W Min	-66.225	-73.481	8009.663	555925.2807	-904805.0491	-6053.6668	0	0	-4.5
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W Max	66.225	73.481	8009.663	557573.0123	-902791.5711	6053.7201	0	0	-4.5
ASD6b-2 D+0.75L+0.75Lr+1.5Fa-0.45W Min	0	-55.111	8009.663	555649.6149	-903797.5027	-7367.1853	0	0	-4.5
ASD7b-1 0.6D+1.5Fa+0.6W Max	0	73.481	3993.788	278013.0035	-445870.6607	9822.9613	0	0	-4.5
ASD7b-1 0.6D+1.5Fa+0.6W Min	-88.3	-97.975	3993.788	275448.4736	-447211.9028	-8071.5794	0	0	-4.5
ASD7b-2 0.6D+1.5Fa-0.6W Max	88.3	97.975	3993.788	277645.4491	-444527.2654	8071.6032	0	0	-4.5
ASD7b-2 0.6D+1.5Fa-0.6W Min	0	-73.481	3993.788	275080.9192	-445868.5075	-9822.9374	0	0	-4.5
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W Max	5.887E-06	122.469	9578.313	666703.9533	-1079189	16371.6149	0	0	-4.5
LRFD4b-1 1.2D+1.0L+0.5Lr+2.0Fa+1.0W Min	-147.167	-163.292	9578.313	662429.7368	-1081425	-13452.6195	0	0	-4.5
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W Max	147.167	163.292	9578.313	666091.3627	-1076950	13452.6848	0	0	-4.5
LRFD4b-2 1.2D+1.0L+0.5Lr+2.0Fa-1.0W Min	0	-122.469	9578.313	661817.1462	-1079186	-16371.5496	0	0	-4.5
LRFD6b-1 0.9D+2.0Fa+1.0W Max	5.586E-06	122.469	5990.682	417263.8455	-668806.1704	16371.6001	0	0	-4.5
LRFD6b-1 0.9D+2.0Fa+1.0W Min	-147.167	-163.292	5990.681	412989.6291	-671041.5739	-13452.6343	0	0	-4.5
LRFD6b-2 0.9D+2.0Fa-1.0W Max	147.167	163.292	5990.681	416651.2549	-666567.1784	13452.6701	0	0	-4.5
LRFD6b-2 0.9D+2.0Fa-1.0W Min	0	-122.469	5990.681	412377.0384	-668802.5819	-16371.5643	0	0	-4.5
ASD Envelope Max	88.3	97.975	8033.32	557848.6781	-444527.2654	9822.9692	0	0	-4.5
ASD Envelope Min	-88.3	-97.975	3993.788	275080.9192	-904805.0491	-9822.9374	0	0	-4.5
LRFD Envelope Max	147.167	163.292	10404.517	720990.4668	-666567.1784	16371.6149	0	0	-4.5
LRFD Envelope Min	-147.167	-163.292	5990.681	412377.0384	-1175580	-16371.5643	0	0	-4.5
$LRFDEnv_{WindOnly}$ Max	5.043E-06	122.469	0.0002207	2443.4035	-1.7943	16371.5822	0	0	-4.5
$LRFDEnv_{WindOnly}$ Min	-147.167	-163.292	-3.583E-	-1830.8129	-2237.1978	-	0	0	-4.5

Load Case/Combo	FX kip	FY kip	FZ kip	MX kip-ft	MY kip-ft	MZ kip-ft	X ft	Y ft	Z ft
			05			13452.6522			
$ASDEnv_{WindOnly}$ Max	0	73.481	0.0001324	1466.0421	-1.0766	9822.9493	0	0	-4.5
$ASDEnv_{WindOnly}$ Min	-88.3	-97.975	-2.15E-05	-1098.4878	-1342.3187	-8071.5913	0	0	-4.5

Table 4.2 - Centers of Mass and Rigidity

Story	Diaphragm	Mass X lb-s²/ft	Mass Y lb-s²/ft	XCM ft	YCM ft	Cumulative X lb-s²/ft	Cumulative Y lb-s²/ft	XCCM ft	YCCM ft	XCR ft	YCR ft
TOWER ROOF	D1-TR	5017.37	5017.37	135.9145	9.6625	5017.37	5017.37	135.9145	9.6625	135.0763	10.4483
TOWER LEVEL	D2-TL	7217.75	7217.75	135.911	9.5469	7217.75	7217.75	135.911	9.5469	134.6411	11.4333
M.H HIGH ROOF	D3-THR	4943.65	4943.65	135.0423	10.8992	4943.65	4943.65	135.0423	10.8992	129.335	22.6102
M.H HIGH ROOF	D3-HHR	26344.57	26344.57	115.967	70.6456	26344.57	26344.57	115.967	70.6456	124.1274	33.4843
2nd FLOOR	D5-T2ndF	5069.79	5069.79	135.4594	12.4795	5069.79	5069.79	135.4594	12.4795	132.1568	15.2142
POST OFFICE R.	D5-H2ndF	6388.71	6388.71	180.2577	102.5277	6388.71	6388.71	180.2577	102.5277	174.3909	103.566
2nd FLOOR	D5-H2ndF	36844.4	36844.4	83.2722	64.1898	43233.11	43233.11	97.6041	69.8551	121.3683	37.8718
1er FLOOR	D6-T1erF	5911.4	5911.4	135.9023	9.5406	5911.4	5911.4	135.9023	9.5406	134.5001	10.2295
1er FLOOR	D6-H1erF	18487.18	18487.18	33.8823	58.3297	18487.18	18487.18	33.8823	58.3297	40.6692	54.2118
GROUND	D7-TGF	5083.42	5083.42	135.8977	9.6408	5083.42	5083.42	135.8977	9.6408	135.776	9.0852

4.2 Modal Results

Table 4.3 - Modal Periods and Frequencies

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad²/sec²
Modal	1	0.577	1.733	10.8884	118.5569
Modal	2	0.52	1.925	12.0943	146.2709
Modal	3	0.504	1.985	12.4721	155.5539
Modal	4	0.448	2.231	14.0186	196.5207
Modal	5	0.416	2.404	15.1034	228.1122
Modal	6	0.292	3.421	21.4976	462.1489
Modal	7	0.278	3.598	22.6061	511.0337
Modal	8	0.239	4.184	26.2868	690.9938
Modal	9	0.219	4.563	28.6703	821.9881
Modal	10	0.217	4.606	28.9408	837.5718
Modal	11	0.216	4.625	29.057	844.3095
Modal	12	0.206	4.857	30.5156	931.1991

Table 4.4 - Modal Participating Mass Ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	1	0.577	0.0001	0.0011	0	0.0001	0.0011	0
Modal	2	0.52	0.2311	0.3076	0	0.2312	0.3087	0
Modal	3	0.504	0.2236	0.2451	0	0.4547	0.5538	0
Modal	4	0.448	0.0792	0.0001	0	0.5339	0.5539	0
Modal	5	0.416	0.0083	0.0004	0	0.5422	0.5543	0
Modal	6	0.292	0.0115	0.0356	0	0.5537	0.5899	0
Modal	7	0.278	0.0479	0.0155	0	0.6016	0.6053	0
Modal	8	0.239	0.0336	0.0661	0	0.6352	0.6714	0
Modal	9	0.219	0.001	0.0061	0	0.6362	0.6775	0
Modal	10	0.217	0.0002	0.0014	0	0.6364	0.6789	0
Modal	11	0.216	1.364E-05	0.0002	0	0.6364	0.6791	0
Modal	12	0.206	0.0511	0.1168	0	0.6874	0.7959	0

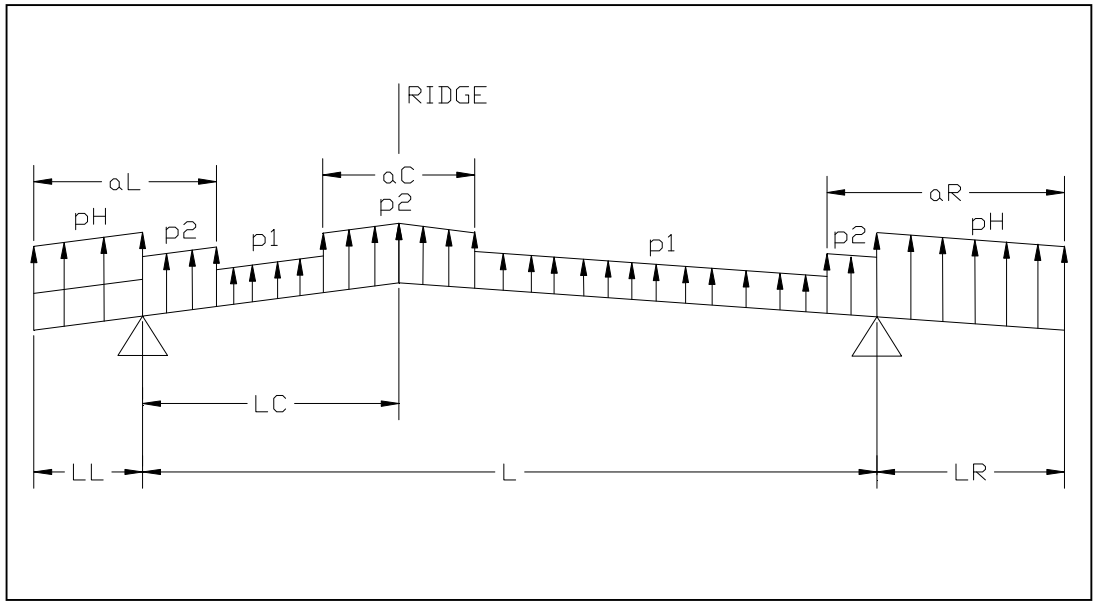
Table 4.4 - Modal Participating Mass Ratios (Part 2 of 2)

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	1	0.0018	0.0001	0.0007	0.0018	0.0001	0.0007
Modal	2	0.1774	0.0916	0.0367	0.1792	0.0917	0.0374
Modal	3	0.2681	0.1252	0.0375	0.4474	0.2169	0.0749
Modal	4	0.016	0.2487	0.4475	0.4634	0.4656	0.5224
Modal	5	0.0008	0.0374	0.0058	0.4642	0.5031	0.5282
Modal	6	0.0339	0.012	0.0169	0.4981	0.515	0.5451
Modal	7	0.0059	0.0129	0.0256	0.5039	0.528	0.5707
Modal	8	0.0842	0.0296	0.0638	0.5881	0.5576	0.6345
Modal	9	0.0073	0.0005	0.0077	0.5955	0.558	0.6422
Modal	10	0.0016	0.0001	0.0015	0.5971	0.5581	0.6437
Modal	11	0.0002	7.814E-06	0.0002	0.5973	0.5581	0.644
Modal	12	0.1071	0.044	0.0074	0.7044	0.6021	0.6514

ROOF DESIGN

REACTIONS ON TRUSSES AND GIRDERS

Project Name:	Tabares Residence
Job Number:	21-0860
Date:	9/20/2021



Gravity Loads Data

Gravity Loads for Comb D+L

DL= 25.00 plf

LL= 20.00 plf

Gravity Loads (Maximum) for Comb 0.6D+W

DL= 10.00 plf

												Gravity (lbs)		Uplift (lbs)		Uplift 0.6D+W	
No.	L (ft)	LL (ft)	LR (ft)	LC (ft)	aL (ft)	aR (ft)	aC (ft)	s (ft)	p1(psf)	p2 (psf)	pH (psf)	RL	RR	RL	RR	RL	RR
1	45.00	0.00	3.50	21.92	0.00	14.76	14.76	2.00	-75.41	-106.74	-143.38	2013	2352	-3917	-5504	-3470	-4981
2	45.00	3.50	3.50	45.00	14.76	14.76	14.76	6.00	-75.41	-106.74	-143.38	7020	7020	-15308	-18083	-13748	-16523
3	7.00	0.00	3.50	6.75	0.00	14.76	0.00	2.00	-75.41	-106.74	-143.38	236	709	-844	-1921	-792	-1763
4	37.67	3.50	3.50	18.83	14.76	14.76	14.76	2.00	-75.41	-106.74	-143.38	2010	2010	-5012	-5012	-4566	-4566
5	14.10	6.83	0.00	14.10	14.76	0.00	0.00	8.50	-75.41	-106.74	-152.15	5942	2064	-17009	-2973	-15689	-2515
6	9.10	5.00	0.00	9.10	14.76	0.00	0.00	6.00	-75.41	-106.74	-152.15	2949	858	-8728	-1789	-8073	-1598
7	49.60	3.50	3.50	24.75	14.76	14.76	14.76	2.00	-75.41	-106.74	-143.38	2547	2547	-5913	-5911	-5347	-5345
8	37.30	3.50	3.50	37.30	14.76	14.76	0.00	2.00	-75.41	-106.74	-143.38	1994	1994	-4522	-4522	-4079	-4079
9	10.50	0.00	3.50	10.50	0.00	14.76	0.00	2.00	-75.41	-106.74	-143.38	420	840	-1003	-2290	-910	-2103
10	5.67	0.00	2.33	5.67	0.00	14.76	0.00	2.00	-90.92	-126.61	-152.26	212	508	-1342	-1286	-1295	-1173
11	9.60	0.00	4.10	9.60	0.00	14.76	0.00	2.00	-90.92	-126.61	-152.26	353	880	-1029	-2726	-950	-2531
7	49.60	3.50	3.50	24.75	14.76	14.76	14.76	6.00	-75.41	-106.74	-143.38	7641	7641	-17739	-17733	-16041	-16035
13												#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
14												#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

SLAB DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

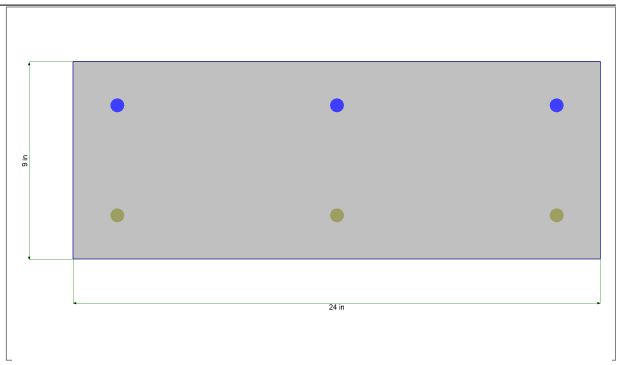
DESCRIPTION: 9 in THK (Tower Slab +53'-0")**

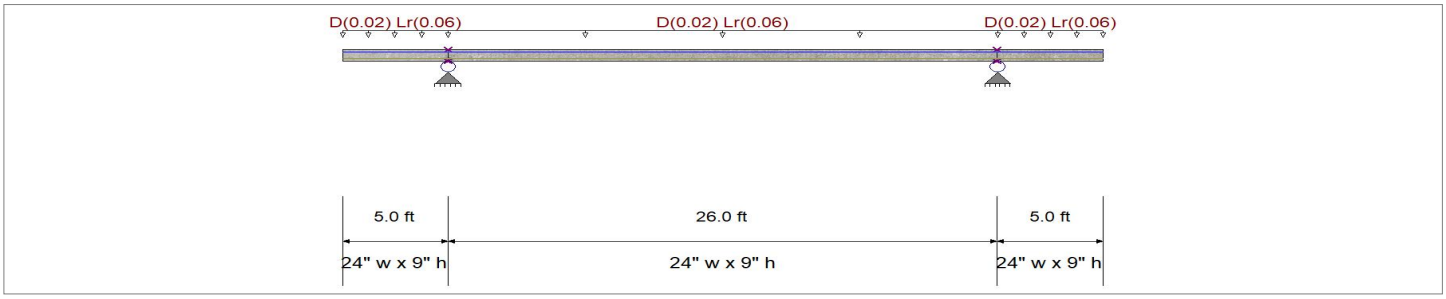
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750
ψ Density	= 145.0 pcf	β_1	=	0.80
λ LtWt Factor	= 1.0			
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 9.0 in

Span #1 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 5.0 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 5.0 ft in this spa

Span #2 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 26.0 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 26.0 ft in this sp

Span #3 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 5.0 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 5.0 ft in this spa

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 0.010, Lr = 0.030 ksf, Tributary Width = 2.0 ft

Load for Span Number 2
Uniform Load : D = 0.010, Lr = 0.030 ksf, Tributary Width = 2.0 ft

Load for Span Number 3
Uniform Load : D = 0.010, Lr = 0.030 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Check As Min Limits!

Maximum Bending Stress Ratio =	**0.845** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	27.432	k-ft
Mn * Phi : Allowable	32.478	k-ft
Location of maximum on span	13.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.086 in	Ratio =	3620	>=360.0	Lr Only
Max Upward Transient Deflection	-0.049 in	Ratio =	2454	>=360.0	
Max Downward Total Deflection	1.006 in	Ratio =	310	>=180.0	
Max Upward Total Deflection	-0.517 in	Ratio =	230	>=180.0	Span: 3 : +D+Lr

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 9 in THK (Tower Slab +53'-0")**

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		5.355	5.355	
Overall MINimum		1.080	1.080	
D Only		4.275	4.275	
+D+Lr		5.355	5.355	
+D+0.750Lr		5.085	5.085	
+0.60D		2.565	2.565	
Lr Only		1.080	1.080	

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.40D	1	0.00	7.00	0.00	0.00	0.00	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	0.20	7.00	-0.08	0.08	0.01	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	0.40	7.00	-0.15	0.15	0.03	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	0.60	7.00	-0.23	0.23	0.07	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	0.80	7.00	-0.30	0.30	0.12	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	1.00	7.00	-0.38	0.38	0.19	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	1	1.20	7.00	-0.46	0.46	0.27	0.97	18.62	Vu < PhiVc/2	ot Reqd 9.6	18.6	0.0	0.0
+1.20D+1.60Lr	1	1.40	7.00	-0.53	0.53	0.37	0.83	18.38	Vu < PhiVc/2	ot Reqd 9.6	18.4	0.0	0.0
+1.20D+1.60Lr	1	1.60	7.00	-0.61	0.61	0.49	0.73	18.20	Vu < PhiVc/2	ot Reqd 9.6	18.2	0.0	0.0
+1.20D+1.60Lr	1	1.80	7.00	-0.69	0.69	0.62	0.65	18.06	Vu < PhiVc/2	ot Reqd 9.6	18.1	0.0	0.0
+1.20D+1.60Lr	1	2.00	7.00	-0.76	0.76	0.76	0.58	17.95	Vu < PhiVc/2	ot Reqd 9.6	17.9	0.0	0.0
+1.20D+1.60Lr	1	2.20	7.00	-0.84	0.84	0.92	0.53	17.85	Vu < PhiVc/2	ot Reqd 9.6	17.9	0.0	0.0
+1.20D+1.60Lr	1	2.40	7.00	-0.91	0.91	1.10	0.49	17.78	Vu < PhiVc/2	ot Reqd 9.6	17.8	0.0	0.0
+1.20D+1.60Lr	1	2.60	7.00	-0.99	0.99	1.29	0.45	17.71	Vu < PhiVc/2	ot Reqd 9.6	17.7	0.0	0.0
+1.20D+1.60Lr	1	2.80	7.00	-1.07	1.07	1.49	0.42	17.65	Vu < PhiVc/2	ot Reqd 9.6	17.7	0.0	0.0
+1.20D+1.60Lr	1	3.00	7.00	-1.14	1.14	1.71	0.39	17.61	Vu < PhiVc/2	ot Reqd 9.6	17.6	0.0	0.0
+1.20D+1.60Lr	1	3.20	7.00	-1.22	1.22	1.95	0.36	17.56	Vu < PhiVc/2	ot Reqd 9.6	17.6	0.0	0.0
+1.20D+1.60Lr	1	3.40	7.00	-1.30	1.30	2.20	0.34	17.53	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	1	3.60	7.00	-1.37	1.37	2.47	0.32	17.49	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	1	3.80	7.00	-1.45	1.45	2.75	0.31	17.46	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	1	4.00	7.00	-1.52	1.52	3.05	0.29	17.44	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	1	4.20	7.00	-1.60	1.60	3.36	0.28	17.41	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	1	4.40	7.00	-1.68	1.68	3.69	0.27	17.39	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	1	4.60	7.00	-1.75	1.75	4.03	0.25	17.37	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	1	4.80	7.00	-1.83	1.83	4.39	0.24	17.35	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	2	5.00	7.00	4.95	4.95	4.76	0.61	17.99	Vu < PhiVc/2	ot Reqd 9.6	18.0	0.0	0.0
+1.20D+1.60Lr	2	6.04	7.00	4.56	4.56	0.18	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	2	7.08	7.00	4.16	4.16	4.72	0.51	17.83	Vu < PhiVc/2	ot Reqd 9.6	17.8	0.0	0.0
+1.20D+1.60Lr	2	8.12	7.00	3.76	3.76	8.84	0.25	17.36	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	2	9.16	7.00	3.37	3.37	12.55	0.16	17.20	Vu < PhiVc/2	ot Reqd 9.6	17.2	0.0	0.0
+1.20D+1.60Lr	2	10.20	7.00	2.97	2.97	15.84	0.11	17.12	Vu < PhiVc/2	ot Reqd 9.6	17.1	0.0	0.0
+1.20D+1.60Lr	2	11.24	7.00	2.58	2.58	18.73	0.08	17.07	Vu < PhiVc/2	ot Reqd 9.6	17.1	0.0	0.0
+1.20D+1.60Lr	2	12.28	7.00	2.18	2.18	21.20	0.06	17.03	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	13.32	7.00	1.78	1.78	23.26	0.04	17.01	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	14.36	7.00	1.39	1.39	24.91	0.03	16.98	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	15.40	7.00	0.99	0.99	26.14	0.02	16.97	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	16.44	7.00	0.59	0.59	26.97	0.01	16.95	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	17.48	7.00	0.20	0.20	27.38	0.00	16.94	Vu < PhiVc/2	ot Reqd 9.6	16.9	0.0	0.0
+1.20D+1.60Lr	2	18.52	7.00	-0.20	0.20	27.38	0.00	16.94	Vu < PhiVc/2	ot Reqd 9.6	16.9	0.0	0.0
+1.20D+1.60Lr	2	19.56	7.00	-0.59	0.59	26.97	0.01	16.95	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	20.60	7.00	-0.99	0.99	26.14	0.02	16.97	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	21.64	7.00	-1.39	1.39	24.91	0.03	16.98	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	22.68	7.00	-1.78	1.78	23.26	0.04	17.01	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	23.72	7.00	-2.18	2.18	21.20	0.06	17.03	Vu < PhiVc/2	ot Reqd 9.6	17.0	0.0	0.0
+1.20D+1.60Lr	2	24.76	7.00	-2.58	2.58	18.73	0.08	17.07	Vu < PhiVc/2	ot Reqd 9.6	17.1	0.0	0.0
+1.20D+1.60Lr	2	25.80	7.00	-2.97	2.97	15.84	0.11	17.12	Vu < PhiVc/2	ot Reqd 9.6	17.1	0.0	0.0
+1.20D+1.60Lr	2	26.84	7.00	-3.37	3.37	12.55	0.16	17.20	Vu < PhiVc/2	ot Reqd 9.6	17.2	0.0	0.0
+1.20D+1.60Lr	2	27.88	7.00	-3.76	3.76	8.84	0.25	17.36	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 9 in THK (Tower Slab +53'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60Lr	2	28.92	7.00	-4.16	4.16	4.72	0.51	17.83	Vu < PhiVc/2	ot Reqd 9.6	17.8	0.0	0.0
+1.20D+1.60Lr	2	29.96	7.00	-4.56	4.56	0.18	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	3	31.00	7.00	1.91	1.91	4.76	0.23	17.34	Vu < PhiVc/2	ot Reqd 9.6	17.3	0.0	0.0
+1.20D+1.60Lr	3	31.20	7.00	1.83	1.83	4.39	0.24	17.35	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	3	31.40	7.00	1.75	1.75	4.03	0.25	17.37	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	3	31.60	7.00	1.68	1.68	3.69	0.27	17.39	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	3	31.80	7.00	1.60	1.60	3.36	0.28	17.41	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	3	32.00	7.00	1.52	1.52	3.05	0.29	17.44	Vu < PhiVc/2	ot Reqd 9.6	17.4	0.0	0.0
+1.20D+1.60Lr	3	32.20	7.00	1.45	1.45	2.75	0.31	17.46	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	3	32.40	7.00	1.37	1.37	2.47	0.32	17.49	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	3	32.60	7.00	1.30	1.30	2.20	0.34	17.53	Vu < PhiVc/2	ot Reqd 9.6	17.5	0.0	0.0
+1.20D+1.60Lr	3	32.80	7.00	1.22	1.22	1.95	0.36	17.56	Vu < PhiVc/2	ot Reqd 9.6	17.6	0.0	0.0
+1.20D+1.60Lr	3	33.00	7.00	1.14	1.14	1.71	0.39	17.61	Vu < PhiVc/2	ot Reqd 9.6	17.6	0.0	0.0
+1.20D+1.60Lr	3	33.20	7.00	1.07	1.07	1.49	0.42	17.65	Vu < PhiVc/2	ot Reqd 9.6	17.7	0.0	0.0
+1.20D+1.60Lr	3	33.40	7.00	0.99	0.99	1.29	0.45	17.71	Vu < PhiVc/2	ot Reqd 9.6	17.7	0.0	0.0
+1.20D+1.60Lr	3	33.60	7.00	0.91	0.91	1.10	0.49	17.78	Vu < PhiVc/2	ot Reqd 9.6	17.8	0.0	0.0
+1.20D+1.60Lr	3	33.80	7.00	0.84	0.84	0.92	0.53	17.85	Vu < PhiVc/2	ot Reqd 9.6	17.9	0.0	0.0
+1.20D+1.60Lr	3	34.00	7.00	0.76	0.76	0.76	0.58	17.95	Vu < PhiVc/2	ot Reqd 9.6	17.9	0.0	0.0
+1.20D+1.60Lr	3	34.20	7.00	0.69	0.69	0.62	0.65	18.06	Vu < PhiVc/2	ot Reqd 9.6	18.1	0.0	0.0
+1.20D+1.60Lr	3	34.40	7.00	0.61	0.61	0.49	0.73	18.20	Vu < PhiVc/2	ot Reqd 9.6	18.2	0.0	0.0
+1.20D+1.60Lr	3	34.60	7.00	0.53	0.53	0.37	0.83	18.38	Vu < PhiVc/2	ot Reqd 9.6	18.4	0.0	0.0
+1.20D+1.60Lr	3	34.80	7.00	0.46	0.46	0.27	0.97	18.62	Vu < PhiVc/2	ot Reqd 9.6	18.6	0.0	0.0
+1.20D+1.60Lr	3	35.00	7.00	0.38	0.38	0.19	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	3	35.20	7.00	0.30	0.30	0.12	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	3	35.40	7.00	0.23	0.23	0.07	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	3	35.60	7.00	0.15	0.15	0.03	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+1.60Lr	3	35.80	7.00	0.08	0.08	0.01	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0
+1.20D+0.50Lr	3	36.00	7.00	0.00	0.00	0.00	1.00	18.67	Vu < PhiVc/2	ot Reqd 9.6	18.7	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	5.000	-4.70	32.48	0.14
Span # 2	2	26.000	27.43	32.48	0.84
Span # 3	3	5.000	-4.76	32.48	0.15
+1.40D					
Span # 1	1	5.000	-4.10	32.48	0.13
Span # 2	2	26.000	23.94	32.48	0.74
Span # 3	3	5.000	-4.16	32.48	0.13
+1.20D+0.50Lr					
Span # 1	1	5.000	-3.89	32.48	0.12
Span # 2	2	26.000	22.68	32.48	0.70
Span # 3	3	5.000	-3.94	32.48	0.12
+1.20D					
Span # 1	1	5.000	-3.52	32.48	0.11
Span # 2	2	26.000	20.52	32.48	0.63
Span # 3	3	5.000	-3.56	32.48	0.11
+1.20D+1.60Lr					
Span # 1	1	5.000	-4.70	32.48	0.14
Span # 2	2	26.000	27.43	32.48	0.84
Span # 3	3	5.000	-4.76	32.48	0.15
+0.90D					
Span # 1	1	5.000	-2.64	32.48	0.08
Span # 2	2	26.000	15.39	32.48	0.47
Span # 3	3	5.000	-2.67	32.48	0.08

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+Lr	1	0.0547	5.520	+D+Lr	-0.5173	0.000
+D+Lr	2	1.0063	13.000	+D+Lr	-0.0105	26.100
	3	0.0000	13.000	+D+Lr	-0.5173	5.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

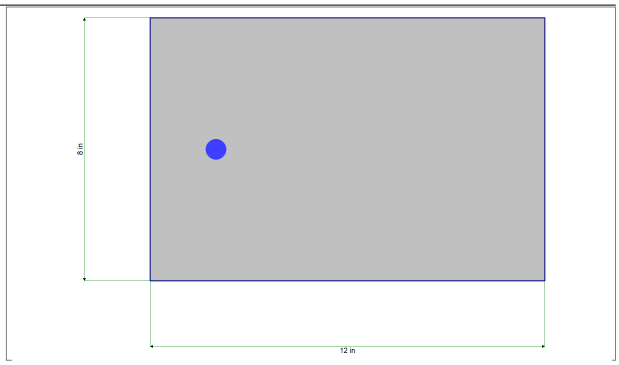
DESCRIPTION: Concrete Slab Balcony (Tower +42'-00")**

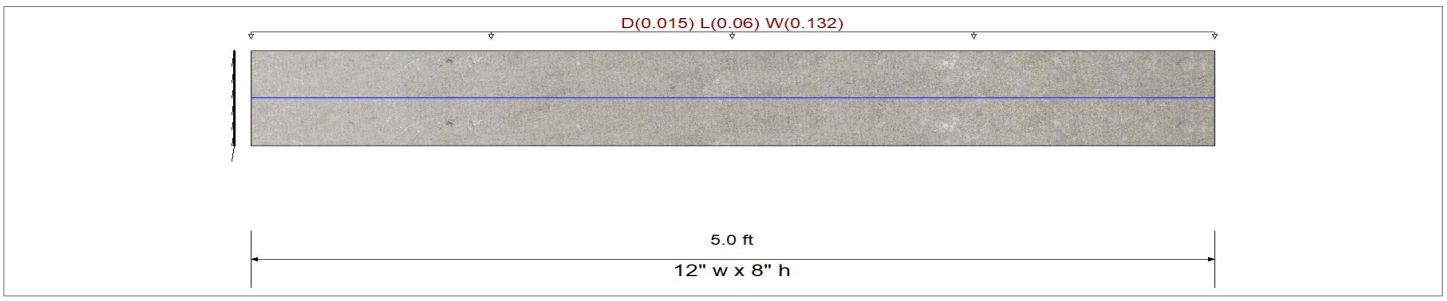
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 8.0 in
Span #1 Reinforcing....
1-#5 at 4.0 in from Bottom, from 0.0 to 5.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0150, L = 0.060, W = 0.1320 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.695**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	-3.70	k-ft
Mn * Phi : Allowable	5.326	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.009 in	Ratio =	13896	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	W Only
Max Downward Total Deflection	0.014 in	Ratio =	8488	>=240.0	Span: 1 : +D+0.750L+0.450W
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+0.750L+0.450W

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	1.080	
Overall MINimum	0.300	
D Only	0.558	
+D+L	0.858	
+D+0.750L	0.783	
+D+0.60W	0.954	
+D+0.750L+0.450W	1.080	

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Slab Balcony (Tower +42'-00")**

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+0.60D+0.60W	0.731	
+0.60D	0.335	
L Only	0.300	
W Only	0.660	

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50L+W	1	0.00	4.00	1.48	1.48	3.70	0.13	4.91	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.05	4.00	1.46	1.46	3.62	0.13	4.91	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.11	4.00	1.45	1.45	3.54	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.16	4.00	1.43	1.43	3.46	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.22	4.00	1.42	1.42	3.38	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.27	4.00	1.40	1.40	3.31	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.33	4.00	1.38	1.38	3.23	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.38	4.00	1.37	1.37	3.16	0.14	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.44	4.00	1.35	1.35	3.08	0.15	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.49	4.00	1.33	1.33	3.01	0.15	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.55	4.00	1.32	1.32	2.94	0.15	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.60	4.00	1.30	1.30	2.86	0.15	4.92	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.66	4.00	1.29	1.29	2.79	0.15	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.71	4.00	1.27	1.27	2.72	0.16	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.77	4.00	1.25	1.25	2.65	0.16	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.82	4.00	1.24	1.24	2.59	0.16	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.87	4.00	1.22	1.22	2.52	0.16	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.93	4.00	1.21	1.21	2.45	0.16	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	0.98	4.00	1.19	1.19	2.39	0.17	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.04	4.00	1.17	1.17	2.32	0.17	4.93	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.09	4.00	1.16	1.16	2.26	0.17	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.15	4.00	1.14	1.14	2.20	0.17	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.20	4.00	1.12	1.12	2.13	0.18	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.26	4.00	1.11	1.11	2.07	0.18	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.31	4.00	1.09	1.09	2.01	0.18	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.37	4.00	1.08	1.08	1.95	0.18	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.42	4.00	1.06	1.06	1.90	0.19	4.94	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.48	4.00	1.04	1.04	1.84	0.19	4.95	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.53	4.00	1.03	1.03	1.78	0.19	4.95	Vu < PhiVc/2	ıt Reqd 9.6	4.9	0.0	0.0
+1.20D+0.50L+W	1	1.58	4.00	1.01	1.01	1.73	0.20	4.95	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.64	4.00	0.99	0.99	1.67	0.20	4.95	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.69	4.00	0.98	0.98	1.62	0.20	4.95	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.75	4.00	0.96	0.96	1.56	0.21	4.96	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.80	4.00	0.95	0.95	1.51	0.21	4.96	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.86	4.00	0.93	0.93	1.46	0.21	4.96	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.91	4.00	0.91	0.91	1.41	0.22	4.96	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	1.97	4.00	0.90	0.90	1.36	0.22	4.96	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.02	4.00	0.88	0.88	1.31	0.22	4.97	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.08	4.00	0.87	0.87	1.26	0.23	4.97	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.13	4.00	0.85	0.85	1.22	0.23	4.97	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.19	4.00	0.83	0.83	1.17	0.24	4.97	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.24	4.00	0.82	0.82	1.13	0.24	4.98	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.30	4.00	0.80	0.80	1.08	0.25	4.98	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.35	4.00	0.78	0.78	1.04	0.25	4.98	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.40	4.00	0.77	0.77	1.00	0.26	4.99	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.46	4.00	0.75	0.75	0.96	0.26	4.99	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.51	4.00	0.74	0.74	0.91	0.27	4.99	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.57	4.00	0.72	0.72	0.88	0.27	5.00	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.62	4.00	0.70	0.70	0.84	0.28	5.00	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.68	4.00	0.69	0.69	0.80	0.29	5.00	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.73	4.00	0.67	0.67	0.76	0.29	5.01	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Slab Balcony (Tower +42'-00")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50L+W	1	2.79	4.00	0.66	0.66	0.72	0.30	5.01	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.84	4.00	0.64	0.64	0.69	0.31	5.02	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.90	4.00	0.62	0.62	0.66	0.32	5.02	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	2.95	4.00	0.61	0.61	0.62	0.33	5.03	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	3.01	4.00	0.59	0.59	0.59	0.33	5.03	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	3.06	4.00	0.57	0.57	0.56	0.34	5.04	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	3.11	4.00	0.56	0.56	0.53	0.35	5.04	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	3.17	4.00	0.54	0.54	0.50	0.36	5.05	Vu < PhiVc/2	ıt Reqd 9.6	5.0	0.0	0.0
+1.20D+0.50L+W	1	3.22	4.00	0.53	0.53	0.47	0.38	5.05	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.28	4.00	0.51	0.51	0.44	0.39	5.06	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.33	4.00	0.49	0.49	0.41	0.40	5.07	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.39	4.00	0.48	0.48	0.38	0.41	5.08	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.44	4.00	0.46	0.46	0.36	0.43	5.09	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.50	4.00	0.44	0.44	0.33	0.44	5.09	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.55	4.00	0.43	0.43	0.31	0.46	5.10	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.61	4.00	0.41	0.41	0.29	0.48	5.11	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.66	4.00	0.40	0.40	0.27	0.50	5.13	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.72	4.00	0.38	0.38	0.24	0.52	5.14	Vu < PhiVc/2	ıt Reqd 9.6	5.1	0.0	0.0
+1.20D+0.50L+W	1	3.77	4.00	0.36	0.36	0.22	0.54	5.15	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	3.83	4.00	0.35	0.35	0.20	0.57	5.17	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	3.88	4.00	0.33	0.33	0.19	0.60	5.18	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	3.93	4.00	0.32	0.32	0.17	0.63	5.20	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	3.99	4.00	0.30	0.30	0.15	0.66	5.22	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	4.04	4.00	0.28	0.28	0.14	0.70	5.24	Vu < PhiVc/2	ıt Reqd 9.6	5.2	0.0	0.0
+1.20D+0.50L+W	1	4.10	4.00	0.27	0.27	0.12	0.74	5.27	Vu < PhiVc/2	ıt Reqd 9.6	5.3	0.0	0.0
+1.20D+0.50L+W	1	4.15	4.00	0.25	0.25	0.11	0.79	5.29	Vu < PhiVc/2	ıt Reqd 9.6	5.3	0.0	0.0
+1.20D+0.50L+W	1	4.21	4.00	0.23	0.23	0.09	0.84	5.33	Vu < PhiVc/2	ıt Reqd 9.6	5.3	0.0	0.0
+1.20D+0.50L+W	1	4.26	4.00	0.22	0.22	0.08	0.90	5.36	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.32	4.00	0.20	0.20	0.07	0.98	5.40	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.37	4.00	0.19	0.19	0.06	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.43	4.00	0.17	0.17	0.05	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.48	4.00	0.15	0.15	0.04	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.54	4.00	0.14	0.14	0.03	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.59	4.00	0.12	0.12	0.02	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.64	4.00	0.11	0.11	0.02	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.70	4.00	0.09	0.09	0.01	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.75	4.00	0.07	0.07	0.01	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.81	4.00	0.06	0.06	0.01	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.86	4.00	0.04	0.04	0.00	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.92	4.00	0.02	0.02	0.00	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0
+1.20D+0.50L+W	1	4.97	4.00	0.01	0.01	0.00	1.00	5.42	Vu < PhiVc/2	ıt Reqd 9.6	5.4	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	5.000	-3.70	5.33	0.69
+1.40D					
Span # 1	1	5.000	-1.95	5.33	0.37
+1.20D+1.60L					
Span # 1	1	5.000	-2.88	5.33	0.54
+1.20D+0.50L					
Span # 1	1	5.000	-2.05	5.33	0.38
+1.20D+0.50W					
Span # 1	1	5.000	-2.50	5.33	0.47
+1.20D+0.50L+W					
Span # 1	1	5.000	-3.70	5.33	0.69
+0.90D+W					
Span # 1	1	5.000	-2.91	5.33	0.55
+0.90D					

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Slab Balcony (Tower +42'-00")**

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	5.000	-1.26	5.33	0.24

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+0.750L+0.450W	1	0.0141	5.000		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

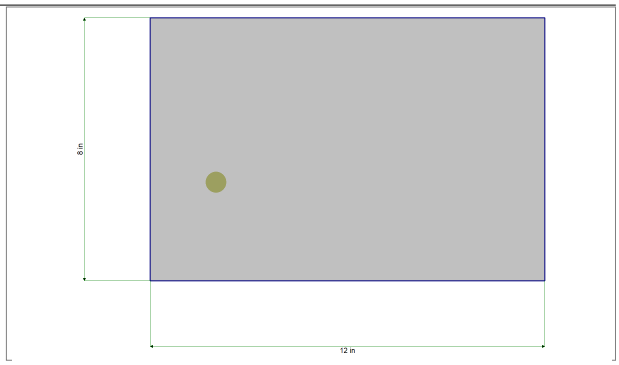
DESCRIPTION: 8 in THK (Elv. +20'-0")**

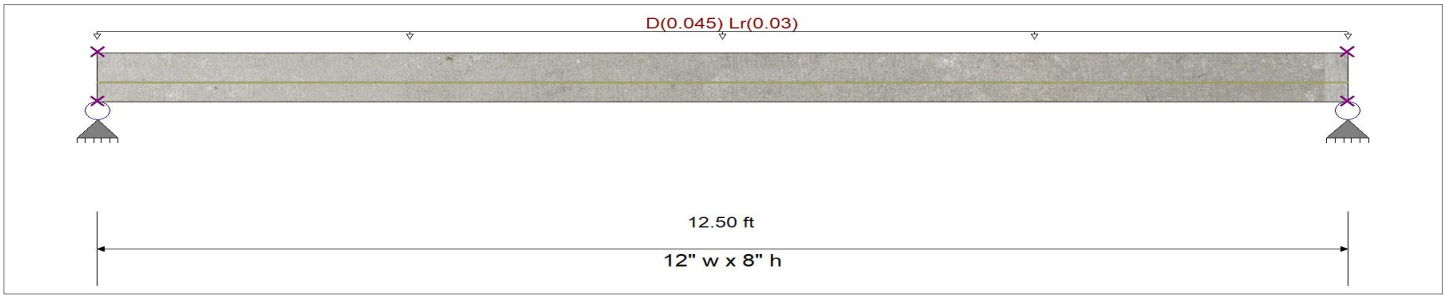
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 8.0 in
Span #1 Reinforcing....
1-#5 at 3.0 in from Bottom, from 0.0 to 12.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0450, Lr = 0.030 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.634** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	4.258	k-ft
Mn * Phi : Allowable	6.721	k-ft
Location of maximum on span	6.261	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.008 in	Ratio =	18789	>=360.0	Lr Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	Lr Only
Max Downward Total Deflection	0.046 in	Ratio =	3283	>=240.0	Span: 1 : +D+Lr
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+Lr

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	1.073	1.073
Overall MINimum	0.187	0.187
D Only	0.885	0.885
+D+Lr	1.073	1.073
+D+0.750Lr	1.026	1.026
+0.60D	0.531	0.531
Lr Only	0.187	0.187

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +20'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60Lr	1	0.00	5.00	1.36	1.36	0.00	1.00	6.63	Vu < PhiVc/2	ot Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	0.14	5.00	1.33	1.33	0.18	1.00	6.63	Vu < PhiVc/2	ot Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	0.27	5.00	1.30	1.30	0.36	1.00	6.63	Vu < PhiVc/2	ot Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	0.41	5.00	1.27	1.27	0.54	0.98	6.62	Vu < PhiVc/2	ot Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	0.55	5.00	1.24	1.24	0.71	0.73	6.47	Vu < PhiVc/2	ot Reqd 9.6	6.5	0.0	0.0
+1.20D+1.60Lr	1	0.68	5.00	1.21	1.21	0.88	0.57	6.38	Vu < PhiVc/2	ot Reqd 9.6	6.4	0.0	0.0
+1.20D+1.60Lr	1	0.82	5.00	1.18	1.18	1.04	0.47	6.32	Vu < PhiVc/2	ot Reqd 9.6	6.3	0.0	0.0
+1.20D+1.60Lr	1	0.96	5.00	1.15	1.15	1.20	0.40	6.28	Vu < PhiVc/2	ot Reqd 9.6	6.3	0.0	0.0
+1.20D+1.60Lr	1	1.09	5.00	1.12	1.12	1.36	0.34	6.25	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.23	5.00	1.09	1.09	1.51	0.30	6.22	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.37	5.00	1.06	1.06	1.66	0.27	6.20	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.50	5.00	1.03	1.03	1.80	0.24	6.18	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.64	5.00	1.01	1.01	1.94	0.22	6.17	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.78	5.00	0.98	0.98	2.08	0.20	6.16	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	1.91	5.00	0.95	0.95	2.21	0.18	6.15	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.05	5.00	0.92	0.92	2.33	0.16	6.14	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.19	5.00	0.89	0.89	2.46	0.15	6.13	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.32	5.00	0.86	0.86	2.58	0.14	6.13	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.46	5.00	0.83	0.83	2.69	0.13	6.12	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.60	5.00	0.80	0.80	2.80	0.12	6.11	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.73	5.00	0.77	0.77	2.91	0.11	6.11	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	2.87	5.00	0.74	0.74	3.01	0.10	6.11	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.01	5.00	0.71	0.71	3.11	0.09	6.10	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.14	5.00	0.68	0.68	3.20	0.09	6.10	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.28	5.00	0.65	0.65	3.30	0.08	6.09	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.42	5.00	0.62	0.62	3.38	0.08	6.09	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.55	5.00	0.59	0.59	3.46	0.07	6.09	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.69	5.00	0.56	0.56	3.54	0.07	6.08	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.83	5.00	0.53	0.53	3.62	0.06	6.08	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	3.96	5.00	0.50	0.50	3.69	0.06	6.08	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.10	5.00	0.47	0.47	3.75	0.05	6.08	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.23	5.00	0.44	0.44	3.82	0.05	6.07	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.37	5.00	0.41	0.41	3.87	0.04	6.07	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.51	5.00	0.38	0.38	3.93	0.04	6.07	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.64	5.00	0.35	0.35	3.98	0.04	6.07	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.78	5.00	0.32	0.32	4.02	0.03	6.07	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	4.92	5.00	0.29	0.29	4.06	0.03	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.05	5.00	0.26	0.26	4.10	0.03	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.19	5.00	0.23	0.23	4.14	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.33	5.00	0.20	0.20	4.17	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.46	5.00	0.17	0.17	4.19	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.60	5.00	0.14	0.14	4.21	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.74	5.00	0.11	0.11	4.23	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	5.87	5.00	0.08	0.08	4.24	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	6.01	5.00	0.05	0.05	4.25	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60Lr	1	6.15	5.00	0.02	0.02	4.26	0.00	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60Lr	1	6.28	5.00	-0.01	0.01	4.26	0.00	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60Lr	1	6.42	5.00	-0.04	0.04	4.25	0.00	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60Lr	1	6.56	5.00	-0.07	0.07	4.25	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60Lr	1	6.69	5.00	-0.10	0.10	4.24	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	6.83	5.00	-0.13	0.13	4.22	0.01	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	6.97	5.00	-0.16	0.16	4.20	0.02	6.05	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.10	5.00	-0.19	0.19	4.18	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.24	5.00	-0.22	0.22	4.15	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.38	5.00	-0.25	0.25	4.12	0.02	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.51	5.00	-0.28	0.28	4.08	0.03	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.65	5.00	-0.31	0.31	4.04	0.03	6.06	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +20'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60Lr	1	7.79	5.00	-0.34	0.34	4.00	0.03	6.07	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	7.92	5.00	-0.36	0.36	3.95	0.04	6.07	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.06	5.00	-0.39	0.39	3.90	0.04	6.07	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.20	5.00	-0.42	0.42	3.84	0.05	6.07	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.33	5.00	-0.45	0.45	3.78	0.05	6.07	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.47	5.00	-0.48	0.48	3.72	0.05	6.08	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.61	5.00	-0.51	0.51	3.65	0.06	6.08	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.74	5.00	-0.54	0.54	3.58	0.06	6.08	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	8.88	5.00	-0.57	0.57	3.50	0.07	6.09	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.02	5.00	-0.60	0.60	3.42	0.07	6.09	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.15	5.00	-0.63	0.63	3.34	0.08	6.09	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.29	5.00	-0.66	0.66	3.25	0.08	6.10	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.43	5.00	-0.69	0.69	3.16	0.09	6.10	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.56	5.00	-0.72	0.72	3.06	0.10	6.10	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.70	5.00	-0.75	0.75	2.96	0.11	6.11	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.84	5.00	-0.78	0.78	2.86	0.11	6.11	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	9.97	5.00	-0.81	0.81	2.75	0.12	6.12	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	10.11	5.00	-0.84	0.84	2.63	0.13	6.12	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	10.25	5.00	-0.87	0.87	2.52	0.14	6.13	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	10.38	5.00	-0.90	0.90	2.40	0.16	6.14	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	10.52	5.00	-0.93	0.93	2.27	0.17	6.15	Vu < PhiVc/2	)t Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60Lr	1	10.66	5.00	-0.96	0.96	2.14	0.19	6.15	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	10.79	5.00	-0.99	0.99	2.01	0.21	6.17	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	10.93	5.00	-1.02	1.02	1.87	0.23	6.18	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	11.07	5.00	-1.05	1.05	1.73	0.25	6.19	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	11.20	5.00	-1.08	1.08	1.58	0.28	6.21	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	11.34	5.00	-1.11	1.11	1.44	0.32	6.23	Vu < PhiVc/2	)t Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60Lr	1	11.48	5.00	-1.14	1.14	1.28	0.37	6.26	Vu < PhiVc/2	)t Reqd 9.6	6.3	0.0	0.0
+1.20D+1.60Lr	1	11.61	5.00	-1.17	1.17	1.12	0.43	6.30	Vu < PhiVc/2	)t Reqd 9.6	6.3	0.0	0.0
+1.20D+1.60Lr	1	11.75	5.00	-1.20	1.20	0.96	0.52	6.35	Vu < PhiVc/2	)t Reqd 9.6	6.3	0.0	0.0
+1.20D+1.60Lr	1	11.89	5.00	-1.23	1.23	0.80	0.64	6.42	Vu < PhiVc/2	)t Reqd 9.6	6.4	0.0	0.0
+1.20D+1.60Lr	1	12.02	5.00	-1.26	1.26	0.63	0.84	6.53	Vu < PhiVc/2	)t Reqd 9.6	6.5	0.0	0.0
+1.20D+1.60Lr	1	12.16	5.00	-1.29	1.29	0.45	1.00	6.63	Vu < PhiVc/2	)t Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	12.30	5.00	-1.32	1.32	0.27	1.00	6.63	Vu < PhiVc/2	)t Reqd 9.6	6.6	0.0	0.0
+1.20D+1.60Lr	1	12.43	5.00	-1.35	1.35	0.09	1.00	6.63	Vu < PhiVc/2	)t Reqd 9.6	6.6	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.500	4.26	6.72	0.63
+1.40D					
Span # 1	1	12.500	3.87	6.72	0.58
+1.20D+0.50Lr					
Span # 1	1	12.500	3.61	6.72	0.54
+1.20D					
Span # 1	1	12.500	3.32	6.72	0.49
+1.20D+1.60Lr					
Span # 1	1	12.500	4.26	6.72	0.63
+0.90D					
Span # 1	1	12.500	2.49	6.72	0.37

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	.ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+Lr	1	0.0457	6.250		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

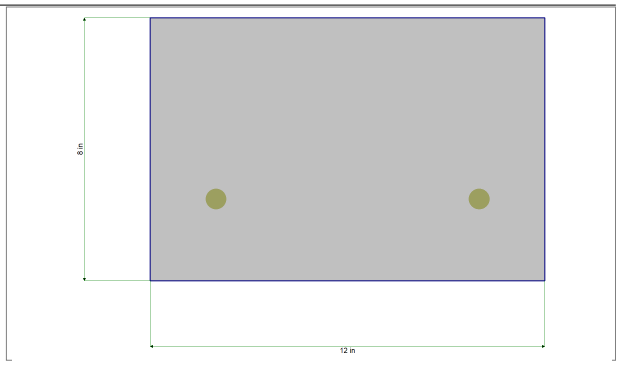
DESCRIPTION: 8 in THK (Marble Hall Elv. +19'-4")**

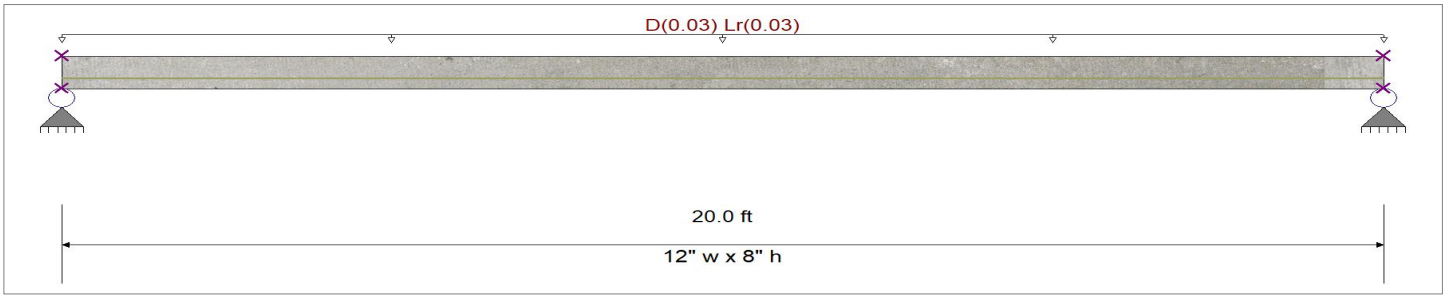
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 8.0 in
Span #1 Reinforcing....
2-#5 at 2.50 in from Bottom, from 0.0 to 20.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.030, Lr = 0.030 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.698**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	10.0	k-ft
Mn * Phi : Allowable	14.327	k-ft
Location of maximum on span	10.018	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.052 in	Ratio =	4587	>=360.0	Lr Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	Lr Only
Max Downward Total Deflection	0.542 in	Ratio =	442	>=240.0	Span: 1 : +D+Lr
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+Lr

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	1.567	1.567
Overall MINimum	0.300	0.300
D Only	1.267	1.267
+D+Lr	1.567	1.567
+D+0.750Lr	1.492	1.492
+0.60D	0.760	0.760
Lr Only	0.300	0.300

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Marble Hall Elv. +19'-4")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60Lr	1	0.00	5.50	2.00	2.00	0.00	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60Lr	1	0.22	5.50	1.96	1.96	0.43	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60Lr	1	0.44	5.50	1.91	1.91	0.86	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60Lr	1	0.66	5.50	1.87	1.87	1.27	0.68	7.44	Vu < PhiVc/2	ıt Reqd 9.6	7.4	0.0	0.0
+1.20D+1.60Lr	1	0.87	5.50	1.83	1.83	1.67	0.50	7.23	Vu < PhiVc/2	ıt Reqd 9.6	7.2	0.0	0.0
+1.20D+1.60Lr	1	1.09	5.50	1.78	1.78	2.07	0.40	7.11	Vu < PhiVc/2	ıt Reqd 9.6	7.1	0.0	0.0
+1.20D+1.60Lr	1	1.31	5.50	1.74	1.74	2.45	0.32	7.03	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60Lr	1	1.53	5.50	1.69	1.69	2.83	0.27	6.97	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60Lr	1	1.75	5.50	1.65	1.65	3.19	0.24	6.93	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	1.97	5.50	1.61	1.61	3.55	0.21	6.89	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	2.19	5.50	1.56	1.56	3.89	0.18	6.86	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	2.40	5.50	1.52	1.52	4.23	0.16	6.84	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	2.62	5.50	1.48	1.48	4.56	0.15	6.82	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	2.84	5.50	1.43	1.43	4.88	0.13	6.81	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	3.06	5.50	1.39	1.39	5.18	0.12	6.79	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	3.28	5.50	1.34	1.34	5.48	0.11	6.78	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	3.50	5.50	1.30	1.30	5.77	0.10	6.77	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	3.72	5.50	1.26	1.26	6.05	0.10	6.76	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	3.93	5.50	1.21	1.21	6.32	0.09	6.75	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	4.15	5.50	1.17	1.17	6.58	0.08	6.75	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	4.37	5.50	1.13	1.13	6.83	0.08	6.74	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	4.59	5.50	1.08	1.08	7.07	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	4.81	5.50	1.04	1.04	7.31	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	5.03	5.50	0.99	0.99	7.53	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	5.25	5.50	0.95	0.95	7.74	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	5.46	5.50	0.91	0.91	7.94	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	5.68	5.50	0.86	0.86	8.14	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	5.90	5.50	0.82	0.82	8.32	0.05	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	6.12	5.50	0.78	0.78	8.49	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	6.34	5.50	0.73	0.73	8.66	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	6.56	5.50	0.69	0.69	8.81	0.04	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	6.78	5.50	0.64	0.64	8.96	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	6.99	5.50	0.60	0.60	9.10	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	7.21	5.50	0.56	0.56	9.22	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	7.43	5.50	0.51	0.51	9.34	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	7.65	5.50	0.47	0.47	9.45	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	7.87	5.50	0.43	0.43	9.55	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	8.09	5.50	0.38	0.38	9.63	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	8.31	5.50	0.34	0.34	9.71	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	8.52	5.50	0.30	0.30	9.78	0.01	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	8.74	5.50	0.25	0.25	9.84	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	8.96	5.50	0.21	0.21	9.89	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	9.18	5.50	0.16	0.16	9.93	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	9.40	5.50	0.12	0.12	9.96	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	9.62	5.50	0.08	0.08	9.99	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	9.84	5.50	0.03	0.03	10.00	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	10.05	5.50	-0.01	0.01	10.00	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	10.27	5.50	-0.05	0.05	9.99	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	10.49	5.50	-0.10	0.10	9.98	0.00	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	10.71	5.50	-0.14	0.14	9.95	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	10.93	5.50	-0.19	0.19	9.91	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	11.15	5.50	-0.23	0.23	9.87	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	11.37	5.50	-0.27	0.27	9.81	0.01	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	11.58	5.50	-0.32	0.32	9.75	0.01	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	11.80	5.50	-0.36	0.36	9.67	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	12.02	5.50	-0.40	0.40	9.59	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	12.24	5.50	-0.45	0.45	9.50	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Marble Hall Elv. +19'-4")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60Lr	1	12.46	5.50	-0.49	0.49	9.40	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	12.68	5.50	-0.54	0.54	9.28	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	12.90	5.50	-0.58	0.58	9.16	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	13.11	5.50	-0.62	0.62	9.03	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	13.33	5.50	-0.67	0.67	8.89	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	13.55	5.50	-0.71	0.71	8.74	0.04	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	13.77	5.50	-0.75	0.75	8.58	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	13.99	5.50	-0.80	0.80	8.41	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	14.21	5.50	-0.84	0.84	8.23	0.05	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	14.43	5.50	-0.89	0.89	8.04	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	14.64	5.50	-0.93	0.93	7.84	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	14.86	5.50	-0.97	0.97	7.63	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	15.08	5.50	-1.02	1.02	7.42	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	15.30	5.50	-1.06	1.06	7.19	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	15.52	5.50	-1.10	1.10	6.95	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	15.74	5.50	-1.15	1.15	6.71	0.08	6.74	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	15.96	5.50	-1.19	1.19	6.45	0.08	6.75	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60Lr	1	16.17	5.50	-1.23	1.23	6.19	0.09	6.76	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	16.39	5.50	-1.28	1.28	5.91	0.10	6.77	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	16.61	5.50	-1.32	1.32	5.63	0.11	6.78	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	16.83	5.50	-1.37	1.37	5.33	0.12	6.79	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	17.05	5.50	-1.41	1.41	5.03	0.13	6.80	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	17.27	5.50	-1.45	1.45	4.72	0.14	6.81	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	17.49	5.50	-1.50	1.50	4.40	0.16	6.83	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60Lr	1	17.70	5.50	-1.54	1.54	4.06	0.17	6.85	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	17.92	5.50	-1.58	1.58	3.72	0.20	6.88	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	18.14	5.50	-1.63	1.63	3.37	0.22	6.91	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	18.36	5.50	-1.67	1.67	3.01	0.25	6.95	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60Lr	1	18.58	5.50	-1.72	1.72	2.64	0.30	7.00	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60Lr	1	18.80	5.50	-1.76	1.76	2.26	0.36	7.07	Vu < PhiVc/2	ıt Reqd 9.6	7.1	0.0	0.0
+1.20D+1.60Lr	1	19.02	5.50	-1.80	1.80	1.87	0.44	7.16	Vu < PhiVc/2	ıt Reqd 9.6	7.2	0.0	0.0
+1.20D+1.60Lr	1	19.23	5.50	-1.85	1.85	1.47	0.58	7.32	Vu < PhiVc/2	ıt Reqd 9.6	7.3	0.0	0.0
+1.20D+1.60Lr	1	19.45	5.50	-1.89	1.89	1.06	0.82	7.60	Vu < PhiVc/2	ıt Reqd 9.6	7.6	0.0	0.0
+1.20D+1.60Lr	1	19.67	5.50	-1.93	1.93	0.64	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60Lr	1	19.89	5.50	-1.98	1.98	0.22	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	20.000	10.00	14.33	0.70
+1.40D					
Span # 1	1	20.000	8.87	14.33	0.62
+1.20D+0.50Lr					
Span # 1	1	20.000	8.35	14.33	0.58
+1.20D					
Span # 1	1	20.000	7.60	14.33	0.53
+1.20D+1.60Lr					
Span # 1	1	20.000	10.00	14.33	0.70
+0.90D					
Span # 1	1	20.000	5.70	14.33	0.40

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	.ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+Lr	1	0.5422	10.000		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

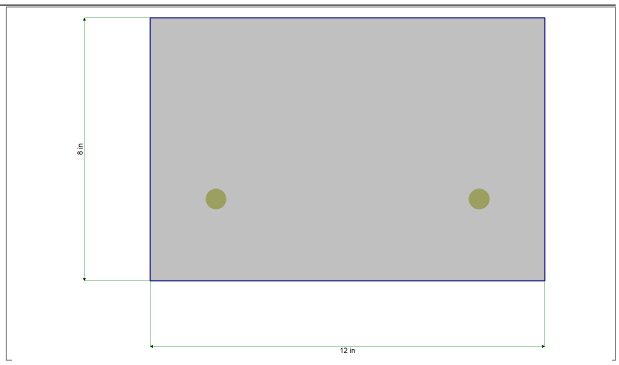
DESCRIPTION: 8 in THK (Marble Hall +18'-0")**

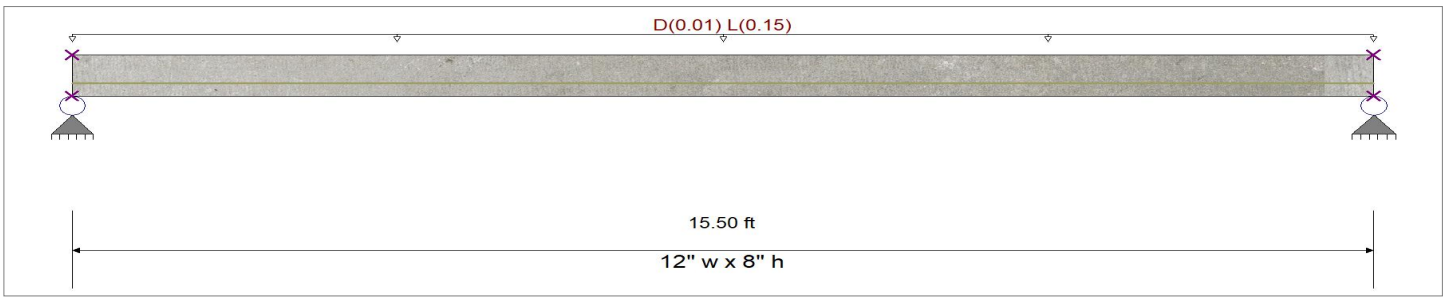
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 8.0 in
Span #1 Reinforcing....
2-#5 at 2.50 in from Bottom, from 0.0 to 15.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.010, L = 0.150 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.771** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	11.051	k-ft
Mn * Phi : Allowable	14.327	k-ft
Location of maximum on span	7.736	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.094 in	Ratio =	1970	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.308 in	Ratio =	602	>=240.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	1.989	1.989
Overall MINimum	0.496	0.496
D Only	0.827	0.827
+D+L	1.989	1.989
+D+0.750L	1.699	1.699
+0.60D	0.496	0.496
L Only	1.162	1.162

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Marble Hall +18'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	5.50	2.85	2.85	0.00	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60L	1	0.17	5.50	2.79	2.79	0.48	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60L	1	0.34	5.50	2.73	2.73	0.95	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60L	1	0.51	5.50	2.66	2.66	1.40	0.87	7.66	Vu < PhiVc/2	ıt Reqd 9.6	7.7	0.0	0.0
+1.20D+1.60L	1	0.68	5.50	2.60	2.60	1.85	0.65	7.40	Vu < PhiVc/2	ıt Reqd 9.6	7.4	0.0	0.0
+1.20D+1.60L	1	0.85	5.50	2.54	2.54	2.28	0.51	7.24	Vu < PhiVc/2	ıt Reqd 9.6	7.2	0.0	0.0
+1.20D+1.60L	1	1.02	5.50	2.48	2.48	2.71	0.42	7.14	Vu < PhiVc/2	ıt Reqd 9.6	7.1	0.0	0.0
+1.20D+1.60L	1	1.19	5.50	2.42	2.42	3.12	0.35	7.06	Vu < PhiVc/2	ıt Reqd 9.6	7.1	0.0	0.0
+1.20D+1.60L	1	1.36	5.50	2.35	2.35	3.53	0.31	7.01	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60L	1	1.52	5.50	2.29	2.29	3.92	0.27	6.96	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60L	1	1.69	5.50	2.23	2.23	4.30	0.24	6.93	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	1.86	5.50	2.17	2.17	4.68	0.21	6.90	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	2.03	5.50	2.10	2.10	5.04	0.19	6.87	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	2.20	5.50	2.04	2.04	5.39	0.17	6.85	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	2.37	5.50	1.98	1.98	5.73	0.16	6.83	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	2.54	5.50	1.92	1.92	6.06	0.15	6.82	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	2.71	5.50	1.85	1.85	6.38	0.13	6.81	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	2.88	5.50	1.79	1.79	6.69	0.12	6.79	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	3.05	5.50	1.73	1.73	6.99	0.11	6.78	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	3.22	5.50	1.67	1.67	7.27	0.11	6.77	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	3.39	5.50	1.61	1.61	7.55	0.10	6.76	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	3.56	5.50	1.54	1.54	7.82	0.09	6.76	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	3.73	5.50	1.48	1.48	8.07	0.08	6.75	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	3.90	5.50	1.42	1.42	8.32	0.08	6.74	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.07	5.50	1.36	1.36	8.55	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.23	5.50	1.29	1.29	8.78	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.40	5.50	1.23	1.23	8.99	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.57	5.50	1.17	1.17	9.20	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.74	5.50	1.11	1.11	9.39	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	4.91	5.50	1.04	1.04	9.57	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.08	5.50	0.98	0.98	9.74	0.05	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.25	5.50	0.92	0.92	9.90	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.42	5.50	0.86	0.86	10.05	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.59	5.50	0.79	0.79	10.19	0.04	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.76	5.50	0.73	0.73	10.32	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	5.93	5.50	0.67	0.67	10.44	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.10	5.50	0.61	0.61	10.55	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.27	5.50	0.55	0.55	10.65	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.44	5.50	0.48	0.48	10.73	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.61	5.50	0.42	0.42	10.81	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.78	5.50	0.36	0.36	10.88	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	6.95	5.50	0.30	0.30	10.93	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.11	5.50	0.23	0.23	10.98	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.28	5.50	0.17	0.17	11.01	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.45	5.50	0.11	0.11	11.04	0.00	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.62	5.50	0.05	0.05	11.05	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.79	5.50	-0.02	0.02	11.05	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	7.96	5.50	-0.08	0.08	11.04	0.00	6.65	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.13	5.50	-0.14	0.14	11.02	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.30	5.50	-0.20	0.20	11.00	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.47	5.50	-0.26	0.26	10.96	0.01	6.66	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.64	5.50	-0.33	0.33	10.91	0.01	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.81	5.50	-0.39	0.39	10.85	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	8.98	5.50	-0.45	0.45	10.77	0.02	6.67	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	9.15	5.50	-0.51	0.51	10.69	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	9.32	5.50	-0.58	0.58	10.60	0.02	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	9.49	5.50	-0.64	0.64	10.50	0.03	6.68	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Marble Hall +18'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	9.66	5.50	-0.70	0.70	10.38	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	9.83	5.50	-0.76	0.76	10.26	0.03	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	9.99	5.50	-0.83	0.83	10.12	0.04	6.69	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	10.16	5.50	-0.89	0.89	9.98	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	10.33	5.50	-0.95	0.95	9.82	0.04	6.70	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	10.50	5.50	-1.01	1.01	9.66	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	10.67	5.50	-1.08	1.08	9.48	0.05	6.71	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	10.84	5.50	-1.14	1.14	9.29	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.01	5.50	-1.20	1.20	9.09	0.06	6.72	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.18	5.50	-1.26	1.26	8.89	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.35	5.50	-1.32	1.32	8.67	0.07	6.73	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.52	5.50	-1.39	1.39	8.44	0.08	6.74	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.69	5.50	-1.45	1.45	8.20	0.08	6.74	Vu < PhiVc/2	ıt Reqd 9.6	6.7	0.0	0.0
+1.20D+1.60L	1	11.86	5.50	-1.51	1.51	7.95	0.09	6.75	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.03	5.50	-1.57	1.57	7.69	0.09	6.76	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.20	5.50	-1.64	1.64	7.41	0.10	6.77	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.37	5.50	-1.70	1.70	7.13	0.11	6.78	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.54	5.50	-1.76	1.76	6.84	0.12	6.79	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.70	5.50	-1.82	1.82	6.53	0.13	6.80	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	12.87	5.50	-1.89	1.89	6.22	0.14	6.81	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	13.04	5.50	-1.95	1.95	5.90	0.15	6.83	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	13.21	5.50	-2.01	2.01	5.56	0.17	6.84	Vu < PhiVc/2	ıt Reqd 9.6	6.8	0.0	0.0
+1.20D+1.60L	1	13.38	5.50	-2.07	2.07	5.21	0.18	6.86	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	13.55	5.50	-2.14	2.14	4.86	0.20	6.88	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	13.72	5.50	-2.20	2.20	4.49	0.22	6.91	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	13.89	5.50	-2.26	2.26	4.11	0.25	6.94	Vu < PhiVc/2	ıt Reqd 9.6	6.9	0.0	0.0
+1.20D+1.60L	1	14.06	5.50	-2.32	2.32	3.73	0.29	6.98	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60L	1	14.23	5.50	-2.38	2.38	3.33	0.33	7.03	Vu < PhiVc/2	ıt Reqd 9.6	7.0	0.0	0.0
+1.20D+1.60L	1	14.40	5.50	-2.45	2.45	2.92	0.38	7.10	Vu < PhiVc/2	ıt Reqd 9.6	7.1	0.0	0.0
+1.20D+1.60L	1	14.57	5.50	-2.51	2.51	2.50	0.46	7.19	Vu < PhiVc/2	ıt Reqd 9.6	7.2	0.0	0.0
+1.20D+1.60L	1	14.74	5.50	-2.57	2.57	2.07	0.57	7.31	Vu < PhiVc/2	ıt Reqd 9.6	7.3	0.0	0.0
+1.20D+1.60L	1	14.91	5.50	-2.63	2.63	1.63	0.74	7.51	Vu < PhiVc/2	ıt Reqd 9.6	7.5	0.0	0.0
+1.20D+1.60L	1	15.08	5.50	-2.70	2.70	1.17	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60L	1	15.25	5.50	-2.76	2.76	0.71	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0
+1.20D+1.60L	1	15.42	5.50	-2.82	2.82	0.24	1.00	7.81	Vu < PhiVc/2	ıt Reqd 9.6	7.8	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.500	11.05	14.33	0.77
+1.40D					
Span # 1	1	15.500	4.48	14.33	0.31
+1.20D+1.60L					
Span # 1	1	15.500	11.05	14.33	0.77
+1.20D+L					
Span # 1	1	15.500	8.35	14.33	0.58
+1.20D					
Span # 1	1	15.500	3.84	14.33	0.27
+0.90D					
Span # 1	1	15.500	2.88	14.33	0.20

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	.ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+L	1	0.3085	7.750		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

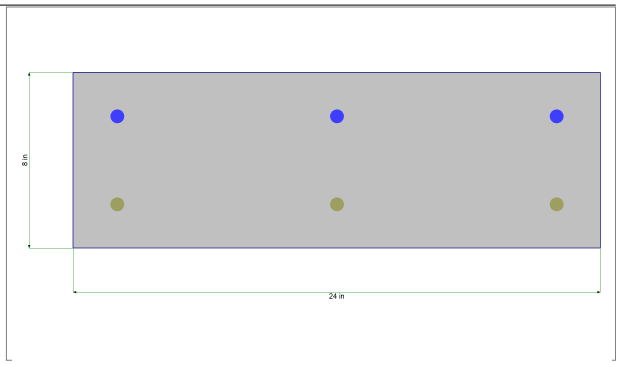
DESCRIPTION: 8 in THK (Elv. +7'-0")** P.O.

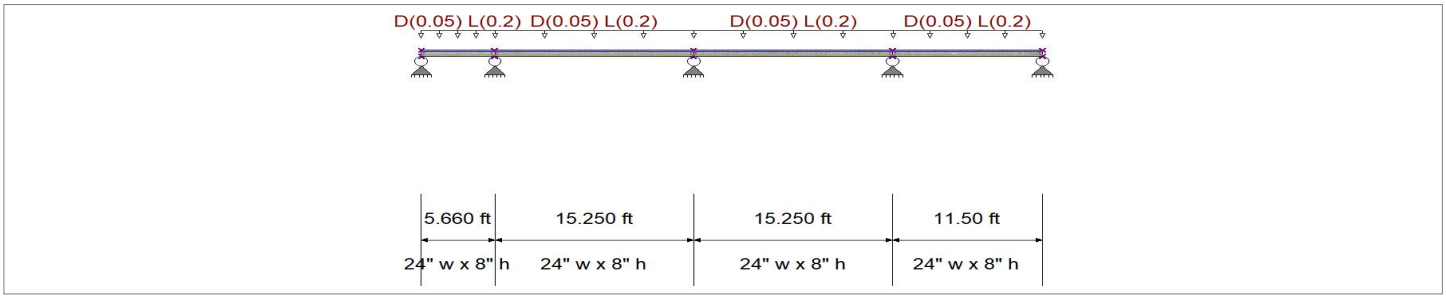
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β_1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		60.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	2	





Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 8.0 in

Span #1 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 5.660 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 5.660 ft in this sp

Span #2 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 15.250 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 15.250 ft in this s

Span #3 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 15.250 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 15.250 ft in this s

Span #4 Reinforcing....
3-#5 at 2.0 in from Top, from 0.0 to 11.50 ft in this span
3-#5 at 2.0 in from Bottom, from 0.0 to 11.50 ft in this sp

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 2.0 ft

Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 2.0 ft

Load for Span Number 3
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 2.0 ft

Load for Span Number 4
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 2.0 ft

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +7'-0")** P.O.

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.454** : 1

Section used for this span	**Typical Section**	
Mu : Applied	-12.845	k-ft
Mn * Phi : Allowable	28.293	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 3	

Maximum Deflection

Max Downward Transient Deflection	0.016 in	Ratio =	11775	>=360.0	L Only
Max Upward Transient Deflection	-0.001 in	Ratio =	46901	>=360.0	L Only
Max Downward Total Deflection	0.034 in	Ratio =	5312	>=240.0	Span: 4 : +D+L
Max Upward Total Deflection	-0.003 in	Ratio =	21158	>=240.0	Span: 4 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5
Overall MAXimum	0.109	5.596	7.041	6.516	1.867
Overall MINimum	0.036	1.843	2.319	2.146	0.615
D Only	0.060	3.072	3.865	3.577	1.025
+D+L	0.109	5.596	7.041	6.516	1.867
+D+0.750L	0.096	4.965	6.247	5.781	1.656
+0.60D	0.036	1.843	2.319	2.146	0.615
L Only	0.049	2.525	3.177	2.940	0.842

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	6.00	0.15	0.15	0.00	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	1	0.36	6.00	-0.07	0.07	0.01	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	1	0.71	6.00	-0.29	0.29	0.05	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	1	1.07	6.00	-0.51	0.51	0.19	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	1	1.43	6.00	-0.73	0.73	0.41	0.88	16.05	Vu < PhiVc/2	ıt Reqd 9.6	16.0	0.0	0.0
+1.20D+1.60L	1	1.79	6.00	-0.94	0.94	0.71	0.67	15.67	Vu < PhiVc/2	ıt Reqd 9.6	15.7	0.0	0.0
+1.20D+1.60L	1	2.14	6.00	-1.16	1.16	1.09	0.54	15.44	Vu < PhiVc/2	ıt Reqd 9.6	15.4	0.0	0.0
+1.20D+1.60L	1	2.50	6.00	-1.38	1.38	1.54	0.45	15.29	Vu < PhiVc/2	ıt Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	1	2.86	6.00	-1.60	1.60	2.07	0.39	15.18	Vu < PhiVc/2	ıt Reqd 9.6	15.2	0.0	0.0
+1.20D+1.60L	1	3.22	6.00	-1.82	1.82	2.69	0.34	15.10	Vu < PhiVc/2	ıt Reqd 9.6	15.1	0.0	0.0
+1.20D+1.60L	1	3.57	6.00	-2.04	2.04	3.37	0.30	15.04	Vu < PhiVc/2	ıt Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	1	3.93	6.00	-2.26	2.26	4.14	0.27	14.98	Vu < PhiVc/2	ıt Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	1	4.29	6.00	-2.48	2.48	4.99	0.25	14.94	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	1	4.65	6.00	-2.69	2.69	5.91	0.23	14.91	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	1	5.00	6.00	-2.91	2.91	6.91	0.21	14.88	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	1	5.36	6.00	-3.13	3.13	7.99	0.20	14.85	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	2	5.82	6.00	4.31	4.31	8.25	0.26	14.97	Vu < PhiVc/2	ıt Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	2	6.78	6.00	3.72	3.72	4.38	0.42	15.25	Vu < PhiVc/2	ıt Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	2	7.75	6.00	3.13	3.13	1.08	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	2	8.71	6.00	2.54	2.54	1.65	0.77	15.85	Vu < PhiVc/2	ıt Reqd 9.6	15.9	0.0	0.0
+1.20D+1.60L	2	9.67	6.00	1.96	1.96	3.82	0.26	14.96	Vu < PhiVc/2	ıt Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	2	10.64	6.00	1.37	1.37	5.42	0.13	14.73	Vu < PhiVc/2	ıt Reqd 9.6	14.7	0.0	0.0
+1.20D+1.60L	2	11.60	6.00	0.78	0.78	6.45	0.06	14.61	Vu < PhiVc/2	ıt Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	2	12.56	6.00	0.19	0.19	6.92	0.01	14.53	Vu < PhiVc/2	ıt Reqd 9.6	14.5	0.0	0.0
+1.20D+1.60L	2	13.53	6.00	-0.40	0.40	6.81	0.03	14.56	Vu < PhiVc/2	ıt Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	2	14.49	6.00	-0.99	0.99	6.14	0.08	14.65	Vu < PhiVc/2	ıt Reqd 9.6	14.7	0.0	0.0
+1.20D+1.60L	2	15.45	6.00	-1.58	1.58	4.90	0.16	14.79	Vu < PhiVc/2	ıt Reqd 9.6	14.8	0.0	0.0
+1.20D+1.60L	2	16.42	6.00	-2.17	2.17	3.09	0.35	15.12	Vu < PhiVc/2	ıt Reqd 9.6	15.1	0.0	0.0
+1.20D+1.60L	2	17.38	6.00	-2.76	2.76	0.72	1.00	16.25	Vu < PhiVc/2	ıt Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	2	18.34	6.00	-3.35	3.35	2.22	0.75	15.82	Vu < PhiVc/2	ıt Reqd 9.6	15.8	0.0	0.0
+1.20D+1.60L	2	19.30	6.00	-3.94	3.94	5.73	0.34	15.11	Vu < PhiVc/2	ıt Reqd 9.6	15.1	0.0	0.0
+1.20D+1.60L	2	20.27	6.00	-4.53	4.53	9.81	0.23	14.91	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	3	21.23	6.00	4.60	4.60	11.34	0.20	14.86	Vu < PhiVc/2	ıt Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	3	22.19	6.00	4.01	4.01	7.19	0.28	15.00	Vu < PhiVc/2	ıt Reqd 9.6	15.0	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +7'-0")** P.O.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	3	23.16	6.00	3.42	3.42	3.61	0.47	15.34	Vu < PhiVc/2	ot Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	3	24.12	6.00	2.83	2.83	0.59	1.00	16.25	Vu < PhiVc/2	ot Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	3	25.08	6.00	2.24	2.24	1.85	0.61	15.57	Vu < PhiVc/2	ot Reqd 9.6	15.6	0.0	0.0
+1.20D+1.60L	3	26.05	6.00	1.65	1.65	3.73	0.22	14.90	Vu < PhiVc/2	ot Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	3	27.01	6.00	1.07	1.07	5.04	0.11	14.69	Vu < PhiVc/2	ot Reqd 9.6	14.7	0.0	0.0
+1.20D+1.60L	3	27.97	6.00	0.48	0.48	5.78	0.04	14.58	Vu < PhiVc/2	ot Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	3	28.94	6.00	-0.11	0.11	5.96	0.01	14.53	Vu < PhiVc/2	ot Reqd 9.6	14.5	0.0	0.0
+1.20D+1.60L	3	29.90	6.00	-0.70	0.70	5.56	0.06	14.62	Vu < PhiVc/2	ot Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	3	30.86	6.00	-1.29	1.29	4.60	0.14	14.75	Vu < PhiVc/2	ot Reqd 9.6	14.8	0.0	0.0
+1.20D+1.60L	3	31.83	6.00	-1.88	1.88	3.07	0.31	15.04	Vu < PhiVc/2	ot Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	3	32.79	6.00	-2.47	2.47	0.98	1.00	16.25	Vu < PhiVc/2	ot Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	3	33.75	6.00	-3.06	3.06	1.69	0.91	16.09	Vu < PhiVc/2	ot Reqd 9.6	16.1	0.0	0.0
+1.20D+1.60L	3	34.72	6.00	-3.65	3.65	4.92	0.37	15.16	Vu < PhiVc/2	ot Reqd 9.6	15.2	0.0	0.0
+1.20D+1.60L	3	35.68	6.00	-4.24	4.24	8.72	0.24	14.93	Vu < PhiVc/2	ot Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	4	36.52	6.00	4.24	4.24	9.25	0.23	14.91	Vu < PhiVc/2	ot Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	4	37.25	6.00	3.79	3.79	6.33	0.30	15.03	Vu < PhiVc/2	ot Reqd 9.6	15.0	0.0	0.0
+1.20D+1.60L	4	37.98	6.00	3.35	3.35	3.74	0.45	15.29	Vu < PhiVc/2	ot Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	4	38.70	6.00	2.91	2.91	1.47	0.99	16.23	Vu < PhiVc/2	ot Reqd 9.6	16.2	0.0	0.0
+1.20D+1.60L	4	39.43	6.00	2.46	2.46	0.48	1.00	16.25	Vu < PhiVc/2	ot Reqd 9.6	16.3	0.0	0.0
+1.20D+1.60L	4	40.15	6.00	2.02	2.02	2.11	0.48	15.34	Vu < PhiVc/2	ot Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	4	40.88	6.00	1.57	1.57	3.41	0.23	14.91	Vu < PhiVc/2	ot Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	4	41.61	6.00	1.13	1.13	4.39	0.13	14.73	Vu < PhiVc/2	ot Reqd 9.6	14.7	0.0	0.0
+1.20D+1.60L	4	42.33	6.00	0.68	0.68	5.05	0.07	14.63	Vu < PhiVc/2	ot Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	4	43.06	6.00	0.24	0.24	5.38	0.02	14.55	Vu < PhiVc/2	ot Reqd 9.6	14.5	0.0	0.0
+1.20D+1.60L	4	43.79	6.00	-0.21	0.21	5.39	0.02	14.54	Vu < PhiVc/2	ot Reqd 9.6	14.5	0.0	0.0
+1.20D+1.60L	4	44.51	6.00	-0.65	0.65	5.08	0.06	14.62	Vu < PhiVc/2	ot Reqd 9.6	14.6	0.0	0.0
+1.20D+1.60L	4	45.24	6.00	-1.10	1.10	4.45	0.12	14.72	Vu < PhiVc/2	ot Reqd 9.6	14.7	0.0	0.0
+1.20D+1.60L	4	45.97	6.00	-1.54	1.54	3.49	0.22	14.89	Vu < PhiVc/2	ot Reqd 9.6	14.9	0.0	0.0
+1.20D+1.60L	4	46.69	6.00	-1.98	1.98	2.21	0.45	15.29	Vu < PhiVc/2	ot Reqd 9.6	15.3	0.0	0.0
+1.20D+1.60L	4	47.42	6.00	-2.43	2.43	0.61	1.00	16.25	Vu < PhiVc/2	ot Reqd 9.6	16.3	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	5.660	-8.76	28.29	0.31
Span # 2	2	15.250	-12.06	28.29	0.43
Span # 3	3	15.250	-12.84	28.29	0.45
Span # 4	4	11.500	-10.83	28.29	0.38
+1.40D					
Span # 1	1	5.660	-4.88	28.29	0.17
Span # 2	2	15.250	-6.71	28.29	0.24
Span # 3	3	15.250	-7.15	28.29	0.25
Span # 4	4	11.500	-6.03	28.29	0.21
+1.20D+1.60L					
Span # 1	1	5.660	-8.76	28.29	0.31
Span # 2	2	15.250	-12.06	28.29	0.43
Span # 3	3	15.250	-12.84	28.29	0.45
Span # 4	4	11.500	-10.83	28.29	0.38
+1.20D+L					
Span # 1	1	5.660	-7.04	28.29	0.25
Span # 2	2	15.250	-9.70	28.29	0.34
Span # 3	3	15.250	-10.33	28.29	0.36
Span # 4	4	11.500	-8.71	28.29	0.31
+1.20D					
Span # 1	1	5.660	-4.18	28.29	0.15
Span # 2	2	15.250	-5.76	28.29	0.20
Span # 3	3	15.250	-6.13	28.29	0.22
Span # 4	4	11.500	-5.17	28.29	0.18
+0.90D					
Span # 1	1	5.660	-3.13	28.29	0.11
Span # 2	2	15.250	-4.32	28.29	0.15

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +7'-0")** P.O.

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 3	3	15.250	-4.60	28.29	0.16
Span # 4	4	11.500	-3.88	28.29	0.14

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0019	6.061	+D+L	-0.0032	3.724
+D+L	2	0.0344	7.625		0.0000	3.724
+D+L	3	0.0262	7.625		0.0000	3.724
+D+L	4	0.0158	6.961		0.0000	3.724

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

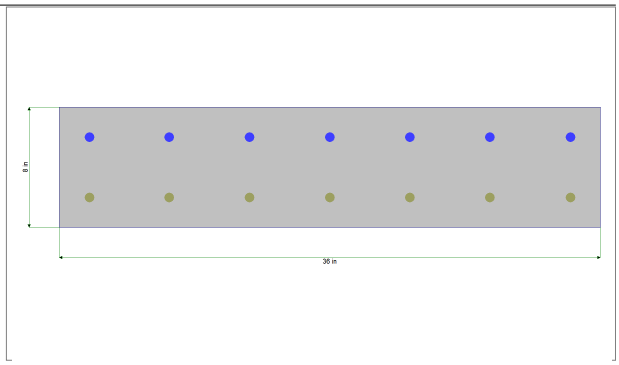
DESCRIPTION: 8 in THK (Elv. +7'-0")**

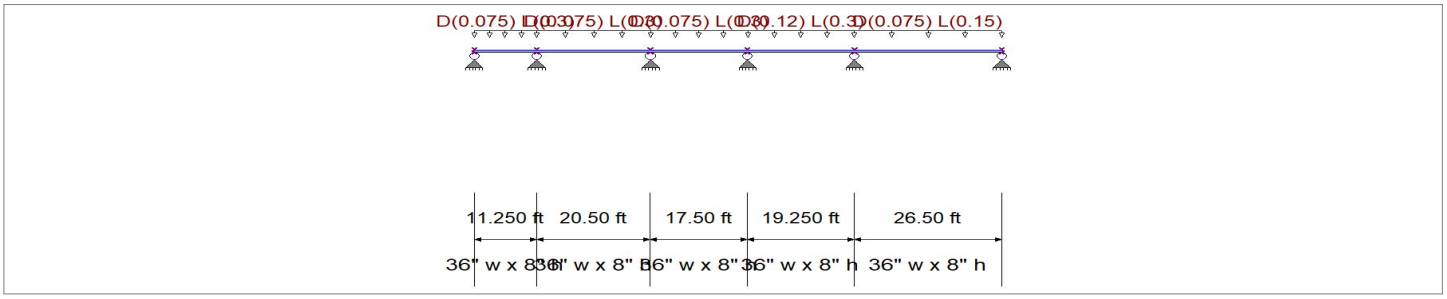
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c$^{1/2}$ * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β_1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		60.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	2	





Cross Section & Reinforcing Details

Rectangular Section, Width = 36.0 in, Height = 8.0 in

Span #1 Reinforcing....
- 4-#5 at 2.0 in from Top, from 0.0 to 11.250 ft in this span
- 4-#5 at 2.0 in from Bottom, from 0.0 to 11.250 ft in this s

Span #2 Reinforcing....
- 4-#5 at 2.0 in from Top, from 0.0 to 20.50 ft in this span
- 4-#5 at 2.0 in from Bottom, from 0.0 to 20.50 ft in this s

Span #3 Reinforcing....
- 4-#5 at 2.0 in from Top, from 0.0 to 17.50 ft in this span
- 4-#5 at 2.0 in from Bottom, from 0.0 to 17.50 ft in this s

Span #4 Reinforcing....
- 7-#5 at 2.0 in from Top, from 0.0 to 19.250 ft in this span
- 7-#5 at 2.0 in from Bottom, from 0.0 to 19.250 ft in this s

Span #5 Reinforcing....
- 7-#5 at 2.0 in from Top, from 0.0 to 26.50 ft in this span
- 7-#5 at 2.0 in from Bottom, from 0.0 to 26.50 ft in this s

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 3.0 ft

Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 3.0 ft

Load for Span Number 3
Uniform Load : D = 0.0250, L = 0.10 ksf, Tributary Width = 3.0 ft

Load for Span Number 4
Uniform Load : D = 0.040, L = 0.10 ksf, Tributary Width = 3.0 ft

Load for Span Number 5
Uniform Load : D = 0.0250, L = 0.050 ksf, Tributary Width = 3.0 ft

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +7'-0")**

DESIGN SUMMARY

Check As Min Limits!

Maximum Bending Stress Ratio = **0.839** : 1

Section used for this span	**Typical Section**	
Mu : Applied	-49.168	k-ft
Mn * Phi : Allowable	58.578	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 5	

Maximum Deflection

Max Downward Transient Deflection	0.124 in	Ratio =	2568	>=360.0	L Only
Max Upward Transient Deflection	-0.004 in	Ratio =	31436	>=360.0	L Only
Max Downward Total Deflection	1.206 in	Ratio =	263	>=240.0	Span: 5 : +D+L
Max Upward Total Deflection	-0.042 in	Ratio =	5545	>=240.0	Span: 5 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5	Support 6
Overall MAXimum	2.030	12.144	13.174	11.185	16.023	5.511
Overall MINimum	0.675	3.979	4.395	3.546	5.567	1.537
D Only	1.124	6.633	7.320	5.946	10.605	3.913
+D+L	2.030	12.144	13.174	11.185	16.023	5.511
+D+0.750L	1.809	10.748	11.732	9.871	14.661	5.114
+0.60D	0.675	3.979	4.395	3.546	6.396	2.334
L Only	0.914	5.485	5.892	5.130	5.567	1.537

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	6.00	2.81	2.81	0.00	1.00	24.09	Vu < PhiVc/2	ıt Reqd 9.6	24.1	0.0	0.0
+1.20D+1.60L	1	1.53	6.00	1.40	1.40	3.23	0.22	22.27	Vu < PhiVc/2	ıt Reqd 9.6	22.3	0.0	0.0
+1.40D	1	3.07	6.00	0.01	0.01	2.42	0.00	21.77	Vu < PhiVc/2	ıt Reqd 9.6	21.8	0.0	0.0
+1.20D+1.60L	1	4.60	6.00	-1.41	1.41	3.22	0.22	22.28	Vu < PhiVc/2	ıt Reqd 9.6	22.3	0.0	0.0
+1.20D+1.60L	1	6.14	6.00	-2.82	2.82	0.03	1.00	24.09	Vu < PhiVc/2	ıt Reqd 9.6	24.1	0.0	0.0
+1.20D+1.60L	1	7.67	6.00	-4.23	4.23	5.44	0.39	22.67	Vu < PhiVc/2	ıt Reqd 9.6	22.7	0.0	0.0
+1.20D+1.60L	1	9.20	6.00	-5.64	5.64	13.01	0.22	22.27	Vu < PhiVc/2	ıt Reqd 9.6	22.3	0.0	0.0
+1.20D+1.60L	1	10.74	6.00	-7.05	7.05	22.74	0.15	22.12	Vu < PhiVc/2	ıt Reqd 9.6	22.1	0.0	0.0
+1.20D+1.60L	2	13.11	6.00	7.51	7.51	10.88	0.34	22.57	Vu < PhiVc/2	ıt Reqd 9.6	22.6	0.0	0.0
+1.20D+1.60L	2	15.91	6.00	4.94	4.94	6.51	0.38	22.65	Vu < PhiVc/2	ıt Reqd 9.6	22.6	0.0	0.0
+1.20D+1.60L	2	18.70	6.00	2.37	2.37	16.74	0.07	21.93	Vu < PhiVc/2	ıt Reqd 9.6	21.9	0.0	0.0
+1.20D+1.60L	2	21.50	6.00	-0.19	0.19	19.79	0.00	21.78	Vu < PhiVc/2	ıt Reqd 9.6	21.8	0.0	0.0
+1.20D+1.60L	2	24.30	6.00	-2.76	2.76	15.66	0.09	21.97	Vu < PhiVc/2	ıt Reqd 9.6	22.0	0.0	0.0
+1.20D+1.60L	2	27.09	6.00	-5.32	5.32	4.36	0.61	23.18	Vu < PhiVc/2	ıt Reqd 9.6	23.2	0.0	0.0
+1.20D+1.60L	2	29.89	6.00	-7.89	7.89	14.11	0.28	22.41	Vu < PhiVc/2	ıt Reqd 9.6	22.4	0.0	0.0
+1.20D+1.60L	3	32.55	6.00	7.89	7.89	23.85	0.17	22.15	Vu < PhiVc/2	ıt Reqd 9.6	22.1	0.0	0.0
+1.20D+1.60L	3	34.93	6.00	5.69	5.69	7.64	0.37	22.63	Vu < PhiVc/2	ıt Reqd 9.6	22.6	0.0	0.0
+1.20D+1.60L	3	37.32	6.00	3.50	3.50	3.33	0.53	22.99	Vu < PhiVc/2	ıt Reqd 9.6	23.0	0.0	0.0
+1.20D+1.60L	3	39.70	6.00	1.31	1.31	9.08	0.07	21.93	Vu < PhiVc/2	ıt Reqd 9.6	21.9	0.0	0.0
+1.20D+1.60L	3	42.09	6.00	-0.88	0.88	9.60	0.05	21.87	Vu < PhiVc/2	ıt Reqd 9.6	21.9	0.0	0.0
+1.20D+1.60L	3	44.48	6.00	-3.07	3.07	4.90	0.31	22.49	Vu < PhiVc/2	ıt Reqd 9.6	22.5	0.0	0.0
+1.20D+1.60L	3	46.86	6.00	-5.26	5.26	5.04	0.52	22.98	Vu < PhiVc/2	ıt Reqd 9.6	23.0	0.0	0.0
+1.20D+1.60L	4	49.25	6.00	7.85	7.85	20.20	0.19	22.56	Vu < PhiVc/2	ıt Reqd 9.6	22.6	0.0	0.0
+1.20D+1.60L	4	51.88	6.00	5.30	5.30	2.94	0.90	25.43	Vu < PhiVc/2	ıt Reqd 9.6	25.4	0.0	0.0
+1.20D+1.60L	4	54.50	6.00	2.75	2.75	7.62	0.18	22.50	Vu < PhiVc/2	ıt Reqd 9.6	22.5	0.0	0.0
+1.40D	4	57.13	6.00	-0.30	0.30	5.48	0.03	21.88	Vu < PhiVc/2	ıt Reqd 9.6	21.9	0.0	0.0
+1.20D+1.60L	4	59.75	6.00	-2.36	2.36	8.65	0.14	22.32	Vu < PhiVc/2	ıt Reqd 9.6	22.3	0.0	0.0
+1.20D+1.60L	4	62.38	6.00	-4.91	4.91	0.88	1.00	25.83	Vu < PhiVc/2	ıt Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	4	65.00	6.00	-7.46	7.46	17.11	0.22	22.65	Vu < PhiVc/2	ıt Reqd 9.6	22.7	0.0	0.0
+1.20D+1.60L	4	67.63	6.00	-10.01	10.01	40.04	0.13	22.27	Vu < PhiVc/2	ıt Reqd 9.6	22.3	0.0	0.0
+1.20D+1.60L	5	70.91	6.00	9.21	9.21	25.02	0.18	22.51	Vu < PhiVc/2	ıt Reqd 9.6	22.5	0.0	0.0
+1.20D+1.60L	5	74.52	6.00	6.76	6.76	3.82	0.89	25.37	Vu < PhiVc/2	ıt Reqd 9.6	25.4	0.0	0.0
+1.20D+1.60L	5	78.14	6.00	4.31	4.31	23.80	0.09	22.13	Vu < PhiVc/2	ıt Reqd 9.6	22.1	0.0	0.0
+1.20D+1.60L	5	81.75	6.00	1.86	1.86	34.93	0.03	21.87	Vu < PhiVc/2	ıt Reqd 9.6	21.9	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 in THK (Elv. +7'-0")**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	5	85.36	6.00	-0.59	0.59	37.21	0.01	21.80	Vu < PhiVc/2	ot Reqd 9.6	21.8	0.0	0.0
+1.20D+1.60L	5	88.98	6.00	-3.04	3.04	30.63	0.05	21.97	Vu < PhiVc/2	ot Reqd 9.6	22.0	0.0	0.0
+1.20D+1.60L	5	92.59	6.00	-5.49	5.49	15.20	0.18	22.50	Vu < PhiVc/2	ot Reqd 9.6	22.5	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	11.250	-24.57	39.04	0.63
Span # 2	2	20.500	-26.47	39.04	0.68
Span # 3	3	17.500	-30.41	39.04	0.78
Span # 4	4	19.250	-44.51	58.58	0.76
Span # 5	5	26.500	-49.17	58.58	0.84
+1.40D					
Span # 1	1	11.250	-13.58	39.04	0.35
Span # 2	2	20.500	-14.81	39.04	0.38
Span # 3	3	17.500	-17.25	39.04	0.44
Span # 4	4	19.250	-32.14	58.58	0.55
Span # 5	5	26.500	-35.08	58.58	0.60
+1.20D+1.60L					
Span # 1	1	11.250	-24.57	39.04	0.63
Span # 2	2	20.500	-26.47	39.04	0.68
Span # 3	3	17.500	-30.41	39.04	0.78
Span # 4	4	19.250	-44.51	58.58	0.76
Span # 5	5	26.500	-49.17	58.58	0.84
+1.20D+L					
Span # 1	1	11.250	-19.72	39.04	0.51
Span # 2	2	20.500	-21.24	39.04	0.54
Span # 3	3	17.500	-24.55	39.04	0.63
Span # 4	4	19.250	-38.15	58.58	0.65
Span # 5	5	26.500	-42.00	58.58	0.72
+1.20D					
Span # 1	1	11.250	-11.64	39.04	0.30
Span # 2	2	20.500	-12.69	39.04	0.33
Span # 3	3	17.500	-14.79	39.04	0.38
Span # 4	4	19.250	-27.55	58.58	0.47
Span # 5	5	26.500	-30.07	58.58	0.51
+0.90D					
Span # 1	1	11.250	-8.73	39.04	0.22
Span # 2	2	20.500	-9.52	39.04	0.24
Span # 3	3	17.500	-11.09	39.04	0.28
Span # 4	4	19.250	-20.66	58.58	0.35
Span # 5	5	26.500	-22.55	58.58	0.38

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0122	12.182	+D+L	-0.0094	8.693
+D+L	2	0.1242	10.250	+D+L	-0.0017	21.295
+D+L	3	0.0316	8.750	L Only	-0.0010	2.386
+D+L	4	0.0949	20.455	+D+L	-0.0417	16.625
+D+L	5	1.2060	15.659		0.0000	16.625

Eastern Engineering Group
3401 NW 82nd Avenue,
Suite 370, Miami, FL 33122
(305) 599-8133
info@easterneg.com
www.easterneg.com

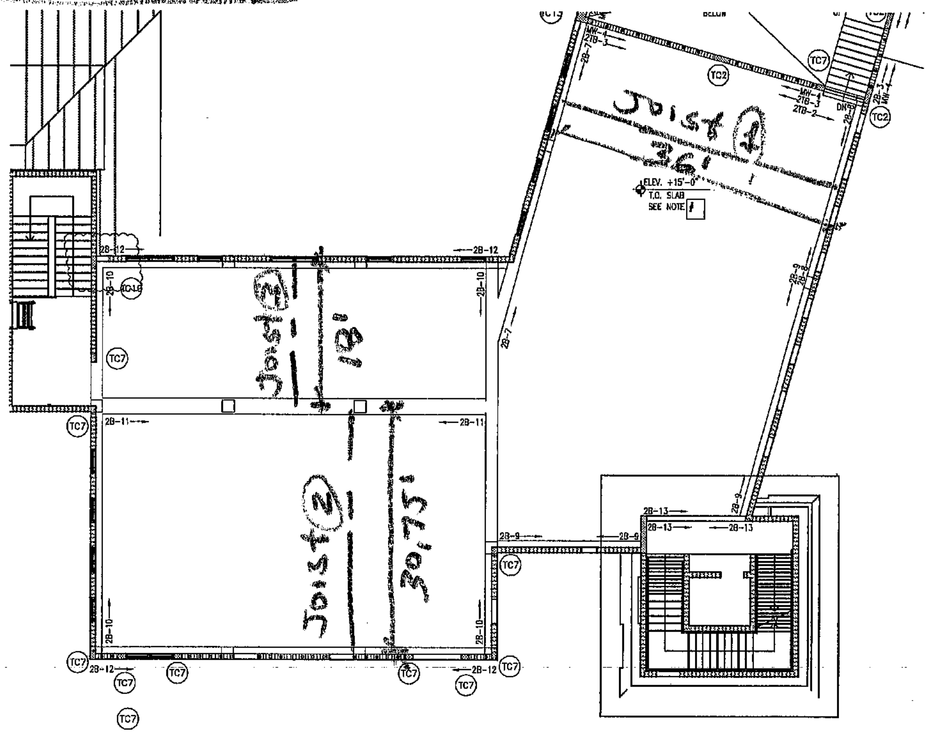
PROJ. NAME: ______________

PROJ No.: ______ DATE: ______

DESIGNED BY: ____ PAGE: ______

REVIEWED BY: ______________

• Precast Joist design at 2nd Floor (level 15'-0):



• Joist 1 (lobbies loads worse scenary)

Loads:

Add = 20 psf ; topping (1" concrete) { $D_L = 150\,psf \times \frac{1"}{12} = 12{,}5$ psf.

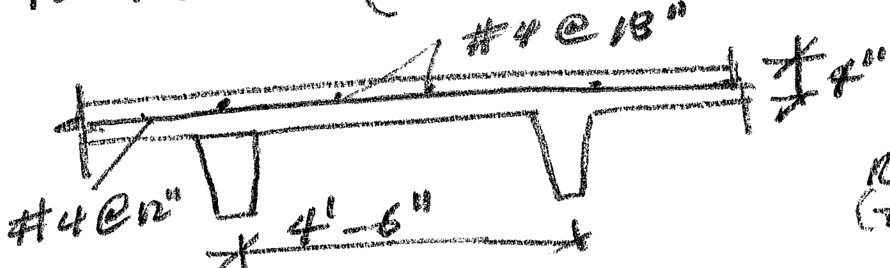
$L_L = 100$ psf.

$L_{max} = 36'$

Using 16" Joist with 3" Composite slab @ 4'-6"

Total load = (12,5 + 20 + 100) psf = 132,5 psf. < 150 psf capacity

ok



$A_{min} = 0{,}0018 \times 4 \times 12 = 0{,}0864\ in^2$

Reinforcement spacing (temperature rebar)

$S_h = 5 \cdot 4 \simeq 20$ t (18")

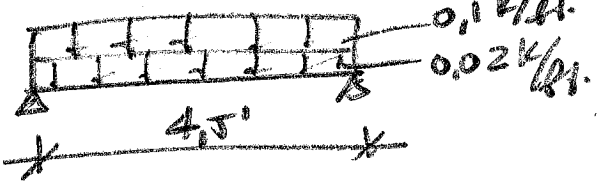
Eastern Engineering Group
3401 NW 82nd Avenue,
Suite 370, Miami, FL 33122
(305) 599-8133
info@easterneg.com
www.easterneg.com

PROJ. NAME: _____
PROJ No.: _____ DATE: _____
DESIGNED BY: _____ PAGE: _____
REVIEWED BY: A.M. OR R.L.

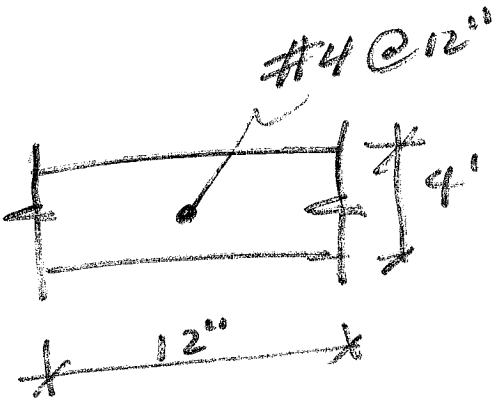
Joist 1 (Cont.)

4" Concrete slab Design

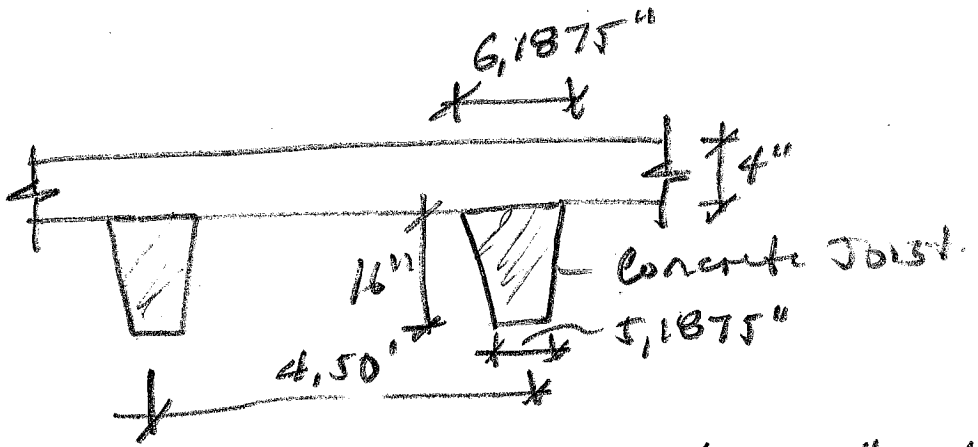
Loads: Add $D_L = 20$ psf
$L_L = 100$ psf.



pinned - pinned.



- System weight for concrete beam design.



$$\text{Conc. Joist (weight per SF)} = \frac{150\,pcf \times \left(\frac{5,6875"}{12} \times \frac{16"}{12}\right)}{4,50'} = 20,97\,psf.$$

$$4" \text{ Conc. slab} = 150\,pcf \times \frac{4"}{12} = 50\,psf$$

System Weight = 71 psf
(Zone Joist 1)

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Lic. # : KW-06012343 — Eastern Engineering Group

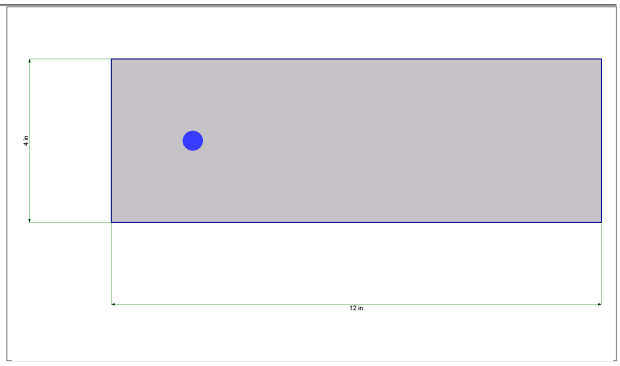
DESCRIPTION: 4 INCHES COMPOSITE CONCRETE SLAB AT 2nd FLOOR

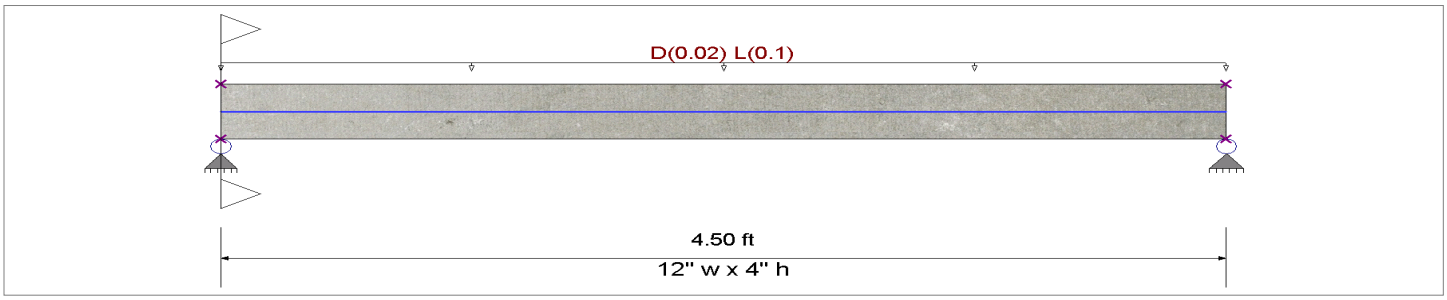
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 4.0 in
Span #1 Reinforcing....
1-#4 at 2.0 in from Bottom, from 0.0 to 4.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020, L = 0.10 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.362** : 1		Maximum Deflection			
Section used for this span	**Typical Section**		Max Downward Transient Deflection	0.004 in	Ratio =	15102 >=360.
Mu : Applied	0.6126 k-ft		Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0
Mn * Phi : Allowable	1.694 k-ft		Max Downward Total Deflection	0.006 in	Ratio =	8971 >=180.
Location of maximum on span	2.246 ft		Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0
Span # where maximum occurs	Span # 1					

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	0.379	0.379
Overall MINimum	0.092	0.092
D Only	0.154	0.154
+D+L	0.379	0.379
+D+0.750L	0.323	0.322
+0.60D	0.092	0.092
L Only	0.225	0.225

Shear Stirrup Requirements

Entire Beam Span Length : Vu < PhiVc/2, Req'd Vs = Not Reqd 9.6.3.1, use #3 stirrups spaced at 0.000 in

Eastern Engineering Group
3401 NW 82nd Avenue,
Suite 370, Miami, FL 33122
(305) 599-8133
info@easterneg.com
www.easterneg.com

PROJ. NAME: _____

PROJ No.: _____ DATE: _____

DESIGNED BY: _____ PAGE: _____

REVIEWED BY: A.M. OR R.L.

- Joist ② (Conference Room)

Loads

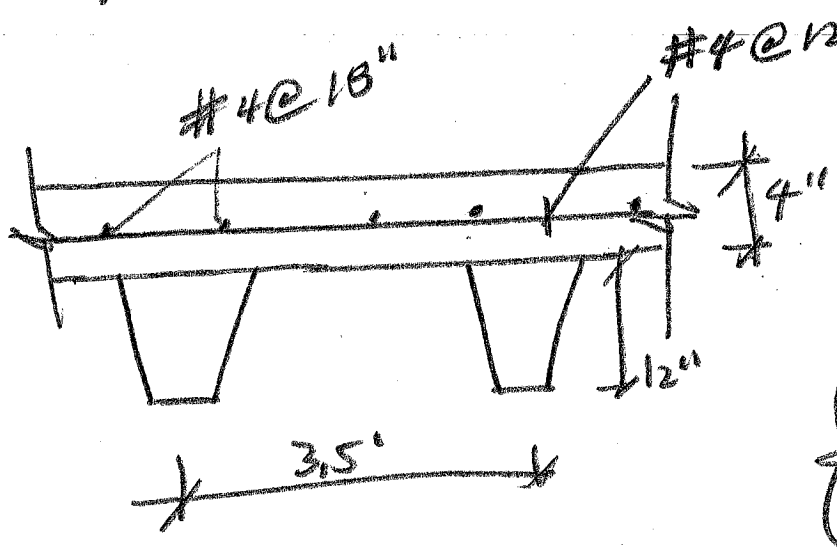
Add = 30psf ; topping (1" concrete) { $D_c = 150 pcf \times \frac{1"}{12} = 12.5 psf$

$L_L = 100 psf$.

$L_{max} \approx 30'$

Using 12" Joist with 3" composite slab @ 3'-6"

total load = 12.5psf + 30psf + 100psf = 142.5psf.



{ System weight:
56psf + 12.5psf = 68.5psf

142.5psf < 170psf
(capacity)

Eastern
Engineering Group
3401 NW 82nd Avenue,
Suite 370, Miami, FL 33122
(305) 599-8133
info@easterneg.com
www.easterneg.com

PROJ. NAME: _____

PROJ No.: _____ DATE: _____

DESIGNED BY: _____ PAGE: _____

REVIEWED BY: A.M. OR R.L.

Joist 3

Loads

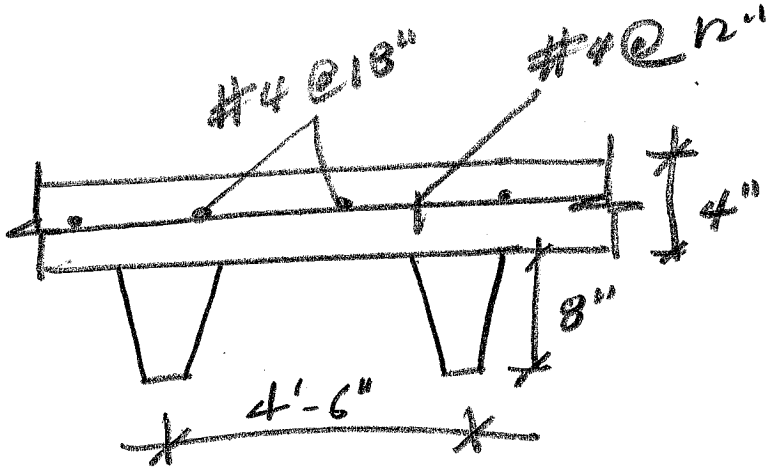
Add = 30 psf : topping (1" Conc.) { $D_L = 150 pcf \times \frac{1"}{12} = 12.5 psf$

$L_L = 100$ psf.

$L_{max} = 18'$

Using 8" Joist with 3" composite slab @ 4'-6"

total load = 142.5 psf (Idem to Joist 2) < 180 psf capacity Ok



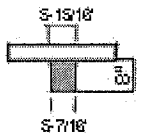
System weight = (47 + 12.5) psf = 59.5 psf

PRESTRESS CONCRETE, INC.
6187 Miami Lakes Dr., Miami Lakes, FL 33014 ☐ Tel. (305) 558-3515 ☐ Fax. (305) 558-8557

LOAD SPAN TABLES

Joist Section Properties

A In^2	I In^4	Sb In^3	St In^3	Yb In	Yt In	Wt. p/f
45.5	242.5			4.06	3.94	45.5



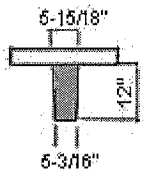
8" JOIST WITH 3" COMPOSITE SLAB (P.S.F.)

DESIGN SPAN (Feet)

Joist Spacing	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	System Weight (R.S.F.)
2'-6"			290	268	246	224	202	180	166	153	140	128	116	106	96	86	75	65	55
3'-6"	245	228	210	193	176	159	142	125	117	109	101	93	85	78	71	64	57	50	50
4'-6"	180	166	158	144	132	121	110	100	93	86	78	70	62	57	52	48			47
5'-6"	145	135	125	115	105	95	85	75	70	65	60	55	50						45
6'-6"	118	109	100	92	84	76	68	60	55	50	45								44

Joist Section Properties

A In^2	I In^4	Sb In^3	St In^3	Yb In	Yt In	Wt. p/f
66.8	799.8			6.14	5.87	66.8



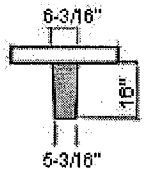
12" JOIST WITH 3" COMPOSITE SLAB (P.S.F.)

DESIGN SPAN (Feet)

Joist Spacing	20	22	24	26	28	30	31	32	33	34	35	36	37	38	39	40	42	44	System Weight (R.S.F.)
2'-6"					268	220	204	188	173	160	146	136	126	116	107	98	84	70	64
3'-6"				234	202	170	158	146	135	126	118	110	103	96	89	82	70	58	56
4'-6"	235	213	192	173	156	139	129	120	111	102	94	88	82	76	70	64	52		51
5'-6"	182	164	148	132	116	100	92	85	78	71	64	60	56	53	50	46			49
6'-6"	150	136	122	107	91	75	70	65	60	55	50	47	45						47

Joist Section Properties

A In^2	I In^4	Sb In^3	St In^3	Yb In	Yt In	Wt. p/f



Joist 1

91.0	1936.3		8.23	7.77	91.0

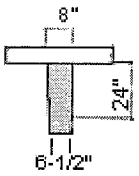
16" JOIST WITH 3" COMPOSITE SLAB (P.S.F.)

DESIGN SPAN (Feet)

Joist Spacing	26	28	30	32	34	36	38	40	42	44	46	48	50	51	52	53	54	55	System Weight (R.S.F.)
3'-61/4"			282	253	222	196	172	150	132	116	100	88	76	71	66	61	56	52	63
4'-61/4"			212	190	170	150	132	114	102	90	80	70	60	58	56	54	52	50	57
5'-61/4"	200	184	168	150	132	115	101	87	77	67	59	54	50						54
6'-61/4"	166	152	138	122	107	93	80	68	60	52									52

Joist Section Properties

A In^2	I In^4	Sb In^3	St In^3	Yb In	Yt In	Wt. p/f
174.0	8322.2			12.42	11.58	174.0



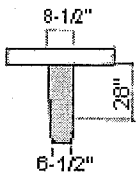
24" JOIST WITH 4" COMPOSITE SLAB (P.S.F.)

DESIGN SPAN (Feet)

Joist Spacing	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	System Weight (R.S.F.)
4'-8"	310	294	278	262	237	212	186	168	150	132	118	105	92	82	72	62	55	50	84
5'-8"	235	222	209	195	182	170	158	145	132	122	110	98	86	77	68	60	52		78
6'-8"	192	179	168	158	148	138	128	116	105	94	86	78	70	64	58	52			73
7'-8"	166	156	146	136	124	113	102	94	86	78	70	63	56	50					70
8'-8"	138	130	122	114	106	98	90	81	73	65	57	50							68

Joist Section Properties

A In^2	I In^4	Sb In^3	St In^3	Yb In	Yt In	Wt. p/f
207.0	13459.0			14.55	13.45	206.0



28" JOIST WITH 4-3/4" COMPOSITE SLAB (P.S.F.)

DESIGN SPAN (Feet)

Joist Spacing	54	56	58	60	62	64	66	68	70	72	74	System Weight (R.S.F.)
4'-8"	230	218	198	178	162	148	137	119	109	97	88	92
5'-8"	215	180	162	146	131	117	105	94	86	76	68	86
6'-8"	165	148	128	119	104	95	84	73	67	60	53	81
7'-8"	135	120	108	93	86	76	68	59	52			78
8'-8"	115	103	90	78	70	62	54					76

WAlva79884@aol.com

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

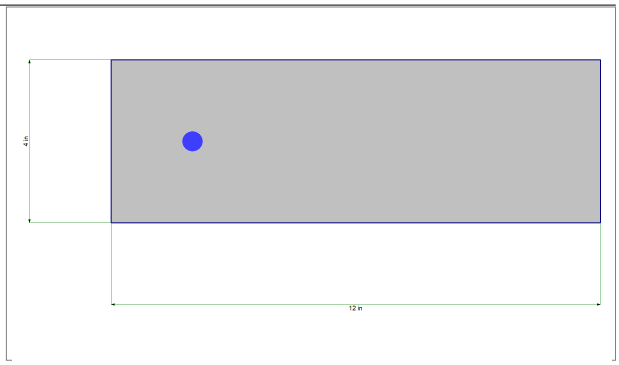
DESCRIPTION: 4 INCHES COMPOSITE CONCRETE SLAB AT 2nd FLOOR

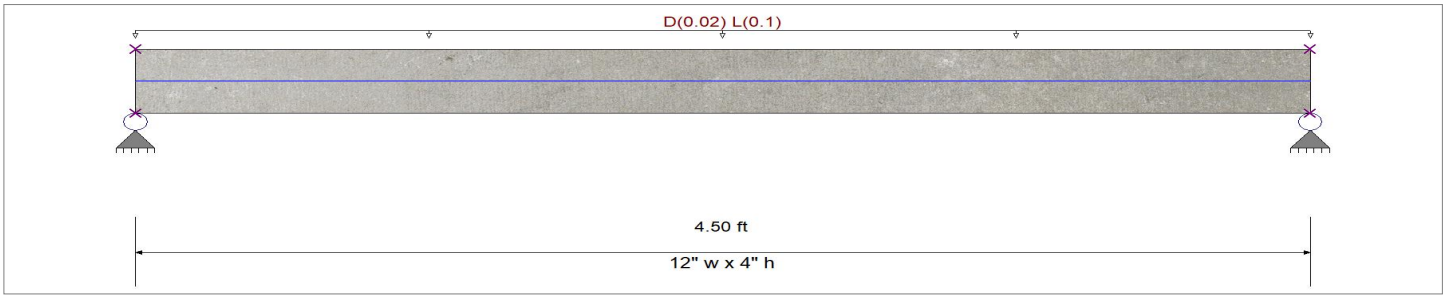
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β 1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		60.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	2	





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 4.0 in
Span #1 Reinforcing....
1-#4 at 2.0 in from Bottom, from 0.0 to 4.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020, L = 0.10 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.362** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	0.6126	k-ft
Mn * Phi : Allowable	1.694	k-ft
Location of maximum on span	2.246	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.004 in	Ratio =	15102	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.006 in	Ratio =	8971	>=180.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	0.379	0.379
Overall MINimum	0.092	0.092
D Only	0.154	0.154
+D+L	0.379	0.379
+D+0.750L	0.323	0.322
+0.60D	0.092	0.092
L Only	0.225	0.225

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 4 INCHES COMPOSITE CONCRETE SLAB AT 2nd FLOOR

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	2.00	0.54	0.54	0.00	1.00	2.79	Vu < PhiVc/2	ɔt Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	0.05	2.00	0.53	0.53	0.03	1.00	2.79	Vu < PhiVc/2	ɔt Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	0.10	2.00	0.52	0.52	0.05	1.00	2.79	Vu < PhiVc/2	ɔt Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	0.15	2.00	0.51	0.51	0.08	1.00	2.79	Vu < PhiVc/2	ɔt Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	0.20	2.00	0.50	0.50	0.10	0.81	2.72	Vu < PhiVc/2	ɔt Reqd 9.6	2.7	0.0	0.0
+1.20D+1.60L	1	0.25	2.00	0.48	0.48	0.13	0.64	2.66	Vu < PhiVc/2	ɔt Reqd 9.6	2.7	0.0	0.0
+1.20D+1.60L	1	0.30	2.00	0.47	0.47	0.15	0.53	2.62	Vu < PhiVc/2	ɔt Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	0.34	2.00	0.46	0.46	0.17	0.44	2.58	Vu < PhiVc/2	ɔt Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	0.39	2.00	0.45	0.45	0.20	0.38	2.56	Vu < PhiVc/2	ɔt Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	0.44	2.00	0.44	0.44	0.22	0.34	2.54	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.49	2.00	0.43	0.43	0.24	0.30	2.53	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.54	2.00	0.41	0.41	0.26	0.27	2.52	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.59	2.00	0.40	0.40	0.28	0.24	2.51	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.64	2.00	0.39	0.39	0.30	0.22	2.50	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.69	2.00	0.38	0.38	0.32	0.20	2.49	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.74	2.00	0.37	0.37	0.34	0.18	2.49	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.79	2.00	0.35	0.35	0.35	0.17	2.48	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.84	2.00	0.34	0.34	0.37	0.15	2.48	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.89	2.00	0.33	0.33	0.39	0.14	2.47	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.93	2.00	0.32	0.32	0.40	0.13	2.47	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	0.98	2.00	0.31	0.31	0.42	0.12	2.46	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.03	2.00	0.29	0.29	0.43	0.11	2.46	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.08	2.00	0.28	0.28	0.45	0.11	2.46	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.13	2.00	0.27	0.27	0.46	0.10	2.46	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.18	2.00	0.26	0.26	0.47	0.09	2.45	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.23	2.00	0.25	0.25	0.49	0.08	2.45	Vu < PhiVc/2	ɔt Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	1.28	2.00	0.24	0.24	0.50	0.08	2.45	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.33	2.00	0.22	0.22	0.51	0.07	2.45	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.38	2.00	0.21	0.21	0.52	0.07	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.43	2.00	0.20	0.20	0.53	0.06	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.48	2.00	0.19	0.19	0.54	0.06	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.52	2.00	0.18	0.18	0.55	0.05	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.57	2.00	0.16	0.16	0.56	0.05	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.62	2.00	0.15	0.15	0.56	0.04	2.44	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.67	2.00	0.14	0.14	0.57	0.04	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.72	2.00	0.13	0.13	0.58	0.04	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.77	2.00	0.12	0.12	0.58	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.82	2.00	0.10	0.10	0.59	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.87	2.00	0.09	0.09	0.59	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.92	2.00	0.08	0.08	0.60	0.02	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	1.97	2.00	0.07	0.07	0.60	0.02	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.02	2.00	0.06	0.06	0.61	0.02	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.07	2.00	0.04	0.04	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.11	2.00	0.03	0.03	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.16	2.00	0.02	0.02	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.21	2.00	0.01	0.01	0.61	0.00	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.26	2.00	-0.00	0.00	0.61	0.00	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.31	2.00	-0.01	0.01	0.61	0.00	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.36	2.00	-0.03	0.03	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.41	2.00	-0.04	0.04	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.46	2.00	-0.05	0.05	0.61	0.01	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.51	2.00	-0.06	0.06	0.60	0.02	2.42	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.56	2.00	-0.07	0.07	0.60	0.02	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.61	2.00	-0.09	0.09	0.60	0.02	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.66	2.00	-0.10	0.10	0.59	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.70	2.00	-0.11	0.11	0.59	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.75	2.00	-0.12	0.12	0.58	0.03	2.43	Vu < PhiVc/2	ɔt Reqd 9.6	2.4	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 4 INCHES COMPOSITE CONCRETE SLAB AT 2nd FLOOR

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	2.80	2.00	-0.13	0.13	0.58	0.04	2.43	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.85	2.00	-0.15	0.15	0.57	0.04	2.43	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.90	2.00	-0.16	0.16	0.56	0.05	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	2.95	2.00	-0.17	0.17	0.55	0.05	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.00	2.00	-0.18	0.18	0.54	0.06	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.05	2.00	-0.19	0.19	0.54	0.06	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.10	2.00	-0.21	0.21	0.53	0.07	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.15	2.00	-0.22	0.22	0.52	0.07	2.44	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.20	2.00	-0.23	0.23	0.50	0.08	2.45	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.25	2.00	-0.24	0.24	0.49	0.08	2.45	Vu < PhiVc/2	ot Reqd 9.6	2.4	0.0	0.0
+1.20D+1.60L	1	3.30	2.00	-0.25	0.25	0.48	0.09	2.45	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.34	2.00	-0.26	0.26	0.47	0.09	2.45	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.39	2.00	-0.28	0.28	0.45	0.10	2.46	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.44	2.00	-0.29	0.29	0.44	0.11	2.46	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.49	2.00	-0.30	0.30	0.43	0.12	2.46	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.54	2.00	-0.31	0.31	0.41	0.13	2.47	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.59	2.00	-0.32	0.32	0.40	0.14	2.47	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.64	2.00	-0.34	0.34	0.38	0.15	2.47	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.69	2.00	-0.35	0.35	0.36	0.16	2.48	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.74	2.00	-0.36	0.36	0.34	0.17	2.48	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.79	2.00	-0.37	0.37	0.33	0.19	2.49	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.84	2.00	-0.38	0.38	0.31	0.21	2.50	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.89	2.00	-0.40	0.40	0.29	0.23	2.50	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.93	2.00	-0.41	0.41	0.27	0.25	2.51	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	3.98	2.00	-0.42	0.42	0.25	0.28	2.52	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	4.03	2.00	-0.43	0.43	0.23	0.32	2.54	Vu < PhiVc/2	ot Reqd 9.6	2.5	0.0	0.0
+1.20D+1.60L	1	4.08	2.00	-0.44	0.44	0.21	0.36	2.55	Vu < PhiVc/2	ot Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	4.13	2.00	-0.46	0.46	0.18	0.41	2.57	Vu < PhiVc/2	ot Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	4.18	2.00	-0.47	0.47	0.16	0.48	2.60	Vu < PhiVc/2	ot Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	4.23	2.00	-0.48	0.48	0.14	0.58	2.63	Vu < PhiVc/2	ot Reqd 9.6	2.6	0.0	0.0
+1.20D+1.60L	1	4.28	2.00	-0.49	0.49	0.11	0.71	2.69	Vu < PhiVc/2	ot Reqd 9.6	2.7	0.0	0.0
+1.20D+1.60L	1	4.33	2.00	-0.50	0.50	0.09	0.93	2.77	Vu < PhiVc/2	ot Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	4.38	2.00	-0.51	0.51	0.07	1.00	2.79	Vu < PhiVc/2	ot Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	4.43	2.00	-0.53	0.53	0.04	1.00	2.79	Vu < PhiVc/2	ot Reqd 9.6	2.8	0.0	0.0
+1.20D+1.60L	1	4.48	2.00	-0.54	0.54	0.01	1.00	2.79	Vu < PhiVc/2	ot Reqd 9.6	2.8	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	4.500	0.61	1.69	0.36
+1.40D					
Span # 1	1	4.500	0.24	1.69	0.14
+1.20D+1.60L					
Span # 1	1	4.500	0.61	1.69	0.36
+1.20D+L					
Span # 1	1	4.500	0.46	1.69	0.27
+1.20D					
Span # 1	1	4.500	0.21	1.69	0.12
+0.90D					
Span # 1	1	4.500	0.16	1.69	0.09

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0060	2.250		0.0000	0.000

BEAM DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

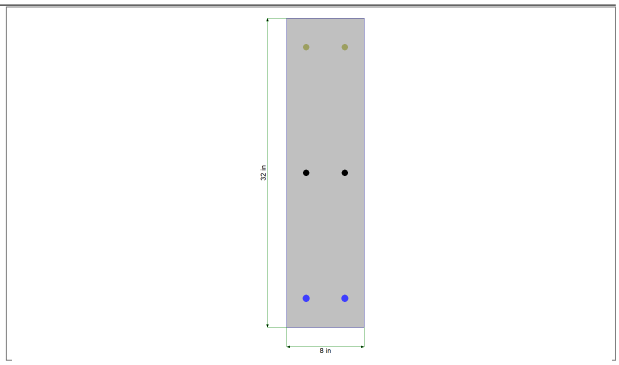
DESCRIPTION: B-1 (TOWER)**

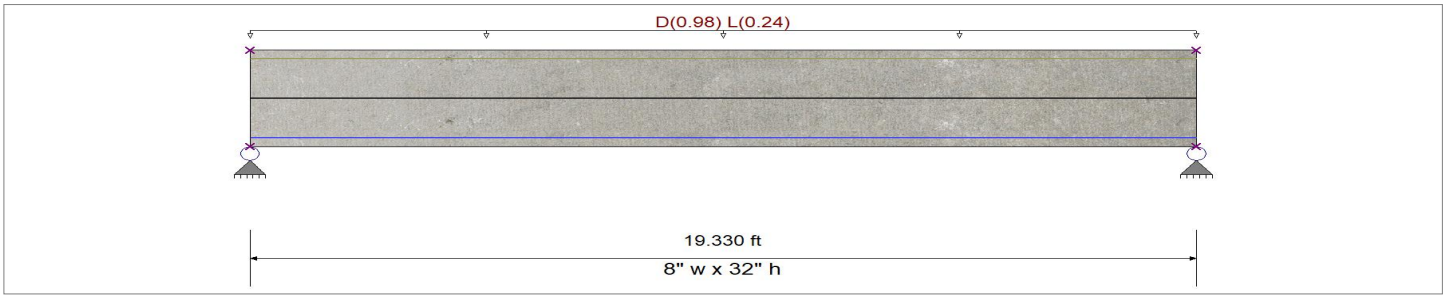
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 8.0 in, Height = 32.0 in
Span #1 Reinforcing....
2-#6 at 3.0 in from Bottom, from 0.0 to 19.330 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 19.330 ft in this span
2-#5 at 16.0 in from Bottom, from 0.0 to 19.330 ft in this

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1225, L = 0.030 ksf, Tributary Width = 8.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.580**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	87.309	k-ft
Mn * Phi : Allowable	150.450	k-ft
Location of maximum on span	9.683	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.009 in	Ratio =	27098	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.065 in	Ratio =	3561	>=240.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	14.283	14.283
Overall MINimum	2.320	2.320
D Only	11.963	11.963
+D+L	14.283	14.283
+D+0.750L	13.703	13.703
+0.60D	7.178	7.178

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: B-1 (TOWER)**

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
L Only	2.320	2.320

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	1	0.00	29.00	18.07	18.07	0.00	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	0.21	29.00	17.67	17.67	3.78	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	0.42	29.00	17.28	17.28	7.47	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	0.63	29.00	16.88	16.88	11.07	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	0.85	29.00	16.49	16.49	14.60	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	1.06	29.00	16.09	16.09	18.04	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	1.27	29.00	15.70	15.70	21.40	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	1.48	29.00	15.30	15.30	24.67	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	1.69	29.00	14.91	14.91	27.86	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	1.90	29.00	14.51	14.51	30.97	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	2.11	29.00	14.12	14.12	34.00	1.00	26.19	PhiVc/2 < Vu <= Min 9.6.3.1	39.9	14.5	14.0	
+1.20D+1.60L	1	2.32	29.00	13.72	13.72	36.94	0.90	25.90	PhiVc/2 < Vu <= Min 9.6.3.1	39.6	14.5	14.0	
+1.20D+1.60L	1	2.54	29.00	13.33	13.33	39.79	0.81	25.65	PhiVc/2 < Vu <= Min 9.6.3.1	39.3	14.5	14.0	
+1.20D+1.60L	1	2.75	29.00	12.93	12.93	42.57	0.73	25.44	PhiVc/2 < Vu <= Min 9.6.3.1	39.1	14.5	14.0	
+1.20D+1.60L	1	2.96	29.00	12.54	12.54	45.26	0.67	25.26	Vu < PhiVc/2 ot Reqd 9.6	25.3	0.0	0.0	
+1.20D+1.60L	1	3.17	29.00	12.14	12.14	47.87	0.61	25.10	Vu < PhiVc/2 ot Reqd 9.6	25.1	0.0	0.0	
+1.20D+1.60L	1	3.38	29.00	11.75	11.75	50.39	0.56	24.96	Vu < PhiVc/2 ot Reqd 9.6	25.0	0.0	0.0	
+1.20D+1.60L	1	3.59	29.00	11.35	11.35	52.83	0.52	24.84	Vu < PhiVc/2 ot Reqd 9.6	24.8	0.0	0.0	
+1.20D+1.60L	1	3.80	29.00	10.96	10.96	55.19	0.48	24.73	Vu < PhiVc/2 ot Reqd 9.6	24.7	0.0	0.0	
+1.20D+1.60L	1	4.01	29.00	10.56	10.56	57.46	0.44	24.63	Vu < PhiVc/2 ot Reqd 9.6	24.6	0.0	0.0	
+1.20D+1.60L	1	4.23	29.00	10.17	10.17	59.65	0.41	24.54	Vu < PhiVc/2 ot Reqd 9.6	24.5	0.0	0.0	
+1.20D+1.60L	1	4.44	29.00	9.77	9.77	61.76	0.38	24.45	Vu < PhiVc/2 ot Reqd 9.6	24.5	0.0	0.0	
+1.20D+1.60L	1	4.65	29.00	9.38	9.38	63.78	0.36	24.38	Vu < PhiVc/2 ot Reqd 9.6	24.4	0.0	0.0	
+1.20D+1.60L	1	4.86	29.00	8.98	8.98	65.72	0.33	24.31	Vu < PhiVc/2 ot Reqd 9.6	24.3	0.0	0.0	
+1.20D+1.60L	1	5.07	29.00	8.59	8.59	67.58	0.31	24.24	Vu < PhiVc/2 ot Reqd 9.6	24.2	0.0	0.0	
+1.20D+1.60L	1	5.28	29.00	8.19	8.19	69.35	0.29	24.18	Vu < PhiVc/2 ot Reqd 9.6	24.2	0.0	0.0	
+1.20D+1.60L	1	5.49	29.00	7.80	7.80	71.04	0.27	24.12	Vu < PhiVc/2 ot Reqd 9.6	24.1	0.0	0.0	
+1.20D+1.60L	1	5.70	29.00	7.40	7.40	72.64	0.25	24.07	Vu < PhiVc/2 ot Reqd 9.6	24.1	0.0	0.0	
+1.20D+1.60L	1	5.92	29.00	7.01	7.01	74.17	0.23	24.02	Vu < PhiVc/2 ot Reqd 9.6	24.0	0.0	0.0	
+1.20D+1.60L	1	6.13	29.00	6.61	6.61	75.61	0.21	23.97	Vu < PhiVc/2 ot Reqd 9.6	24.0	0.0	0.0	
+1.20D+1.60L	1	6.34	29.00	6.22	6.22	76.96	0.20	23.93	Vu < PhiVc/2 ot Reqd 9.6	23.9	0.0	0.0	
+1.20D+1.60L	1	6.55	29.00	5.82	5.82	78.23	0.18	23.88	Vu < PhiVc/2 ot Reqd 9.6	23.9	0.0	0.0	
+1.20D+1.60L	1	6.76	29.00	5.43	5.43	79.42	0.17	23.84	Vu < PhiVc/2 ot Reqd 9.6	23.8	0.0	0.0	
+1.20D+1.60L	1	6.97	29.00	5.04	5.04	80.53	0.15	23.80	Vu < PhiVc/2 ot Reqd 9.6	23.8	0.0	0.0	
+1.20D+1.60L	1	7.18	29.00	4.64	4.64	81.55	0.14	23.76	Vu < PhiVc/2 ot Reqd 9.6	23.8	0.0	0.0	
+1.20D+1.60L	1	7.39	29.00	4.25	4.25	82.49	0.12	23.73	Vu < PhiVc/2 ot Reqd 9.6	23.7	0.0	0.0	
+1.20D+1.60L	1	7.61	29.00	3.85	3.85	83.34	0.11	23.69	Vu < PhiVc/2 ot Reqd 9.6	23.7	0.0	0.0	
+1.20D+1.60L	1	7.82	29.00	3.46	3.46	84.12	0.10	23.66	Vu < PhiVc/2 ot Reqd 9.6	23.7	0.0	0.0	
+1.20D+1.60L	1	8.03	29.00	3.06	3.06	84.80	0.09	23.62	Vu < PhiVc/2 ot Reqd 9.6	23.6	0.0	0.0	
+1.20D+1.60L	1	8.24	29.00	2.67	2.67	85.41	0.08	23.59	Vu < PhiVc/2 ot Reqd 9.6	23.6	0.0	0.0	
+1.20D+1.60L	1	8.45	29.00	2.27	2.27	85.93	0.06	23.56	Vu < PhiVc/2 ot Reqd 9.6	23.6	0.0	0.0	
+1.20D+1.60L	1	8.66	29.00	1.88	1.88	86.37	0.05	23.52	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	8.87	29.00	1.48	1.48	86.72	0.04	23.49	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	9.08	29.00	1.09	1.09	86.99	0.03	23.46	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	9.30	29.00	0.69	0.69	87.18	0.02	23.43	Vu < PhiVc/2 ot Reqd 9.6	23.4	0.0	0.0	
+1.20D+1.60L	1	9.51	29.00	0.30	0.30	87.29	0.01	23.40	Vu < PhiVc/2 ot Reqd 9.6	23.4	0.0	0.0	
+1.20D+1.60L	1	9.72	29.00	-0.10	0.10	87.31	0.00	23.38	Vu < PhiVc/2 ot Reqd 9.6	23.4	0.0	0.0	
+1.20D+1.60L	1	9.93	29.00	-0.49	0.49	87.24	0.01	23.42	Vu < PhiVc/2 ot Reqd 9.6	23.4	0.0	0.0	
+1.20D+1.60L	1	10.14	29.00	-0.89	0.89	87.10	0.02	23.45	Vu < PhiVc/2 ot Reqd 9.6	23.4	0.0	0.0	
+1.20D+1.60L	1	10.35	29.00	-1.28	1.28	86.87	0.04	23.48	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	10.56	29.00	-1.68	1.68	86.56	0.05	23.51	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	10.77	29.00	-2.07	2.07	86.16	0.06	23.54	Vu < PhiVc/2 ot Reqd 9.6	23.5	0.0	0.0	
+1.20D+1.60L	1	10.99	29.00	-2.47	2.47	85.68	0.07	23.57	Vu < PhiVc/2 ot Reqd 9.6	23.6	0.0	0.0	
+1.20D+1.60L	1	11.20	29.00	-2.86	2.86	85.12	0.08	23.61	Vu < PhiVc/2 ot Reqd 9.6	23.6	0.0	0.0	

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: B-1 (TOWER)**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	11.41	29.00	-3.26	3.26	84.47	0.09	23.64	Vu < PhiVc/2	ıt Reqd 9.6	23.6	0.0	0.0
+1.20D+1.60L	1	11.62	29.00	-3.65	3.65	83.74	0.11	23.67	Vu < PhiVc/2	ıt Reqd 9.6	23.7	0.0	0.0
+1.20D+1.60L	1	11.83	29.00	-4.05	4.05	82.93	0.12	23.71	Vu < PhiVc/2	ıt Reqd 9.6	23.7	0.0	0.0
+1.20D+1.60L	1	12.04	29.00	-4.44	4.44	82.03	0.13	23.75	Vu < PhiVc/2	ıt Reqd 9.6	23.7	0.0	0.0
+1.20D+1.60L	1	12.25	29.00	-4.84	4.84	81.05	0.14	23.78	Vu < PhiVc/2	ıt Reqd 9.6	23.8	0.0	0.0
+1.20D+1.60L	1	12.46	29.00	-5.23	5.23	79.99	0.16	23.82	Vu < PhiVc/2	ıt Reqd 9.6	23.8	0.0	0.0
+1.20D+1.60L	1	12.68	29.00	-5.63	5.63	78.84	0.17	23.86	Vu < PhiVc/2	ıt Reqd 9.6	23.9	0.0	0.0
+1.20D+1.60L	1	12.89	29.00	-6.02	6.02	77.61	0.19	23.90	Vu < PhiVc/2	ıt Reqd 9.6	23.9	0.0	0.0
+1.20D+1.60L	1	13.10	29.00	-6.42	6.42	76.29	0.20	23.95	Vu < PhiVc/2	ıt Reqd 9.6	23.9	0.0	0.0
+1.20D+1.60L	1	13.31	29.00	-6.81	6.81	74.90	0.22	24.00	Vu < PhiVc/2	ıt Reqd 9.6	24.0	0.0	0.0
+1.20D+1.60L	1	13.52	29.00	-7.21	7.21	73.42	0.24	24.04	Vu < PhiVc/2	ıt Reqd 9.6	24.0	0.0	0.0
+1.20D+1.60L	1	13.73	29.00	-7.60	7.60	71.85	0.26	24.10	Vu < PhiVc/2	ıt Reqd 9.6	24.1	0.0	0.0
+1.20D+1.60L	1	13.94	29.00	-8.00	8.00	70.20	0.28	24.15	Vu < PhiVc/2	ıt Reqd 9.6	24.2	0.0	0.0
+1.20D+1.60L	1	14.15	29.00	-8.39	8.39	68.47	0.30	24.21	Vu < PhiVc/2	ıt Reqd 9.6	24.2	0.0	0.0
+1.20D+1.60L	1	14.37	29.00	-8.79	8.79	66.66	0.32	24.27	Vu < PhiVc/2	ıt Reqd 9.6	24.3	0.0	0.0
+1.20D+1.60L	1	14.58	29.00	-9.18	9.18	64.76	0.34	24.34	Vu < PhiVc/2	ıt Reqd 9.6	24.3	0.0	0.0
+1.20D+1.60L	1	14.79	29.00	-9.58	9.58	62.78	0.37	24.41	Vu < PhiVc/2	ıt Reqd 9.6	24.4	0.0	0.0
+1.20D+1.60L	1	15.00	29.00	-9.97	9.97	60.71	0.40	24.49	Vu < PhiVc/2	ıt Reqd 9.6	24.5	0.0	0.0
+1.20D+1.60L	1	15.21	29.00	-10.37	10.37	58.57	0.43	24.58	Vu < PhiVc/2	ıt Reqd 9.6	24.6	0.0	0.0
+1.20D+1.60L	1	15.42	29.00	-10.76	10.76	56.33	0.46	24.68	Vu < PhiVc/2	ıt Reqd 9.6	24.7	0.0	0.0
+1.20D+1.60L	1	15.63	29.00	-11.16	11.16	54.02	0.50	24.78	Vu < PhiVc/2	ıt Reqd 9.6	24.8	0.0	0.0
+1.20D+1.60L	1	15.84	29.00	-11.55	11.55	51.62	0.54	24.90	Vu < PhiVc/2	ıt Reqd 9.6	24.9	0.0	0.0
+1.20D+1.60L	1	16.06	29.00	-11.95	11.95	49.14	0.59	25.03	Vu < PhiVc/2	ıt Reqd 9.6	25.0	0.0	0.0
+1.20D+1.60L	1	16.27	29.00	-12.34	12.34	46.57	0.64	25.18	Vu < PhiVc/2	ıt Reqd 9.6	25.2	0.0	0.0
+1.20D+1.60L	1	16.48	29.00	-12.74	12.74	43.92	0.70	25.35	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	14.5	14.0
+1.20D+1.60L	1	16.69	29.00	-13.13	13.13	41.19	0.77	25.54	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	14.5	14.0
+1.20D+1.60L	1	16.90	29.00	-13.53	13.53	38.38	0.85	25.77	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	14.5	14.0
+1.20D+1.60L	1	17.11	29.00	-13.92	13.92	35.48	0.95	26.04	PhiVc/2 < Vu <=	Min 9.6.3.1	39.7	14.5	14.0
+1.20D+1.60L	1	17.32	29.00	-14.32	14.32	32.49	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	17.53	29.00	-14.71	14.71	29.43	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	17.75	29.00	-15.11	15.11	26.28	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	17.96	29.00	-15.50	15.50	23.05	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	18.17	29.00	-15.90	15.90	19.73	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	18.38	29.00	-16.29	16.29	16.33	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	18.59	29.00	-16.68	16.68	12.85	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	18.80	29.00	-17.08	17.08	9.28	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	19.01	29.00	-17.47	17.47	5.63	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0
+1.20D+1.60L	1	19.22	29.00	-17.87	17.87	1.90	1.00	26.19	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	14.5	14.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	19.330	87.31	150.45	0.58
+1.40D					
Span # 1	1	19.330	80.94	150.45	0.54
+1.20D+1.60L					
Span # 1	1	19.330	87.31	150.45	0.58
+1.20D+0.50L					
Span # 1	1	19.330	74.98	150.45	0.50
+1.20D					
Span # 1	1	19.330	69.37	150.45	0.46
+0.90D					
Span # 1	1	19.330	52.03	150.45	0.35

Overall Maximum Deflections

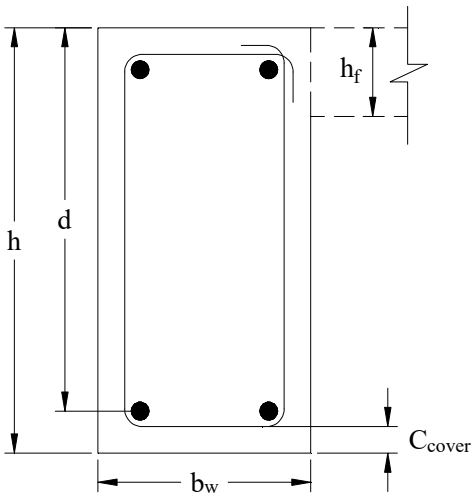
Load Combination	Span	Max. "-" Defl (in)	ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+L	1	0.0651	9.665		0.0000	0.000

Project Name: **Date:**

Combined Shear & Torsion Design for Reinforced Concrete Beams (Critial Section)

"B-2" (TOWER)

Beam Data:



$f'_c := 5000$ psi — Compressive Strength of Concrete

$f_y := 60000$ psi — Longitudinal Reinforcement Yield Strength

$\lambda := 1.0$ — Concrete Weight Modification Factor:

λ = **1.0 for Normal-Weight concrete**
λ = 0.85 for Sand-lightweight concrete
λ = **0.75 for All other lightweight concrete**

$\phi := 0.75$ — Shear & Torsion Strength Reduction Factor

$b_w := 8.0$ in — Beam Web Width

$h := 16.0$ in — Overall Thickness of Member

$d := 15.18$ in — Beam Effective Depth (~ h - 2.5)

$h_f := 0.0$ in — Flange Depth
(For Isolated members with overhanging flanges and monolithically casted spandrels to slabs)

$C_{cover} := 1.5$ in — Concrete Cover

C_{cover} = **1.5 Minimum for Beams**
= 2.0 For Concrete exposed to earth or weather
= **3.0 For Concrete cast against & permanently exposed to earth**

Web Reinforcement Data:

$f_{yt} := 60000$ psi — Shear Reinforcement Yield Strength

$A_v := 0.22$ in^2 — Shear Area of Reinforcement:

A_v = **0.22 for No. 3 Bars Single Loop**
0.40 For No. 4 Bars Single Loop
0.44 for No. 3 Bars Double Loop
0.80 For No. 4 Bars Double Loop

Torque and Shear Loads:

$T_u := 2550.0$ lb-ft — Design Factored Torsional Moment (at 'd' from FOS)
For Equilibrium Torsion T_u = Factored Load * Eccentricity
For Compatibility Torsion T_u = ϕT_{cr}

$V_u := 2010.0$ lbs — Design Factored Shear (at 'd' from FOS) (lbs)

Torsion Threshold Check:

$x_0 := b_w$ $y_0 := h$

$A_{cp1} := b_w \cdot h$ $p_{cp1} := 2 \cdot (x_0 + y_0)$

$A_{cp1} = 128.0$ Area enclosed by outside perimeter of beam only (in^2)

$p_{cp1} = 48.0$ Outside perimeter of beam only (in^2)

$h_b := h - h_f$

$L_f := if(h_b < 4 \cdot h_f, h_b, 4 \cdot h_f)$

$L_f = 0.0$ Length of overhanging flange (in)

$A_{cp2} := (x_0 \cdot y_0) + (L_f \cdot h_f)$ $p_{cp2} := 2 \cdot (x_0 + y_0) + 2 \cdot (L_f + h_f)$

$A_{cp2} = 128.0$ Area enclosed by outside perimeter of beam and flange (in^2)

$p_{cp2} = 48.0$ Outside perimeter of beam and flange (in^2)

$$T_{cr} := 4 \cdot \lambda \cdot \sqrt{f'_c} \cdot \max\left(\frac{A_{cp1}^2}{p_{cp1}}, \frac{A_{cp2}^2}{p_{cp2}}\right) \cdot \frac{1}{12}$$ $T_{threshold} := \left(\frac{1}{4}\right) \cdot T_{cr}$

$T_{cr} = 8045.30$ Section Cracking Torque (lb-ft)

$T_{threshold} = 2011.33$ Section Threshold Torsional Value (lb-ft)

$$T_{design} := \begin{cases} \text{"TORSIONAL EFFECTS NEGLECTED"} \\ \text{"DESIGN FOR TORSION"} \quad \text{if } T_u > T_{threshold} \end{cases}$$

$T_{design} = \text{"DESIGN FOR TORSION"}$

Nominal Concrete Shear Strength:

$V_c := 2 \cdot \lambda \cdot \sqrt{f'_c} \cdot b_w \cdot d$

$V_c = 17174.21$ lbs

Section Adequacy for Combined Torsion and Shear Stresses:

$$d_{b\text{-stirrup}} := \begin{cases} 0.375 \\ 0.5 \quad \text{if} \begin{cases} A_v = 0.40 \\ A_v = 0.80 \end{cases} \end{cases}$$

$d_{b\text{-stirrup}} = 0.375$ in

$x_1 := b_w - 2 \cdot C_{cover} - d_{b\text{-stirrup}}$ $x_1 = 4.63$ in

$y_1 := h - 2 \cdot C_{cover} - d_{b\text{-stirrup}}$ $y_1 = 12.63$ in

$p_h := 2 \cdot (x_1 + y_1)$ $p_h = 34.50$ in

$A_{oh} := x_1 \cdot y_1$ $A_{oh} = 58.39$ in^2

$$f_{vt} := \sqrt{\left(\frac{V_u}{b_w \cdot d}\right)^2 + \left(\frac{T_u \cdot 12 \cdot p_h}{1.7 \cdot A_{oh}^2}\right)^2}$$ $f_{vt} = 182.89$ psi

$$f_{Vcr} := \phi \cdot \left[\left(\frac{V_c}{b_w \cdot d}\right) + 8 \cdot \sqrt{f'_c}\right]$$ $f_{Vcr} = 530.33$ psi

$$SECTION_{adequacy} := \begin{cases} \text{"INCREASE SECTION DIMENSIONS"} \\ \text{"SECTION O.K."} \quad \text{if} \quad f_{vt} < f_{Vcr} \end{cases}$$

$SECTION_{adequacy} = \text{"SECTION O.K."}$

Maximum Torsional Reinforcement Spacing:

$$s_{max} := \min\left(\frac{p_h}{8}, 12\right)$$

$s_{max} = 4.3$ in

Minimum Torsional Reinforcement:

$$A_{(tv/s)\text{-min}} := \begin{cases} \dfrac{50 \cdot b_w}{f_{yt}} \\ \left[0.75 \cdot \sqrt{f'_c} \cdot \left(\dfrac{b_w}{f_{yt}}\right)\right] \quad \text{if} \quad f'_c > 4444.4 \end{cases}$$

$A_{(tv/s)\text{-min}} = 0.0071$ in^2 / in / 2 stirrup legs

Minimum Shear Reinforcement:

$$A_{(v/s)\text{-min}} := \begin{cases} \dfrac{50 \cdot b_w}{f_{yt}} \\ \left[0.75 \cdot \sqrt{f'_c} \cdot \left(\dfrac{b_w}{f_{yt}}\right)\right] \quad \text{if} \quad f'_c > 4444.4 \end{cases}$$

$A_{(v/s)\text{-min}} = 0.0071$ in^2 / in / 2 stirrup legs

Required Torsional Reinforcement:

$$A_o := 0.85 \cdot A_{oh} \qquad \theta := \frac{\pi}{4}$$

$$A_{(t/s)} := \begin{cases} \dfrac{\left(\dfrac{T_u}{\phi}\right) \cdot 12}{2 \cdot A_o \cdot f_{yt} \cdot \cot(\theta)} \\ 0 \quad \text{if} \quad \dfrac{T_u}{\phi} < T_{threshold} \end{cases}$$

$A_{(t/s)} = 0.0069$ in^2 / in / 1 stirrup leg

Required Shear Reinforcement:

$$A_{(v/s)} := \begin{cases} \max\left[\left(\dfrac{\dfrac{V_u}{\phi} - V_c}{f_{yt} \cdot d}\right), A_{(v/s)\text{-min}}\right] \\ A_{(v/s)\text{-min}} \quad \text{if} \quad 0.5 \cdot V_c < \left(\dfrac{V_u}{\phi}\right) \le V_c \\ 0 \quad \text{if} \quad \dfrac{V_u}{\phi} \le 0.5 \cdot V_c \end{cases}$$

$A_{(v/s)} = 0.0000$ in^2 / in / 2 stirrup legs

Required Combined Stirrup Spacing:

$$s_{req} := \min\left(\min\left(\frac{A_v}{2 \cdot A_{(t/s)} + A_{(v/s)}}, \frac{A_v}{A_{(tv/s)\text{-min}}}\right), s_{max}\right)$$

$s_{req} = 4.3$ in

Additional Longitudinal Reinforcement:

$$d_{b\text{-long}} := \max\left(0.042 \cdot s_{max}, \frac{3}{8}\right)$$

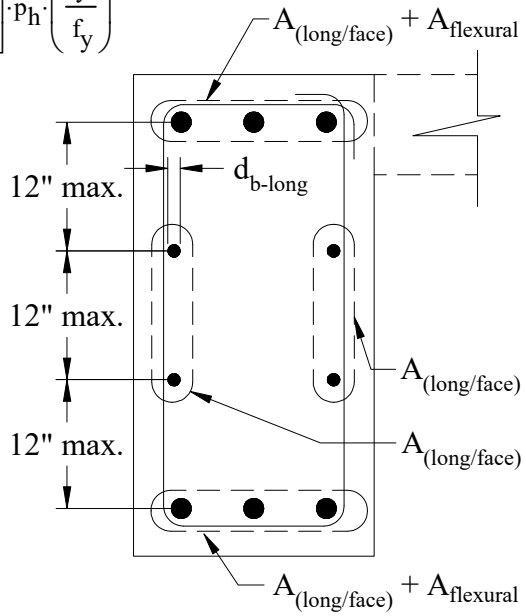
$$A_{long\text{-min}} := \left(\frac{5 \cdot \sqrt{f'_c} \cdot \max(A_{cp1}, A_{cp2})}{f_y}\right) - \max\left[A_{(t/s)}, \left(\frac{25 \cdot b_w}{f_y}\right)\right] \cdot p_h \cdot \left(\frac{f_{yt}}{f_y}\right)$$

$A_{long\text{-min}} = 0.52$ in^2

$$A_{long} := \left[A_{(t/s)} \cdot p_h \cdot \left(\frac{f_{yt}}{f_y}\right) \cdot (\cot(\theta))^2\right]$$

$A_{long} = 0.24$ in^2

$$A_{(long/face)} := \frac{\max(A_{long\text{-min}}, A_{long})}{4}$$



Minimum Bar Diameter: $d_{b\text{-long}} = 0.38$ in

Area of Long. Reinf. per Beam face: $A_{(long/face)} = 0.13$ in^2

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

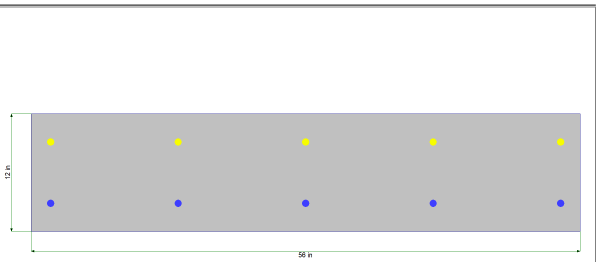
DESCRIPTION: 2B-2 LATERAL** P.O

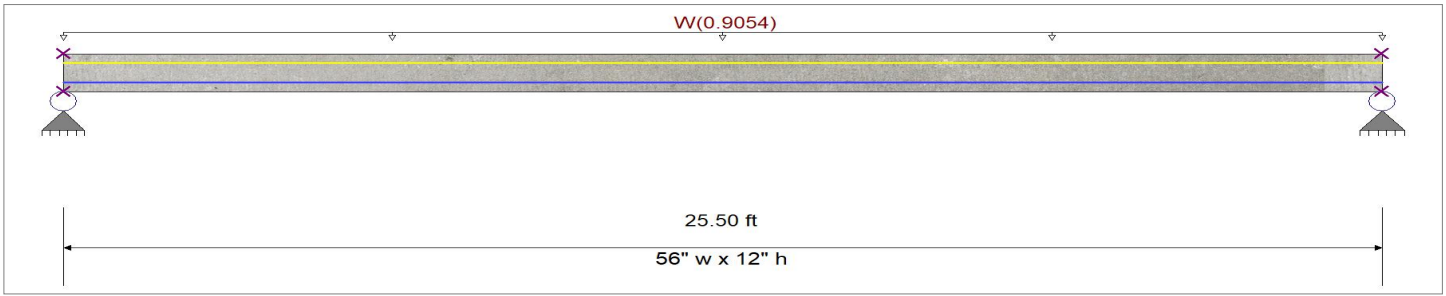
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 56.0 in, Height = 12.0 in
Span #1 Reinforcing....
5-#6 at 2.875 in from Bottom, from 0.0 to 25.50 ft in this span 5-#6 at 2.875 in from Top, from 0.0 to 25.50 ft in this sp

Load for Span Number 1
Uniform Load : W = 0.1006 ksf, Tributary Width = 9.0 ft, (WIND)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.683** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	73.592	k-ft
Mn * Phi : Allowable	107.818	k-ft
Location of maximum on span	12.773	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.415 in	Ratio =	737	>=360.0	Overall MAXimum Envelope
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	Overall MAXimum Envelope
Max Downward Total Deflection	0.415 in	Ratio =	737	>=240.0	Span: 1 : W Only
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : W Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	11.544	11.544
Overall MINimum	5.195	5.195
+0.60W	6.926	6.926
+0.450W	5.195	5.195
W Only	11.544	11.544

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-2 LATERAL** P.O

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
W Only	1	0.00	9.13	11.54	11.54	0.00	1.00	55.61	Vu < PhiVc/2	ɔt Reqd 9.6	55.6	0.0	0.0
W Only	1	0.28	9.13	11.29	11.29	3.18	1.00	55.61	Vu < PhiVc/2	ɔt Reqd 9.6	55.6	0.0	0.0
W Only	1	0.56	9.13	11.04	11.04	6.29	1.00	55.61	Vu < PhiVc/2	ɔt Reqd 9.6	55.6	0.0	0.0
W Only	1	0.84	9.13	10.79	10.79	9.33	0.88	55.11	Vu < PhiVc/2	ɔt Reqd 9.6	55.1	0.0	0.0
W Only	1	1.11	9.13	10.53	10.53	12.31	0.65	54.17	Vu < PhiVc/2	ɔt Reqd 9.6	54.2	0.0	0.0
W Only	1	1.39	9.13	10.28	10.28	15.21	0.51	53.61	Vu < PhiVc/2	ɔt Reqd 9.6	53.6	0.0	0.0
W Only	1	1.67	9.13	10.03	10.03	18.04	0.42	53.23	Vu < PhiVc/2	ɔt Reqd 9.6	53.2	0.0	0.0
W Only	1	1.95	9.13	9.78	9.78	20.80	0.36	52.96	Vu < PhiVc/2	ɔt Reqd 9.6	53.0	0.0	0.0
W Only	1	2.23	9.13	9.53	9.53	23.49	0.31	52.76	Vu < PhiVc/2	ɔt Reqd 9.6	52.8	0.0	0.0
W Only	1	2.51	9.13	9.27	9.27	26.11	0.27	52.60	Vu < PhiVc/2	ɔt Reqd 9.6	52.6	0.0	0.0
W Only	1	2.79	9.13	9.02	9.02	28.66	0.24	52.48	Vu < PhiVc/2	ɔt Reqd 9.6	52.5	0.0	0.0
W Only	1	3.07	9.13	8.77	8.77	31.13	0.21	52.37	Vu < PhiVc/2	ɔt Reqd 9.6	52.4	0.0	0.0
W Only	1	3.34	9.13	8.52	8.52	33.54	0.19	52.29	Vu < PhiVc/2	ɔt Reqd 9.6	52.3	0.0	0.0
W Only	1	3.62	9.13	8.26	8.26	35.88	0.18	52.21	Vu < PhiVc/2	ɔt Reqd 9.6	52.2	0.0	0.0
W Only	1	3.90	9.13	8.01	8.01	38.15	0.16	52.15	Vu < PhiVc/2	ɔt Reqd 9.6	52.1	0.0	0.0
W Only	1	4.18	9.13	7.76	7.76	40.35	0.15	52.09	Vu < PhiVc/2	ɔt Reqd 9.6	52.1	0.0	0.0
W Only	1	4.46	9.13	7.51	7.51	42.47	0.13	52.04	Vu < PhiVc/2	ɔt Reqd 9.6	52.0	0.0	0.0
W Only	1	4.74	9.13	7.25	7.25	44.53	0.12	52.00	Vu < PhiVc/2	ɔt Reqd 9.6	52.0	0.0	0.0
W Only	1	5.02	9.13	7.00	7.00	46.52	0.11	51.96	Vu < PhiVc/2	ɔt Reqd 9.6	52.0	0.0	0.0
W Only	1	5.30	9.13	6.75	6.75	48.43	0.11	51.93	Vu < PhiVc/2	ɔt Reqd 9.6	51.9	0.0	0.0
W Only	1	5.57	9.13	6.50	6.50	50.28	0.10	51.90	Vu < PhiVc/2	ɔt Reqd 9.6	51.9	0.0	0.0
W Only	1	5.85	9.13	6.25	6.25	52.05	0.09	51.87	Vu < PhiVc/2	ɔt Reqd 9.6	51.9	0.0	0.0
W Only	1	6.13	9.13	5.99	5.99	53.76	0.08	51.84	Vu < PhiVc/2	ɔt Reqd 9.6	51.8	0.0	0.0
W Only	1	6.41	9.13	5.74	5.74	55.39	0.08	51.81	Vu < PhiVc/2	ɔt Reqd 9.6	51.8	0.0	0.0
W Only	1	6.69	9.13	5.49	5.49	56.96	0.07	51.79	Vu < PhiVc/2	ɔt Reqd 9.6	51.8	0.0	0.0
W Only	1	6.97	9.13	5.24	5.24	58.45	0.07	51.77	Vu < PhiVc/2	ɔt Reqd 9.6	51.8	0.0	0.0
W Only	1	7.25	9.13	4.98	4.98	59.88	0.06	51.75	Vu < PhiVc/2	ɔt Reqd 9.6	51.8	0.0	0.0
W Only	1	7.52	9.13	4.73	4.73	61.23	0.06	51.73	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	7.80	9.13	4.48	4.48	62.51	0.05	51.71	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	8.08	9.13	4.23	4.23	63.73	0.05	51.70	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	8.36	9.13	3.97	3.97	64.87	0.05	51.68	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	8.64	9.13	3.72	3.72	65.94	0.04	51.67	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	8.92	9.13	3.47	3.47	66.94	0.04	51.65	Vu < PhiVc/2	ɔt Reqd 9.6	51.7	0.0	0.0
W Only	1	9.20	9.13	3.22	3.22	67.88	0.04	51.64	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	9.48	9.13	2.96	2.96	68.74	0.03	51.63	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	9.75	9.13	2.71	2.71	69.53	0.03	51.61	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	10.03	9.13	2.46	2.46	70.25	0.03	51.60	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	10.31	9.13	2.21	2.21	70.90	0.02	51.59	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	10.59	9.13	1.96	1.96	71.48	0.02	51.58	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	10.87	9.13	1.70	1.70	71.99	0.02	51.56	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	11.15	9.13	1.45	1.45	72.43	0.02	51.55	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	11.43	9.13	1.20	1.20	72.80	0.01	51.54	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	11.70	9.13	0.95	0.95	73.10	0.01	51.53	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	11.98	9.13	0.69	0.69	73.33	0.01	51.52	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	12.26	9.13	0.44	0.44	73.48	0.00	51.51	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	12.54	9.13	0.19	0.19	73.57	0.00	51.50	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	12.82	9.13	-0.06	0.06	73.59	0.00	51.49	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	13.10	9.13	-0.32	0.32	73.54	0.00	51.50	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	13.38	9.13	-0.57	0.57	73.41	0.01	51.51	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	13.66	9.13	-0.82	0.82	73.22	0.01	51.52	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	13.93	9.13	-1.07	1.07	72.96	0.01	51.54	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	14.21	9.13	-1.32	1.32	72.62	0.01	51.55	Vu < PhiVc/2	ɔt Reqd 9.6	51.5	0.0	0.0
W Only	1	14.49	9.13	-1.58	1.58	72.22	0.02	51.56	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	14.77	9.13	-1.83	1.83	71.74	0.02	51.57	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	15.05	9.13	-2.08	2.08	71.20	0.02	51.58	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	15.33	9.13	-2.33	2.33	70.58	0.03	51.59	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0
W Only	1	15.61	9.13	-2.59	2.59	69.90	0.03	51.61	Vu < PhiVc/2	ɔt Reqd 9.6	51.6	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-2 LATERAL** P.O

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
W Only	1	15.89	9.13	-2.84	2.84	69.14	0.03	51.62	Vu < PhiVc/2	ot Reqd 9.6	51.6	0.0	0.0
W Only	1	16.16	9.13	-3.09	3.09	68.32	0.03	51.63	Vu < PhiVc/2	ot Reqd 9.6	51.6	0.0	0.0
W Only	1	16.44	9.13	-3.34	3.34	67.42	0.04	51.65	Vu < PhiVc/2	ot Reqd 9.6	51.6	0.0	0.0
W Only	1	16.72	9.13	-3.60	3.60	66.45	0.04	51.66	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	17.00	9.13	-3.85	3.85	65.42	0.04	51.67	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	17.28	9.13	-4.10	4.10	64.31	0.05	51.69	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	17.56	9.13	-4.35	4.35	63.13	0.05	51.71	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	17.84	9.13	-4.60	4.60	61.88	0.06	51.72	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	18.11	9.13	-4.86	4.86	60.56	0.06	51.74	Vu < PhiVc/2	ot Reqd 9.6	51.7	0.0	0.0
W Only	1	18.39	9.13	-5.11	5.11	59.17	0.07	51.76	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
W Only	1	18.67	9.13	-5.36	5.36	57.72	0.07	51.78	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
W Only	1	18.95	9.13	-5.61	5.61	56.19	0.08	51.80	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
W Only	1	19.23	9.13	-5.87	5.87	54.59	0.08	51.83	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
W Only	1	19.51	9.13	-6.12	6.12	52.92	0.09	51.85	Vu < PhiVc/2	ot Reqd 9.6	51.9	0.0	0.0
W Only	1	19.79	9.13	-6.37	6.37	51.18	0.09	51.88	Vu < PhiVc/2	ot Reqd 9.6	51.9	0.0	0.0
W Only	1	20.07	9.13	-6.62	6.62	49.36	0.10	51.91	Vu < PhiVc/2	ot Reqd 9.6	51.9	0.0	0.0
W Only	1	20.34	9.13	-6.88	6.88	47.48	0.11	51.94	Vu < PhiVc/2	ot Reqd 9.6	51.9	0.0	0.0
W Only	1	20.62	9.13	-7.13	7.13	45.53	0.12	51.98	Vu < PhiVc/2	ot Reqd 9.6	52.0	0.0	0.0
W Only	1	20.90	9.13	-7.38	7.38	43.51	0.13	52.02	Vu < PhiVc/2	ot Reqd 9.6	52.0	0.0	0.0
W Only	1	21.18	9.13	-7.63	7.63	41.42	0.14	52.07	Vu < PhiVc/2	ot Reqd 9.6	52.1	0.0	0.0
W Only	1	21.46	9.13	-7.89	7.89	39.26	0.15	52.12	Vu < PhiVc/2	ot Reqd 9.6	52.1	0.0	0.0
W Only	1	21.74	9.13	-8.14	8.14	37.02	0.17	52.18	Vu < PhiVc/2	ot Reqd 9.6	52.2	0.0	0.0
W Only	1	22.02	9.13	-8.39	8.39	34.72	0.18	52.25	Vu < PhiVc/2	ot Reqd 9.6	52.2	0.0	0.0
W Only	1	22.30	9.13	-8.64	8.64	32.35	0.20	52.33	Vu < PhiVc/2	ot Reqd 9.6	52.3	0.0	0.0
W Only	1	22.57	9.13	-8.89	8.89	29.90	0.23	52.42	Vu < PhiVc/2	ot Reqd 9.6	52.4	0.0	0.0
W Only	1	22.85	9.13	-9.15	9.15	27.39	0.25	52.54	Vu < PhiVc/2	ot Reqd 9.6	52.5	0.0	0.0
W Only	1	23.13	9.13	-9.40	9.40	24.81	0.29	52.68	Vu < PhiVc/2	ot Reqd 9.6	52.7	0.0	0.0
W Only	1	23.41	9.13	-9.65	9.65	22.15	0.33	52.86	Vu < PhiVc/2	ot Reqd 9.6	52.9	0.0	0.0
W Only	1	23.69	9.13	-9.90	9.90	19.43	0.39	53.09	Vu < PhiVc/2	ot Reqd 9.6	53.1	0.0	0.0
W Only	1	23.97	9.13	-10.16	10.16	16.63	0.46	53.41	Vu < PhiVc/2	ot Reqd 9.6	53.4	0.0	0.0
W Only	1	24.25	9.13	-10.41	10.41	13.77	0.57	53.86	Vu < PhiVc/2	ot Reqd 9.6	53.9	0.0	0.0
W Only	1	24.52	9.13	-10.66	10.66	10.83	0.75	54.58	Vu < PhiVc/2	ot Reqd 9.6	54.6	0.0	0.0
W Only	1	24.80	9.13	-10.91	10.91	7.82	1.00	55.61	Vu < PhiVc/2	ot Reqd 9.6	55.6	0.0	0.0
W Only	1	25.08	9.13	-11.17	11.17	4.75	1.00	55.61	Vu < PhiVc/2	ot Reqd 9.6	55.6	0.0	0.0
W Only	1	25.36	9.13	-11.42	11.42	1.60	1.00	55.61	Vu < PhiVc/2	ot Reqd 9.6	55.6	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	25.500	73.59	107.82	0.68
Span # 1	1	25.500	73.59	107.82	0.68
+0.50W					
Span # 1	1	25.500	36.80	107.82	0.34
W Only					
Span # 1	1	25.500	73.59	107.82	0.68

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
W Only	1	0.4148	12.750		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

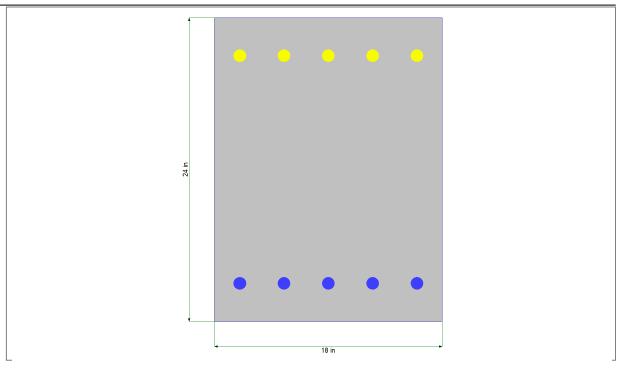
DESCRIPTION: 2B-10**

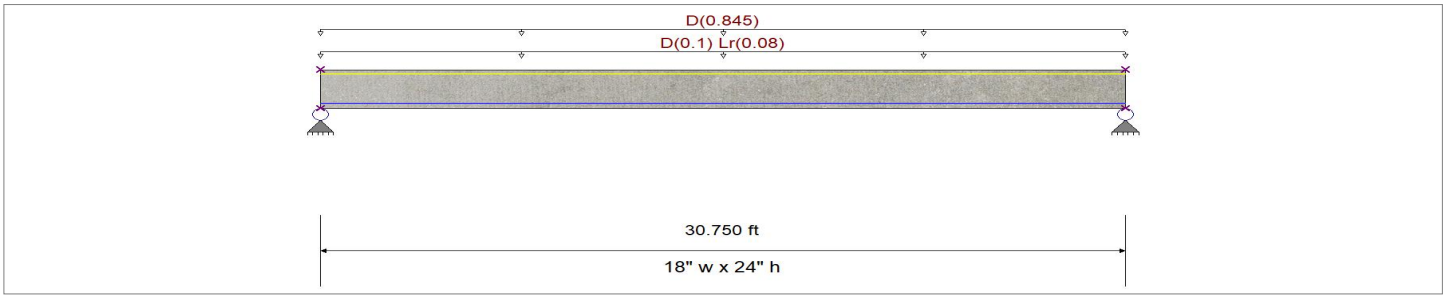
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750
ψ Density	= 145.0 pcf	β 1	=	0.80
λ LtWt Factor	= 1.0			
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 18.0 in, Height = 24.0 in
Span #1 Reinforcing....
5-#8 at 3.0 in from Bottom, from 0.0 to 30.750 ft in this span
5-#8 at 3.0 in from Top, from 0.0 to 30.750 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0250, Lr = 0.020 ksf, Tributary Width = 4.0 ft, (ROOF)
Uniform Load : D = 0.0650 ksf, Tributary Width = 13.0 ft, (MASONRY WALL)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.661** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	228.353	k-ft
Mn * Phi : Allowable	345.436	k-ft
Location of maximum on span	15.403	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.019 in	Ratio =	19168	>=360.0	Lr Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	Lr Only
Max Downward Total Deflection	0.809 in	Ratio =	455	>=240.0	Span: 1 : +D+Lr
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+Lr

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	22.447	22.448
Overall MINimum	1.230	1.230
D Only	21.217	21.218
+D+Lr	22.447	22.448
+D+0.750Lr	22.140	22.140
+0.60D	12.731	12.731

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-10**

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Lr Only	1.230	1.230

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.40D	1	0.00	21.00	29.70	29.70	0.00	1.00	45.49	PhiVc/2 < Vu <= Min 11.5.6.3	60.9	9.2	9.0	
+1.40D	1	0.34	21.00	29.06	29.06	9.87	1.00	45.49	PhiVc/2 < Vu <= Min 11.5.6.3	60.9	9.2	9.0	
+1.40D	1	0.67	21.00	28.41	28.41	19.53	1.00	45.49	PhiVc/2 < Vu <= Min 11.5.6.3	60.9	9.2	9.0	
+1.40D	1	1.01	21.00	27.76	27.76	28.97	1.00	45.49	PhiVc/2 < Vu <= Min 11.5.6.3	60.9	9.2	9.0	
+1.40D	1	1.34	21.00	27.11	27.11	38.19	1.00	45.49	PhiVc/2 < Vu <= Min 11.5.6.3	60.9	9.2	9.0	
+1.40D	1	1.68	21.00	26.46	26.46	47.19	0.98	45.36	PhiVc/2 < Vu <= Min 11.5.6.3	60.8	9.2	9.0	
+1.40D	1	2.02	21.00	25.81	25.81	55.97	0.81	44.07	PhiVc/2 < Vu <= Min 11.5.6.3	59.5	9.2	9.0	
+1.40D	1	2.35	21.00	25.16	25.16	64.53	0.68	43.14	PhiVc/2 < Vu <= Min 11.5.6.3	58.5	9.2	9.0	
+1.40D	1	2.69	21.00	24.51	24.51	72.88	0.59	42.45	PhiVc/2 < Vu <= Min 11.5.6.3	57.8	9.2	9.0	
+1.40D	1	3.02	21.00	23.86	23.86	81.01	0.52	41.91	PhiVc/2 < Vu <= Min 11.5.6.3	57.3	9.2	9.0	
+1.40D	1	3.36	21.00	23.21	23.21	88.92	0.46	41.47	PhiVc/2 < Vu <= Min 11.5.6.3	56.9	9.2	9.0	
+1.40D	1	3.70	21.00	22.56	22.56	96.61	0.41	41.12	PhiVc/2 < Vu <= Min 11.5.6.3	56.5	9.2	9.0	
+1.40D	1	4.03	21.00	21.91	21.91	104.08	0.37	40.82	PhiVc/2 < Vu <= Min 11.5.6.3	56.2	9.2	9.0	
+1.40D	1	4.37	21.00	21.26	21.26	111.34	0.33	40.56	PhiVc/2 < Vu <= Min 11.5.6.3	56.0	9.2	9.0	
+1.40D	1	4.70	21.00	20.61	20.61	118.37	0.30	40.35	PhiVc/2 < Vu <= Min 11.5.6.3	55.7	9.2	9.0	
+1.40D	1	5.04	21.00	19.97	19.97	125.19	0.28	40.16	Vu < PhiVc/2	Not Reqd 9.6	40.2	0.0	0.0
+1.40D	1	5.38	21.00	19.32	19.32	131.79	0.26	39.99	Vu < PhiVc/2	Not Reqd 9.6	40.0	0.0	0.0
+1.40D	1	5.71	21.00	18.67	18.67	138.18	0.24	39.84	Vu < PhiVc/2	Not Reqd 9.6	39.8	0.0	0.0
+1.40D	1	6.05	21.00	18.02	18.02	144.34	0.22	39.71	Vu < PhiVc/2	Not Reqd 9.6	39.7	0.0	0.0
+1.40D	1	6.39	21.00	17.37	17.37	150.29	0.20	39.59	Vu < PhiVc/2	Not Reqd 9.6	39.6	0.0	0.0
+1.40D	1	6.72	21.00	16.72	16.72	156.01	0.19	39.48	Vu < PhiVc/2	Not Reqd 9.6	39.5	0.0	0.0
+1.40D	1	7.06	21.00	16.07	16.07	161.52	0.17	39.38	Vu < PhiVc/2	Not Reqd 9.6	39.4	0.0	0.0
+1.40D	1	7.39	21.00	15.42	15.42	166.81	0.16	39.29	Vu < PhiVc/2	Not Reqd 9.6	39.3	0.0	0.0
+1.40D	1	7.73	21.00	14.77	14.77	171.89	0.15	39.20	Vu < PhiVc/2	Not Reqd 9.6	39.2	0.0	0.0
+1.40D	1	8.07	21.00	14.12	14.12	176.74	0.14	39.12	Vu < PhiVc/2	Not Reqd 9.6	39.1	0.0	0.0
+1.40D	1	8.40	21.00	13.47	13.47	181.38	0.13	39.05	Vu < PhiVc/2	Not Reqd 9.6	39.1	0.0	0.0
+1.40D	1	8.74	21.00	12.82	12.82	185.80	0.12	38.98	Vu < PhiVc/2	Not Reqd 9.6	39.0	0.0	0.0
+1.40D	1	9.07	21.00	12.17	12.17	190.00	0.11	38.92	Vu < PhiVc/2	Not Reqd 9.6	38.9	0.0	0.0
+1.40D	1	9.41	21.00	11.52	11.52	193.98	0.10	38.86	Vu < PhiVc/2	Not Reqd 9.6	38.9	0.0	0.0
+1.40D	1	9.75	21.00	10.88	10.88	197.74	0.10	38.80	Vu < PhiVc/2	Not Reqd 9.6	38.8	0.0	0.0
+1.40D	1	10.08	21.00	10.23	10.23	201.29	0.09	38.75	Vu < PhiVc/2	Not Reqd 9.6	38.7	0.0	0.0
+1.40D	1	10.42	21.00	9.58	9.58	204.62	0.08	38.69	Vu < PhiVc/2	Not Reqd 9.6	38.7	0.0	0.0
+1.40D	1	10.75	21.00	8.93	8.93	207.73	0.08	38.65	Vu < PhiVc/2	Not Reqd 9.6	38.6	0.0	0.0
+1.40D	1	11.09	21.00	8.28	8.28	210.62	0.07	38.60	Vu < PhiVc/2	Not Reqd 9.6	38.6	0.0	0.0
+1.40D	1	11.43	21.00	7.63	7.63	213.29	0.06	38.55	Vu < PhiVc/2	Not Reqd 9.6	38.6	0.0	0.0
+1.40D	1	11.76	21.00	6.98	6.98	215.75	0.06	38.51	Vu < PhiVc/2	Not Reqd 9.6	38.5	0.0	0.0
+1.40D	1	12.10	21.00	6.33	6.33	217.98	0.05	38.46	Vu < PhiVc/2	Not Reqd 9.6	38.5	0.0	0.0
+1.40D	1	12.43	21.00	5.68	5.68	220.00	0.05	38.42	Vu < PhiVc/2	Not Reqd 9.6	38.4	0.0	0.0
+1.40D	1	12.77	21.00	5.03	5.03	221.80	0.04	38.38	Vu < PhiVc/2	Not Reqd 9.6	38.4	0.0	0.0
+1.40D	1	13.11	21.00	4.38	4.38	223.38	0.03	38.34	Vu < PhiVc/2	Not Reqd 9.6	38.3	0.0	0.0
+1.40D	1	13.44	21.00	3.73	3.73	224.75	0.03	38.30	Vu < PhiVc/2	Not Reqd 9.6	38.3	0.0	0.0
+1.40D	1	13.78	21.00	3.08	3.08	225.89	0.02	38.27	Vu < PhiVc/2	Not Reqd 9.6	38.3	0.0	0.0
+1.40D	1	14.11	21.00	2.43	2.43	226.82	0.02	38.23	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	14.45	21.00	1.79	1.79	227.53	0.01	38.19	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	14.79	21.00	1.14	1.14	228.02	0.01	38.15	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	15.12	21.00	0.49	0.49	228.29	0.00	38.12	Vu < PhiVc/2	Not Reqd 9.6	38.1	0.0	0.0
+1.40D	1	15.46	21.00	-0.16	0.16	228.35	0.00	38.10	Vu < PhiVc/2	Not Reqd 9.6	38.1	0.0	0.0
+1.40D	1	15.80	21.00	-0.81	0.81	228.18	0.01	38.13	Vu < PhiVc/2	Not Reqd 9.6	38.1	0.0	0.0
+1.40D	1	16.13	21.00	-1.46	1.46	227.80	0.01	38.17	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	16.47	21.00	-2.11	2.11	227.20	0.02	38.21	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	16.80	21.00	-2.76	2.76	226.38	0.02	38.25	Vu < PhiVc/2	Not Reqd 9.6	38.2	0.0	0.0
+1.40D	1	17.14	21.00	-3.41	3.41	225.35	0.03	38.28	Vu < PhiVc/2	Not Reqd 9.6	38.3	0.0	0.0
+1.40D	1	17.48	21.00	-4.06	4.06	224.09	0.03	38.32	Vu < PhiVc/2	Not Reqd 9.6	38.3	0.0	0.0
+1.40D	1	17.81	21.00	-4.71	4.71	222.62	0.04	38.36	Vu < PhiVc/2	Not Reqd 9.6	38.4	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-10**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.40D	1	18.15	21.00	-5.36	5.36	220.93	0.04	38.40	Vu < PhiVc/2	ot Reqd 9.6	38.4	0.0	0.0
+1.40D	1	18.48	21.00	-6.01	6.01	219.02	0.05	38.44	Vu < PhiVc/2	ot Reqd 9.6	38.4	0.0	0.0
+1.40D	1	18.82	21.00	-6.66	6.66	216.89	0.05	38.49	Vu < PhiVc/2	ot Reqd 9.6	38.5	0.0	0.0
+1.40D	1	19.16	21.00	-7.30	7.30	214.55	0.06	38.53	Vu < PhiVc/2	ot Reqd 9.6	38.5	0.0	0.0
+1.40D	1	19.49	21.00	-7.95	7.95	211.98	0.07	38.57	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.40D	1	19.83	21.00	-8.60	8.60	209.20	0.07	38.62	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.40D	1	20.16	21.00	-9.25	9.25	206.20	0.08	38.67	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.40D	1	20.50	21.00	-9.90	9.90	202.98	0.09	38.72	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.40D	1	20.84	21.00	-10.55	10.55	199.54	0.09	38.77	Vu < PhiVc/2	ot Reqd 9.6	38.8	0.0	0.0
+1.40D	1	21.17	21.00	-11.20	11.20	195.89	0.10	38.83	Vu < PhiVc/2	ot Reqd 9.6	38.8	0.0	0.0
+1.40D	1	21.51	21.00	-11.85	11.85	192.02	0.11	38.89	Vu < PhiVc/2	ot Reqd 9.6	38.9	0.0	0.0
+1.40D	1	21.84	21.00	-12.50	12.50	187.92	0.12	38.95	Vu < PhiVc/2	ot Reqd 9.6	39.0	0.0	0.0
+1.40D	1	22.18	21.00	-13.15	13.15	183.62	0.13	39.02	Vu < PhiVc/2	ot Reqd 9.6	39.0	0.0	0.0
+1.40D	1	22.52	21.00	-13.80	13.80	179.09	0.13	39.09	Vu < PhiVc/2	ot Reqd 9.6	39.1	0.0	0.0
+1.40D	1	22.85	21.00	-14.45	14.45	174.34	0.15	39.16	Vu < PhiVc/2	ot Reqd 9.6	39.2	0.0	0.0
+1.40D	1	23.19	21.00	-15.10	15.10	169.38	0.16	39.24	Vu < PhiVc/2	ot Reqd 9.6	39.2	0.0	0.0
+1.40D	1	23.52	21.00	-15.75	15.75	164.20	0.17	39.33	Vu < PhiVc/2	ot Reqd 9.6	39.3	0.0	0.0
+1.40D	1	23.86	21.00	-16.39	16.39	158.80	0.18	39.43	Vu < PhiVc/2	ot Reqd 9.6	39.4	0.0	0.0
+1.40D	1	24.20	21.00	-17.04	17.04	153.18	0.19	39.53	Vu < PhiVc/2	ot Reqd 9.6	39.5	0.0	0.0
+1.40D	1	24.53	21.00	-17.69	17.69	147.34	0.21	39.64	Vu < PhiVc/2	ot Reqd 9.6	39.6	0.0	0.0
+1.40D	1	24.87	21.00	-18.34	18.34	141.28	0.23	39.77	Vu < PhiVc/2	ot Reqd 9.6	39.8	0.0	0.0
+1.40D	1	25.20	21.00	-18.99	18.99	135.01	0.25	39.91	Vu < PhiVc/2	ot Reqd 9.6	39.9	0.0	0.0
+1.40D	1	25.54	21.00	-19.64	19.64	128.52	0.27	40.07	Vu < PhiVc/2	ot Reqd 9.6	40.1	0.0	0.0
+1.40D	1	25.88	21.00	-20.29	20.29	121.81	0.29	40.25	PhiVc/2 < Vu <=	Min 11.5.6.3	55.6	9.2	9.0
+1.40D	1	26.21	21.00	-20.94	20.94	114.88	0.32	40.45	PhiVc/2 < Vu <=	Min 11.5.6.3	55.9	9.2	9.0
+1.40D	1	26.55	21.00	-21.59	21.59	107.74	0.35	40.69	PhiVc/2 < Vu <=	Min 11.5.6.3	56.1	9.2	9.0
+1.40D	1	26.89	21.00	-22.24	22.24	100.37	0.39	40.96	PhiVc/2 < Vu <=	Min 11.5.6.3	56.4	9.2	9.0
+1.40D	1	27.22	21.00	-22.89	22.89	92.79	0.43	41.29	PhiVc/2 < Vu <=	Min 11.5.6.3	56.7	9.2	9.0
+1.40D	1	27.56	21.00	-23.54	23.54	84.99	0.48	41.68	PhiVc/2 < Vu <=	Min 11.5.6.3	57.1	9.2	9.0
+1.40D	1	27.89	21.00	-24.19	24.19	76.97	0.55	42.16	PhiVc/2 < Vu <=	Min 11.5.6.3	57.6	9.2	9.0
+1.40D	1	28.23	21.00	-24.83	24.83	68.73	0.63	42.77	PhiVc/2 < Vu <=	Min 11.5.6.3	58.2	9.2	9.0
+1.40D	1	28.57	21.00	-25.48	25.48	60.28	0.74	43.57	PhiVc/2 < Vu <=	Min 11.5.6.3	59.0	9.2	9.0
+1.40D	1	28.90	21.00	-26.13	26.13	51.60	0.89	44.65	PhiVc/2 < Vu <=	Min 11.5.6.3	60.1	9.2	9.0
+1.40D	1	29.24	21.00	-26.78	26.78	42.71	1.00	45.49	PhiVc/2 < Vu <=	Min 11.5.6.3	60.9	9.2	9.0
+1.40D	1	29.57	21.00	-27.43	27.43	33.60	1.00	45.49	PhiVc/2 < Vu <=	Min 11.5.6.3	60.9	9.2	9.0
+1.40D	1	29.91	21.00	-28.08	28.08	24.27	1.00	45.49	PhiVc/2 < Vu <=	Min 11.5.6.3	60.9	9.2	9.0
+1.40D	1	30.25	21.00	-28.73	28.73	14.73	1.00	45.49	PhiVc/2 < Vu <=	Min 11.5.6.3	60.9	9.2	9.0
+1.40D	1	30.58	21.00	-29.38	29.38	4.96	1.00	45.49	PhiVc/2 < Vu <=	Min 11.5.6.3	60.9	9.2	9.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	30.750	228.35	345.44	0.66
+1.40D					
Span # 1	1	30.750	228.35	345.44	0.66
+1.20D+0.50Lr					
Span # 1	1	30.750	200.46	345.44	0.58
+1.20D					
Span # 1	1	30.750	195.73	345.44	0.57
+1.20D+1.60Lr					
Span # 1	1	30.750	210.86	345.44	0.61
+0.90D					
Span # 1	1	30.750	146.80	345.44	0.42

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+Lr	1	0.8093	15.375		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

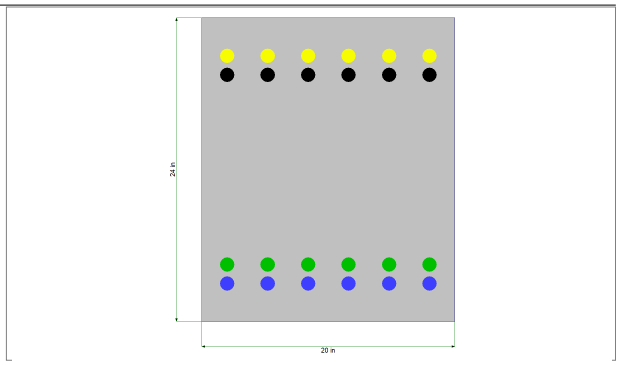
DESCRIPTION: 2B-11**

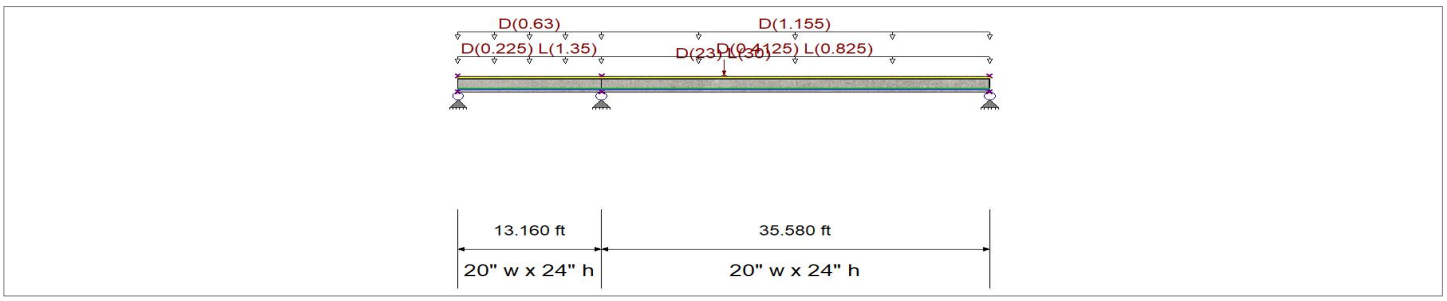
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		4
			Number of Resisting Legs Per Stirrup	=	4.0





Cross Section & Reinforcing Details

Rectangular Section, Width = 20.0 in, Height = 24.0 in

Span #1 Reinforcing....
- 6-#9 at 3.0 in from Bottom, from 0.0 to 13.160 ft in this span
- 6-#9 at 4.50 in from Top, from 0.0 to 13.160 ft in this span
- 6-#9 at 4.50 in from Bottom, from 0.0 to 13.160 ft in this
- 6-#9 at 3.0 in from Top, from 0.0 to 13.160 ft in this spa

Span #2 Reinforcing....
- 6-#9 at 3.0 in from Bottom, from 0.0 to 35.580 ft in this span
- 6-#9 at 4.50 in from Top, from 0.0 to 35.580 ft in this span
- 6-#9 at 4.50 in from Bottom, from 0.0 to 35.580 ft in this
- 6-#9 at 3.0 in from Top, from 0.0 to 35.580 ft in this spa

Beam self weight calculated and added to loads

Load for Span Number 1
- Uniform Load : D = 0.0250, L = 0.150 ksf, Tributary Width = 9.0 ft, (SUPERIMPOSED LOAD)
- Uniform Load : D = 0.070 ksf, Tributary Width = 9.0 ft, (PRECAST JOIST)

Load for Span Number 2
- Uniform Load : D = 0.0250, L = 0.050 ksf, Tributary Width = 16.50 ft, (SUPERIMPOSED LOAD)
- Uniform Load : D = 0.070 ksf, Tributary Width = 16.50 ft, (PRECAST JOIST)
- Point Load : D = 23.0, L = 30.0 k @ 11.210 ft, (REACTION 2B-15)

DESIGN SUMMARY

Check As Max Limits!

Maximum Bending Stress Ratio =	**0.867**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	-815.76	k-ft
Mn * Phi : Allowable	940.90	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.486 in	Ratio =	879	>=360.0	L Only
Max Upward Transient Deflection	-0.049 in	Ratio =	3233	>=360.0	L Only
Max Downward Total Deflection	1.288 in	Ratio =	331	>=240.0	Span: 2 : +D+L
Max Upward Total Deflection	-0.134 in	Ratio =	1174	>=240.0	Span: 2 : +D+L

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-11**

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-27.809	167.479	51.031
Overall MINimum	-9.758	58.782	17.234
D Only	-18.114	97.921	33.774
+D+L	-27.809	167.479	51.031
+D+0.750L	-25.372	150.071	46.722
+0.60D	-10.890	58.782	20.256
L Only	-9.758	69.644	17.234

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	21.00	-37.21	37.21	0.00	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	0.32	21.00	-38.42	38.42	12.19	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	0.64	21.00	-39.64	39.64	24.77	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	0.97	21.00	-40.85	40.85	37.73	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	1.29	21.00	-42.06	42.06	51.10	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	1.61	21.00	-43.28	43.28	64.85	1.00	64.82	PhiVc/2 < Vu <= Min 9.6.3.1	115.2	10.5	10.0	
+1.20D+1.60L	1	1.93	21.00	-44.49	44.49	78.99	0.99	64.50	PhiVc/2 < Vu <= Min 9.6.3.1	114.9	10.5	10.0	
+1.20D+1.60L	1	2.26	21.00	-45.70	45.70	93.52	0.86	61.56	PhiVc/2 < Vu <= Min 9.6.3.1	112.0	10.5	10.0	
+1.20D+1.60L	1	2.58	21.00	-46.92	46.92	108.45	0.76	59.35	PhiVc/2 < Vu <= Min 9.6.3.1	109.8	10.5	10.0	
+1.20D+1.60L	1	2.90	21.00	-48.13	48.13	123.77	0.68	57.63	PhiVc/2 < Vu <= Min 9.6.3.1	108.0	10.5	10.0	
+1.20D+1.60L	1	3.22	21.00	-49.35	49.35	139.47	0.62	56.25	PhiVc/2 < Vu <= Min 9.6.3.1	106.7	10.5	10.0	
+1.20D+1.60L	1	3.55	21.00	-50.56	50.56	155.57	0.57	55.12	PhiVc/2 < Vu <= Min 9.6.3.1	105.5	10.5	10.0	
+1.20D+1.60L	1	3.87	21.00	-51.77	51.77	172.06	0.53	54.17	PhiVc/2 < Vu <= Min 9.6.3.1	104.6	10.5	10.0	
+1.20D+1.60L	1	4.19	21.00	-52.99	52.99	188.94	0.49	53.36	PhiVc/2 < Vu <= Min 9.6.3.1	103.8	10.5	10.0	
+1.20D+1.60L	1	4.51	21.00	-54.20	54.20	206.22	0.46	52.67	PhiVc < Vu	1.531	103.1	10.5	10.0
+1.20D+1.60L	1	4.83	21.00	-55.41	55.41	223.88	0.43	52.07	PhiVc < Vu	3.348	102.5	10.5	10.0
+1.20D+1.60L	1	5.16	21.00	-56.63	56.63	241.93	0.41	51.54	PhiVc < Vu	5.091	101.9	10.5	10.0
+1.20D+1.60L	1	5.48	21.00	-57.84	57.84	260.38	0.39	51.07	PhiVc < Vu	6.774	101.5	10.5	10.0
+1.20D+1.60L	1	5.80	21.00	-59.06	59.06	279.22	0.37	50.65	PhiVc < Vu	8.407	101.0	10.5	10.0
+1.20D+1.60L	1	6.12	21.00	-60.27	60.27	298.45	0.35	50.27	PhiVc < Vu	9.997	100.7	10.5	10.0
+1.20D+1.60L	1	6.45	21.00	-61.48	61.48	318.06	0.34	49.93	PhiVc < Vu	11.551	100.3	10.5	10.0
+1.20D+1.60L	1	6.77	21.00	-62.70	62.70	338.08	0.32	49.62	PhiVc < Vu	13.074	100.0	10.5	10.0
+1.20D+1.60L	1	7.09	21.00	-63.91	63.91	358.48	0.31	49.34	PhiVc < Vu	14.570	99.7	10.5	10.0
+1.20D+1.60L	1	7.41	21.00	-65.12	65.12	379.27	0.30	49.08	PhiVc < Vu	16.042	99.5	10.5	10.0
+1.20D+1.60L	1	7.73	21.00	-66.34	66.34	400.45	0.29	48.84	PhiVc < Vu	17.494	99.2	10.5	10.0
+1.20D+1.60L	1	8.06	21.00	-67.55	67.55	422.03	0.28	48.62	PhiVc < Vu	18.928	99.0	10.5	10.0
+1.20D+1.60L	1	8.38	21.00	-68.76	68.76	444.00	0.27	48.42	PhiVc < Vu	20.346	98.8	10.5	10.0
+1.20D+1.60L	1	8.70	21.00	-69.98	69.98	466.35	0.26	48.23	PhiVc < Vu	21.750	98.6	10.5	10.0
+1.20D+1.60L	1	9.02	21.00	-71.19	71.19	489.10	0.25	48.05	PhiVc < Vu	23.141	98.5	10.5	10.0
+1.20D+1.60L	1	9.35	21.00	-72.41	72.41	512.24	0.25	47.89	PhiVc < Vu	24.520	98.3	10.5	10.0
+1.20D+1.60L	1	9.67	21.00	-73.62	73.62	535.77	0.24	47.73	PhiVc < Vu	25.889	98.1	10.5	10.0
+1.20D+1.60L	1	9.99	21.00	-74.83	74.83	559.69	0.23	47.58	PhiVc < Vu	27.249	98.0	10.5	10.0
+1.20D+1.60L	1	10.31	21.00	-76.05	76.05	584.01	0.23	47.45	PhiVc < Vu	28.60	97.8	10.5	10.0
+1.20D+1.60L	1	10.64	21.00	-77.26	77.26	608.71	0.22	47.32	PhiVc < Vu	29.943	97.7	10.5	10.0
+1.20D+1.60L	1	10.96	21.00	-78.47	78.47	633.81	0.22	47.20	PhiVc < Vu	31.279	97.6	10.5	10.0
+1.20D+1.60L	1	11.28	21.00	-79.69	79.69	659.29	0.21	47.08	PhiVc < Vu	32.609	97.5	10.5	10.0
+1.20D+1.60L	1	11.60	21.00	-80.90	80.90	685.17	0.21	46.97	PhiVc < Vu	33.933	97.4	10.5	10.0
+1.20D+1.60L	1	11.92	21.00	-82.12	82.12	711.44	0.20	46.87	PhiVc < Vu	35.251	97.3	10.5	10.0
+1.20D+1.60L	1	12.25	21.00	-83.33	83.33	738.10	0.20	46.77	PhiVc < Vu	36.564	97.2	10.5	10.0
+1.20D+1.60L	1	12.57	21.00	-84.54	84.54	765.15	0.19	46.67	PhiVc < Vu	37.872	97.1	10.5	10.0
+1.20D+1.60L	1	12.89	21.00	-85.76	85.76	792.60	0.19	46.58	PhiVc < Vu	39.176	97.0	10.5	10.0
+1.20D+1.60L	2	13.31	21.00	141.42	141.42	795.19	0.31	49.32	Vs>(4bdf'c^.5)	92.10	150.1	5.3	5.0
+1.20D+1.60L	2	14.18	21.00	138.13	138.13	673.39	0.36	50.40	PhiVc < Vu	87.732	151.2	5.7	5.0
+1.20D+1.60L	2	15.05	21.00	134.83	134.83	554.47	0.43	51.90	PhiVc < Vu	82.939	152.7	6.1	5.0
+1.20D+1.60L	2	15.92	21.00	131.54	131.54	438.42	0.53	54.13	PhiVc < Vu	77.406	154.9	6.5	5.0
+1.20D+1.60L	2	16.79	21.00	128.25	128.25	325.24	0.69	57.85	PhiVc < Vu	70.399	158.6	7.2	5.0
+1.20D+1.60L	2	17.66	21.00	124.95	124.95	214.93	1.00	64.82	PhiVc < Vu	60.130	165.6	8.4	5.0
+1.20D+1.60L	2	18.53	21.00	121.66	121.66	107.48	1.00	64.82	PhiVc < Vu	56.836	165.6	8.9	5.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-11**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	2	19.40	21.00	118.36	118.36	2.92	1.00	64.82	PhiVc < Vu	53.541	165.6	9.4	5.0
+1.20D+1.60L	2	20.28	21.00	115.07	115.07	98.78	1.00	64.82	PhiVc < Vu	50.247	165.6	10.0	5.0
+1.20D+1.60L	2	21.15	21.00	111.77	111.77	197.61	0.99	64.59	PhiVc < Vu	47.181	165.4	10.5	5.0
+1.20D+1.60L	2	22.02	21.00	108.48	108.48	293.57	0.65	56.87	PhiVc < Vu	51.608	157.7	9.8	5.0
+1.20D+1.60L	2	22.89	21.00	105.18	105.18	386.66	0.48	53.03	PhiVc < Vu	52.152	153.8	9.7	5.0
+1.20D+1.60L	2	23.76	21.00	101.89	101.89	476.87	0.37	50.73	PhiVc < Vu	51.156	151.5	9.9	5.0
+1.20D+1.60L	2	24.63	21.00	22.99	22.99	544.35	0.07	43.98	PhiVc/2 < Vu <=	Min 9.6.3.1	94.4	10.5	10.0
+1.20D+1.60L	2	25.50	21.00	19.70	19.70	562.95	0.06	43.70	Vu < PhiVc/2	ot Reqd 9.6	43.7	0.0	0.0
+1.40D	2	26.38	21.00	16.89	16.89	340.25	0.09	44.28	Vu < PhiVc/2	ot Reqd 9.6	44.3	0.0	0.0
+1.40D	2	27.25	21.00	14.39	14.39	353.88	0.07	43.92	Vu < PhiVc/2	ot Reqd 9.6	43.9	0.0	0.0
+1.40D	2	28.12	21.00	11.89	11.89	365.33	0.06	43.60	Vu < PhiVc/2	ot Reqd 9.6	43.6	0.0	0.0
+1.40D	2	28.99	21.00	9.39	9.39	374.60	0.04	43.31	Vu < PhiVc/2	ot Reqd 9.6	43.3	0.0	0.0
+1.40D	2	29.86	21.00	6.89	6.89	381.69	0.03	43.03	Vu < PhiVc/2	ot Reqd 9.6	43.0	0.0	0.0
+1.40D	2	30.73	21.00	4.38	4.38	386.60	0.02	42.77	Vu < PhiVc/2	ot Reqd 9.6	42.8	0.0	0.0
+1.20D+1.60L	2	31.60	21.00	-3.36	3.36	612.78	0.01	42.54	Vu < PhiVc/2	ot Reqd 9.6	42.5	0.0	0.0
+1.20D+1.60L	2	32.47	21.00	-6.66	6.66	608.41	0.02	42.75	Vu < PhiVc/2	ot Reqd 9.6	42.8	0.0	0.0
+1.20D+1.60L	2	33.35	21.00	-9.95	9.95	601.18	0.03	42.97	Vu < PhiVc/2	ot Reqd 9.6	43.0	0.0	0.0
+1.20D+1.60L	2	34.22	21.00	-13.25	13.25	591.07	0.04	43.20	Vu < PhiVc/2	ot Reqd 9.6	43.2	0.0	0.0
+1.20D+1.60L	2	35.09	21.00	-16.54	16.54	578.09	0.05	43.45	Vu < PhiVc/2	ot Reqd 9.6	43.4	0.0	0.0
+1.20D+1.60L	2	35.96	21.00	-19.84	19.84	562.25	0.06	43.71	Vu < PhiVc/2	ot Reqd 9.6	43.7	0.0	0.0
+1.20D+1.60L	2	36.83	21.00	-23.13	23.13	543.53	0.07	44.00	PhiVc/2 < Vu <=	Min 9.6.3.1	94.4	10.5	10.0
+1.20D+1.60L	2	37.70	21.00	-26.42	26.42	521.94	0.09	44.31	PhiVc/2 < Vu <=	Min 9.6.3.1	94.7	10.5	10.0
+1.20D+1.60L	2	38.57	21.00	-29.72	29.72	497.48	0.10	44.67	PhiVc/2 < Vu <=	Min 9.6.3.1	95.1	10.5	10.0
+1.20D+1.60L	2	39.45	21.00	-33.01	33.01	470.15	0.12	45.09	PhiVc/2 < Vu <=	Min 9.6.3.1	95.5	10.5	10.0
+1.20D+1.60L	2	40.32	21.00	-36.31	36.31	439.95	0.14	45.57	PhiVc/2 < Vu <=	Min 9.6.3.1	96.0	10.5	10.0
+1.20D+1.60L	2	41.19	21.00	-39.60	39.60	406.88	0.17	46.15	PhiVc/2 < Vu <=	Min 9.6.3.1	96.6	10.5	10.0
+1.20D+1.60L	2	42.06	21.00	-42.90	42.90	370.93	0.20	46.87	PhiVc/2 < Vu <=	Min 9.6.3.1	97.3	10.5	10.0
+1.20D+1.60L	2	42.93	21.00	-46.19	46.19	332.12	0.24	47.80	PhiVc/2 < Vu <=	Min 9.6.3.1	98.2	10.5	10.0
+1.20D+1.60L	2	43.80	21.00	-49.49	49.49	290.43	0.30	49.03	PhiVc < Vu	0.4568	99.4	10.5	10.0
+1.20D+1.60L	2	44.67	21.00	-52.78	52.78	245.88	0.38	50.77	PhiVc < Vu	2.008	101.2	10.5	10.0
+1.20D+1.60L	2	45.55	21.00	-56.08	56.08	198.45	0.49	53.45	PhiVc < Vu	2.629	103.8	10.5	10.0
+1.20D+1.60L	2	46.42	21.00	-59.37	59.37	148.16	0.70	58.10	PhiVc < Vu	1.271	108.5	10.5	10.0
+1.20D+1.60L	2	47.29	21.00	-62.66	62.66	94.99	1.00	64.82	PhiVc/2 < Vu <=	Min 9.6.3.1	115.2	10.5	10.0
+1.20D+1.60L	2	48.16	21.00	-65.96	65.96	38.95	1.00	64.82	PhiVc < Vu	1.139	115.2	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	13.160	-811.11	940.90	0.86
Span # 2	2	35.580	-815.76	940.90	0.87
+1.40D					
Span # 1	1	13.160	-491.99	940.90	0.52
Span # 2	2	35.580	-494.67	940.90	0.53
+1.20D+1.60L					
Span # 1	1	13.160	-811.11	940.90	0.86
Span # 2	2	35.580	-815.76	940.90	0.87
+1.20D+0.50L					
Span # 1	1	13.160	-543.39	940.90	0.58
Span # 2	2	35.580	-546.43	940.90	0.58
+1.20D					
Span # 1	1	13.160	-421.70	940.90	0.45
Span # 2	2	35.580	-424.00	940.90	0.45
+0.90D					
Span # 1	1	13.160	-316.28	940.90	0.34
Span # 2	2	35.580	-318.00	940.90	0.34

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0325	13.668	+D+L	-0.1344	7.708
+D+L	2	1.2883	18.807		0.0000	7.708

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

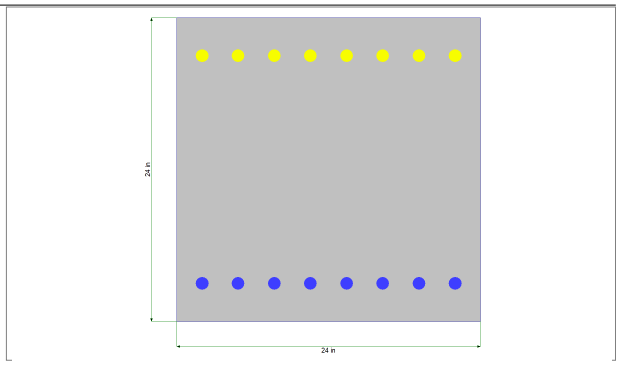
DESCRIPTION: 2B-13**

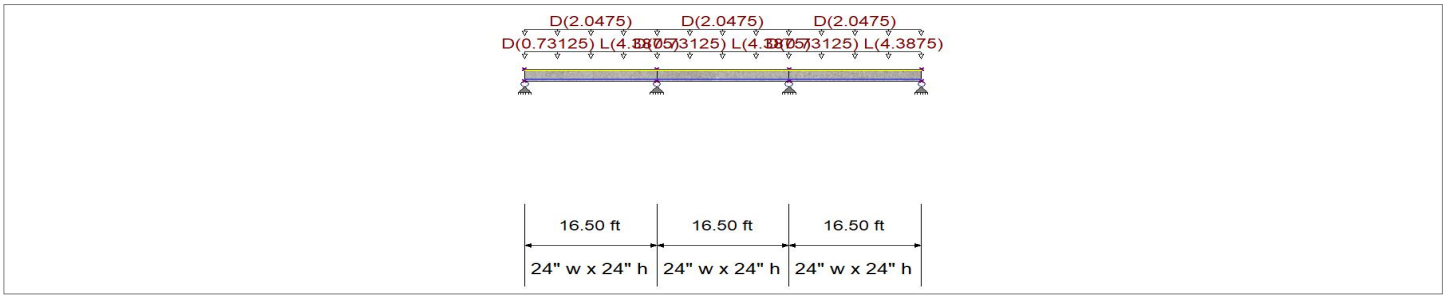
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β 1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	4.0	





Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 24.0 in

Span #1 Reinforcing....
8-#8 at 3.0 in from Bottom, from 0.0 to 16.50 ft in this span
8-#8 at 3.0 in from Top, from 0.0 to 16.50 ft in this span

Span #2 Reinforcing....
8-#8 at 3.0 in from Bottom, from 0.0 to 16.50 ft in this span
8-#8 at 3.0 in from Top, from 0.0 to 16.50 ft in this span

Span #3 Reinforcing....
8-#8 at 3.0 in from Bottom, from 0.0 to 16.50 ft in this span
8-#8 at 3.0 in from Top, from 0.0 to 16.50 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.150 ksf, Tributary Width = 29.250 ft, (SUPERIMPOSED LOAD)
Uniform Load : D = 0.070 ksf, Tributary Width = 29.250 ft, (PRECAST JOIST)

Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.150 ksf, Tributary Width = 29.250 ft, (SUPERIMPOSED LOAD)
Uniform Load : D = 0.070 ksf, Tributary Width = 29.250 ft, (PRECAST JOIST)

Load for Span Number 3
Uniform Load : D = 0.0250, L = 0.150 ksf, Tributary Width = 29.250 ft, (SUPERIMPOSED LOAD)
Uniform Load : D = 0.070 ksf, Tributary Width = 29.250 ft, (PRECAST JOIST)

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-13**

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.551** : 1

Section used for this span	**Typical Section**	
Mu : Applied	-300.850	k-ft
Mn * Phi : Allowable	546.27	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 3	

Maximum Deflection

Max Downward Transient Deflection	0.035 in	Ratio =	5679	>=360.0	L Only
Max Upward Transient Deflection	-0.002 in	Ratio =	106069	>=360.0	L Only
Max Downward Total Deflection	0.105 in	Ratio =	1879	>=240.0	Span: 3 : +D+L
Max Upward Total Deflection	-0.005 in	Ratio =	37936	>=240.0	Span: 3 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	51.346	140.374	140.374	51.346
Overall MINimum	13.301	36.577	36.577	13.301
D Only	22.168	60.961	60.961	22.168
+D+L	51.346	140.374	140.374	51.346
+D+0.750L	44.117	120.455	120.455	44.117
+0.60D	13.301	36.577	36.577	13.301
L Only	29.023	79.568	79.568	29.023

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	21.00	72.93	72.93	0.00	1.00	62.63	PhiVc < Vu	10.299	90.4	10.5	10.0
+1.20D+1.60L	1	0.66	21.00	65.64	65.64	45.73	1.00	62.63	PhiVc < Vu	3.006	90.4	10.5	10.0
+1.20D+1.60L	1	1.32	21.00	58.35	58.35	86.64	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	1	1.98	21.00	51.05	51.05	122.75	0.73	59.41	PhiVc/2 < Vu <=	Min 9.6.3.1	87.1	10.5	10.0
+1.20D+1.60L	1	2.64	21.00	43.76	43.76	154.04	0.50	56.68	PhiVc/2 < Vu <=	Min 9.6.3.1	84.4	10.5	10.0
+1.20D+1.60L	1	3.30	21.00	36.47	36.47	180.51	0.35	54.97	PhiVc/2 < Vu <=	Min 9.6.3.1	82.7	10.5	10.0
+1.20D+1.60L	1	3.96	21.00	29.17	29.17	202.17	0.25	53.78	PhiVc/2 < Vu <=	Min 9.6.3.1	81.5	10.5	10.0
+1.20D+1.60L	1	4.62	21.00	21.88	21.88	219.02	0.17	52.86	Vu < PhiVc/2	ɔt Reqd 9.6	52.9	0.0	0.0
+1.20D+1.60L	1	5.28	21.00	14.59	14.59	231.05	0.11	52.09	Vu < PhiVc/2	ɔt Reqd 9.6	52.1	0.0	0.0
+1.20D+1.60L	1	5.94	21.00	7.29	7.29	238.27	0.05	51.42	Vu < PhiVc/2	ɔt Reqd 9.6	51.4	0.0	0.0
+1.20D+1.60L	1	6.60	21.00	0.00	0.00	240.68	0.00	50.78	Vu < PhiVc/2	ɔt Reqd 9.6	50.8	0.0	0.0
+1.20D+1.60L	1	7.26	21.00	-7.29	7.29	238.27	0.05	51.42	Vu < PhiVc/2	ɔt Reqd 9.6	51.4	0.0	0.0
+1.20D+1.60L	1	7.92	21.00	-14.59	14.59	231.05	0.11	52.09	Vu < PhiVc/2	ɔt Reqd 9.6	52.1	0.0	0.0
+1.20D+1.60L	1	8.58	21.00	-21.88	21.88	219.02	0.17	52.86	Vu < PhiVc/2	ɔt Reqd 9.6	52.9	0.0	0.0
+1.20D+1.60L	1	9.24	21.00	-29.17	29.17	202.17	0.25	53.78	PhiVc/2 < Vu <=	Min 9.6.3.1	81.5	10.5	10.0
+1.20D+1.60L	1	9.90	21.00	-36.47	36.47	180.51	0.35	54.97	PhiVc/2 < Vu <=	Min 9.6.3.1	82.7	10.5	10.0
+1.20D+1.60L	1	10.56	21.00	-43.76	43.76	154.04	0.50	56.68	PhiVc/2 < Vu <=	Min 9.6.3.1	84.4	10.5	10.0
+1.20D+1.60L	1	11.22	21.00	-51.05	51.05	122.75	0.73	59.41	PhiVc/2 < Vu <=	Min 9.6.3.1	87.1	10.5	10.0
+1.20D+1.60L	1	11.88	21.00	-58.35	58.35	86.64	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	1	12.54	21.00	-65.64	65.64	45.73	1.00	62.63	PhiVc < Vu	3.006	118.1	10.5	5.0
+1.20D+1.60L	1	13.20	21.00	-72.93	72.93	0.00	1.00	62.63	PhiVc < Vu	10.299	118.1	10.5	5.0
+1.20D+1.60L	1	13.86	21.00	-80.23	80.23	50.54	1.00	62.63	PhiVc < Vu	17.592	118.1	10.5	5.0
+1.20D+1.60L	1	14.52	21.00	-87.52	87.52	105.90	1.00	62.63	PhiVc < Vu	24.886	118.1	10.5	5.0
+1.20D+1.60L	1	15.18	21.00	-94.81	94.81	166.07	1.00	62.62	PhiVc < Vu	32.189	118.1	8.6	5.0
+1.20D+1.60L	1	15.84	21.00	-102.11	102.11	231.05	0.77	59.95	PhiVc < Vu	42.158	115.4	6.6	5.0
+1.20D+1.60L	2	16.50	21.00	91.17	91.17	300.85	0.53	57.07	PhiVc < Vu	34.098	112.5	8.1	5.0
+1.20D+1.60L	2	17.16	21.00	83.87	83.87	243.09	0.60	57.94	PhiVc < Vu	25.934	113.4	10.5	5.0
+1.20D+1.60L	2	17.82	21.00	76.58	76.58	190.14	0.70	59.14	PhiVc < Vu	17.443	114.6	10.5	5.0
+1.20D+1.60L	2	18.48	21.00	69.29	69.29	142.00	0.85	60.90	PhiVc < Vu	8.384	116.3	10.5	5.0
+1.20D+1.60L	2	19.14	21.00	61.99	61.99	98.68	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	19.80	21.00	54.70	54.70	60.17	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	20.46	21.00	47.41	47.41	26.47	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	21.12	21.00	40.11	40.11	2.41	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	21.78	21.00	32.82	32.82	26.47	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-13**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	2	22.44	21.00	25.53	25.53	45.73	0.98	62.36	Vu < PhiVc/2	ot Reqd 9.6	62.4	0.0	0.0
+1.20D+1.60L	2	23.10	21.00	18.23	18.23	60.17	0.53	57.07	Vu < PhiVc/2	ot Reqd 9.6	57.1	0.0	0.0
+1.20D+1.60L	2	23.76	21.00	10.94	10.94	69.80	0.27	54.03	Vu < PhiVc/2	ot Reqd 9.6	54.0	0.0	0.0
+1.20D+1.60L	2	24.42	21.00	3.65	3.65	74.61	0.09	51.80	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
+1.20D+1.60L	2	25.08	21.00	-3.65	3.65	74.61	0.09	51.80	Vu < PhiVc/2	ot Reqd 9.6	51.8	0.0	0.0
+1.20D+1.60L	2	25.74	21.00	-10.94	10.94	69.80	0.27	54.03	Vu < PhiVc/2	ot Reqd 9.6	54.0	0.0	0.0
+1.20D+1.60L	2	26.40	21.00	-18.23	18.23	60.17	0.53	57.07	Vu < PhiVc/2	ot Reqd 9.6	57.1	0.0	0.0
+1.20D+1.60L	2	27.06	21.00	-25.53	25.53	45.73	0.98	62.36	Vu < PhiVc/2	ot Reqd 9.6	62.4	0.0	0.0
+1.20D+1.60L	2	27.72	21.00	-32.82	32.82	26.47	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	28.38	21.00	-40.11	40.11	2.41	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	29.04	21.00	-47.41	47.41	26.47	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	29.70	21.00	-54.70	54.70	60.17	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	30.36	21.00	-61.99	61.99	98.68	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	2	31.02	21.00	-69.29	69.29	142.00	0.85	60.90	PhiVc < Vu	8.384	116.3	10.5	5.0
+1.20D+1.60L	2	31.68	21.00	-76.58	76.58	190.14	0.70	59.14	PhiVc < Vu	17.443	114.6	10.5	5.0
+1.20D+1.60L	2	32.34	21.00	-83.87	83.87	243.09	0.60	57.94	PhiVc < Vu	25.934	113.4	10.5	5.0
+1.20D+1.60L	3	33.00	21.00	109.40	109.40	300.85	0.64	58.33	PhiVc < Vu	51.075	113.8	5.4	5.0
+1.20D+1.60L	3	33.66	21.00	102.11	102.11	231.05	0.77	59.95	PhiVc < Vu	42.158	115.4	6.6	5.0
+1.20D+1.60L	3	34.32	21.00	94.81	94.81	166.07	1.00	62.62	PhiVc < Vu	32.189	118.1	8.6	5.0
+1.20D+1.60L	3	34.98	21.00	87.52	87.52	105.90	1.00	62.63	PhiVc < Vu	24.886	118.1	10.5	5.0
+1.20D+1.60L	3	35.64	21.00	80.23	80.23	50.54	1.00	62.63	PhiVc < Vu	17.592	118.1	10.5	5.0
+1.20D+1.60L	3	36.30	21.00	72.93	72.93	0.00	1.00	62.63	PhiVc < Vu	10.299	118.1	10.5	5.0
+1.20D+1.60L	3	36.96	21.00	65.64	65.64	45.73	1.00	62.63	PhiVc < Vu	3.006	118.1	10.5	5.0
+1.20D+1.60L	3	37.62	21.00	58.35	58.35	86.64	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	3	38.28	21.00	51.05	51.05	122.75	0.73	59.41	PhiVc/2 < Vu <=	Min 9.6.3.1	87.1	10.5	10.0
+1.20D+1.60L	3	38.94	21.00	43.76	43.76	154.04	0.50	56.68	PhiVc/2 < Vu <=	Min 9.6.3.1	84.4	10.5	10.0
+1.20D+1.60L	3	39.60	21.00	36.47	36.47	180.51	0.35	54.97	PhiVc/2 < Vu <=	Min 9.6.3.1	82.7	10.5	10.0
+1.20D+1.60L	3	40.26	21.00	29.17	29.17	202.17	0.25	53.78	PhiVc/2 < Vu <=	Min 9.6.3.1	81.5	10.5	10.0
+1.20D+1.60L	3	40.92	21.00	21.88	21.88	219.02	0.17	52.86	Vu < PhiVc/2	ot Reqd 9.6	52.9	0.0	0.0
+1.20D+1.60L	3	41.58	21.00	14.59	14.59	231.05	0.11	52.09	Vu < PhiVc/2	ot Reqd 9.6	52.1	0.0	0.0
+1.20D+1.60L	3	42.24	21.00	7.29	7.29	238.27	0.05	51.42	Vu < PhiVc/2	ot Reqd 9.6	51.4	0.0	0.0
+1.20D+1.60L	3	42.90	21.00	-0.00	0.00	240.68	0.00	50.78	Vu < PhiVc/2	ot Reqd 9.6	50.8	0.0	0.0
+1.20D+1.60L	3	43.56	21.00	-7.29	7.29	238.27	0.05	51.42	Vu < PhiVc/2	ot Reqd 9.6	51.4	0.0	0.0
+1.20D+1.60L	3	44.22	21.00	-14.59	14.59	231.05	0.11	52.09	Vu < PhiVc/2	ot Reqd 9.6	52.1	0.0	0.0
+1.20D+1.60L	3	44.88	21.00	-21.88	21.88	219.02	0.17	52.86	Vu < PhiVc/2	ot Reqd 9.6	52.9	0.0	0.0
+1.20D+1.60L	3	45.54	21.00	-29.17	29.17	202.17	0.25	53.78	PhiVc/2 < Vu <=	Min 9.6.3.1	81.5	10.5	10.0
+1.20D+1.60L	3	46.20	21.00	-36.47	36.47	180.51	0.35	54.97	PhiVc/2 < Vu <=	Min 9.6.3.1	82.7	10.5	10.0
+1.20D+1.60L	3	46.86	21.00	-43.76	43.76	154.04	0.50	56.68	PhiVc/2 < Vu <=	Min 9.6.3.1	84.4	10.5	10.0
+1.20D+1.60L	3	47.52	21.00	-51.05	51.05	122.75	0.73	59.41	PhiVc/2 < Vu <=	Min 9.6.3.1	87.1	10.5	10.0
+1.20D+1.60L	3	48.18	21.00	-58.35	58.35	86.64	1.00	62.63	PhiVc/2 < Vu <=	Min 9.6.3.1	90.4	10.5	10.0
+1.20D+1.60L	3	48.84	21.00	-65.64	65.64	45.73	1.00	62.63	PhiVc < Vu	3.006	90.4	10.5	10.0
+1.20D+1.60L	3	49.50	21.00	-72.93	72.93	0.00	1.00	62.63	PhiVc < Vu	10.299	90.4	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	16.500	-288.88	546.27	0.53
Span # 2	2	16.500	-300.85	546.27	0.55
Span # 3	3	16.500	-300.85	546.27	0.55
+1.40D					
Span # 1	1	16.500	-122.93	546.27	0.23
Span # 2	2	16.500	-128.02	546.27	0.23
Span # 3	3	16.500	-128.02	546.27	0.23
+1.20D+1.60L					
Span # 1	1	16.500	-288.88	546.27	0.53
Span # 2	2	16.500	-300.85	546.27	0.55
Span # 3	3	16.500	-300.85	546.27	0.55
+1.20D+0.50L					
Span # 1	1	16.500	-162.71	546.27	0.30

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-13**

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	16.500	-169.46	546.27	0.31
Span # 3	3	16.500	-169.46	546.27	0.31
+1.20D					
Span # 1	1	16.500	-105.37	546.27	0.19
Span # 2	2	16.500	-109.73	546.27	0.20
Span # 3	3	16.500	-109.73	546.27	0.20
+0.90D					
Span # 1	1	16.500	-79.02	546.27	0.14
Span # 2	2	16.500	-82.30	546.27	0.15
Span # 3	3	16.500	-82.30	546.27	0.15

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.1053	7.590	+D+L	-0.0018	16.830
+D+0.750L	2	0.0048	8.250	+D+L	-0.0052	1.650
+D+L	3	0.1053	8.910		0.0000	1.650

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

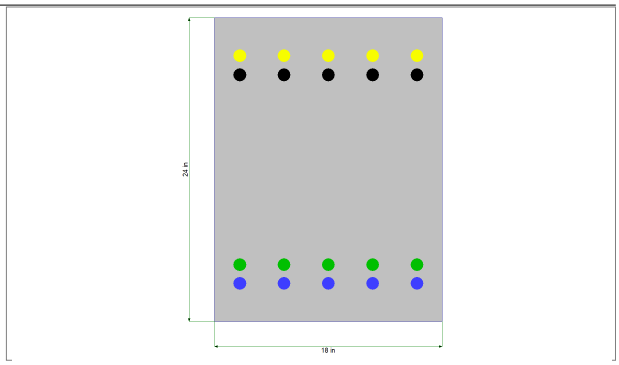
DESCRIPTION: 2B-16**

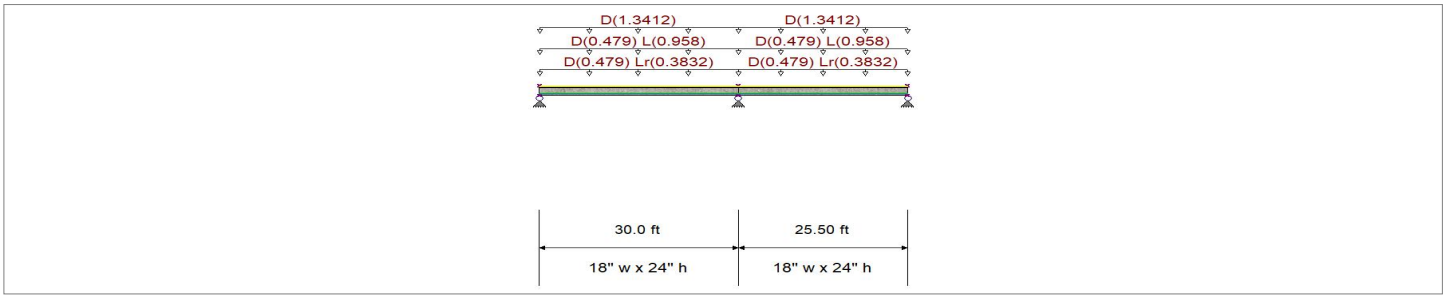
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c$^{1/2}$ * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β_1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	4.0	





Cross Section & Reinforcing Details

Rectangular Section, Width = 18.0 in, Height = 24.0 in
Span #1 Reinforcing....
5-#8 at 3.0 in from Bottom, from 0.0 to 30.0 ft in this span
5-#8 at 4.50 in from Top, from 0.0 to 30.0 ft in this span
5-#8 at 4.50 in from Bottom, from 0.0 to 30.0 ft in this s
5-#8 at 3.0 in from Top, from 0.0 to 30.0 ft in this span
Span #2 Reinforcing....
5-#8 at 3.0 in from Bottom, from 0.0 to 25.50 ft in this span
5-#8 at 4.50 in from Top, from 0.0 to 25.50 ft in this span
5-#8 at 4.50 in from Bottom, from 0.0 to 25.50 ft in this
5-#8 at 3.0 in from Top, from 0.0 to 25.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0250, Lr = 0.020 ksf, Tributary Width = 19.160 ft, (ROOF)
Uniform Load : D = 0.0250, L = 0.050 ksf, Tributary Width = 19.160 ft, (SUPERIMPOSED LOAD)
Uniform Load : D = 0.070 ksf, Tributary Width = 19.160 ft, (PRECAST JOIST)
Load for Span Number 2
Uniform Load : D = 0.0250, Lr = 0.020 ksf, Tributary Width = 19.160 ft, (ROOF)
Uniform Load : D = 0.0250, L = 0.050 ksf, Tributary Width = 19.160 ft, (SUPERIMPOSED LOAD)
Uniform Load : D = 0.070 ksf, Tributary Width = 19.160 ft, (PRECAST JOIST)

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-16**

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.778** : 1

Section used for this span	**Typical Section**
Mu : Applied	-491.315 k-ft
Mn * Phi : Allowable	631.90 k-ft
Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.103 in	Ratio =	3485	>=360.0	L Only
Max Upward Transient Deflection	-0.002 in	Ratio =	163991	>=360.0	L Only
Max Downward Total Deflection	0.650 in	Ratio =	553	>=240.0	Span: 2 : +D+0.750Lr+0.750L
Max Upward Total Deflection	-0.015 in	Ratio =	20486	>=240.0	Span: 2 : +D+0.750Lr+0.750L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	43.972	130.188	33.416
Overall MINimum	4.494	13.363	3.411
D Only	32.252	94.942	24.554
+D+L	43.412	128.513	32.992
+D+Lr	36.709	108.385	27.921
+D+0.750Lr+0.750L	43.972	130.188	33.416
+D+0.750L	40.613	120.141	30.872
+0.60D	19.468	56.711	14.870
Lr Only	4.494	13.363	3.411
L Only	11.286	33.298	8.586

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	1	0.00	21.00	58.70	58.70	0.00	1.00	52.90	PhiVc < Vu	5.804	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	0.73	21.00	55.03	55.03	41.78	1.00	52.90	PhiVc < Vu	2.126	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	1.47	21.00	51.35	51.35	80.86	1.00	52.90	PhiVc/2 < Vu <= Min 9.6.3.1		80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	2.20	21.00	47.67	47.67	117.23	0.71	48.63	PhiVc/2 < Vu <= Min 9.6.3.1		76.3	10.5	10.0
+1.20D+0.50Lr+1.60L	1	2.94	21.00	43.99	43.99	150.90	0.51	45.65	PhiVc/2 < Vu <= Min 9.6.3.1		73.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	3.67	21.00	40.32	40.32	181.88	0.39	43.83	PhiVc/2 < Vu <= Min 9.6.3.1		71.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	4.41	21.00	36.64	36.64	210.15	0.31	42.61	PhiVc/2 < Vu <= Min 9.6.3.1		70.3	10.5	10.0
+1.20D+0.50Lr+1.60L	1	5.14	21.00	32.96	32.96	235.71	0.24	41.71	PhiVc/2 < Vu <= Min 9.6.3.1		69.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	5.88	21.00	29.28	29.28	258.58	0.20	41.02	PhiVc/2 < Vu <= Min 9.6.3.1		68.7	10.5	10.0
+1.20D+0.50Lr+1.60L	1	6.61	21.00	25.61	25.61	278.74	0.16	40.47	PhiVc/2 < Vu <= Min 9.6.3.1		68.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.35	21.00	21.93	21.93	296.21	0.13	40.01	PhiVc/2 < Vu <= Min 9.6.3.1		67.7	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.08	21.00	18.25	18.25	310.97	0.10	39.61	Vu < PhiVc/2	ot Reqd 9.6	39.6	0.0	0.0
+1.20D+0.50Lr+1.60L	1	8.82	21.00	14.57	14.57	323.03	0.08	39.26	Vu < PhiVc/2	ot Reqd 9.6	39.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	9.55	21.00	10.90	10.90	332.38	0.06	38.94	Vu < PhiVc/2	ot Reqd 9.6	38.9	0.0	0.0
+1.20D+0.50Lr+1.60L	1	10.29	21.00	7.22	7.22	339.04	0.04	38.64	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.20D+0.50Lr+1.60L	1	11.02	21.00	3.54	3.54	342.99	0.02	38.36	Vu < PhiVc/2	ot Reqd 9.6	38.4	0.0	0.0
+1.20D+0.50Lr+1.60L	1	11.76	21.00	-0.14	0.14	344.24	0.00	38.10	Vu < PhiVc/2	ot Reqd 9.6	38.1	0.0	0.0
+1.20D+0.50Lr+1.60L	1	12.49	21.00	-3.81	3.81	342.79	0.02	38.38	Vu < PhiVc/2	ot Reqd 9.6	38.4	0.0	0.0
+1.20D+0.50Lr+1.60L	1	13.22	21.00	-7.49	7.49	338.64	0.04	38.66	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.20D+0.50Lr+1.60L	1	13.96	21.00	-11.17	11.17	331.79	0.06	38.96	Vu < PhiVc/2	ot Reqd 9.6	39.0	0.0	0.0
+1.20D+0.50Lr+1.60L	1	14.69	21.00	-14.84	14.84	322.23	0.08	39.28	Vu < PhiVc/2	ot Reqd 9.6	39.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	15.43	21.00	-18.52	18.52	309.98	0.10	39.64	Vu < PhiVc/2	ot Reqd 9.6	39.6	0.0	0.0
+1.20D+0.50Lr+1.60L	1	16.16	21.00	-22.20	22.20	295.02	0.13	40.04	PhiVc/2 < Vu <= Min 9.6.3.1		67.8	10.5	10.0
+1.20D+0.50Lr+1.60L	1	16.90	21.00	-25.88	25.88	277.36	0.16	40.51	PhiVc/2 < Vu <= Min 9.6.3.1		68.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	17.63	21.00	-29.55	29.55	256.99	0.20	41.07	PhiVc/2 < Vu <= Min 9.6.3.1		68.8	10.5	10.0
+1.20D+0.50Lr+1.60L	1	18.37	21.00	-33.23	33.23	233.93	0.25	41.77	PhiVc/2 < Vu <= Min 9.6.3.1		69.5	10.5	10.0
+1.20D+0.50Lr+1.60L	1	19.10	21.00	-36.91	36.91	208.16	0.31	42.68	PhiVc/2 < Vu <= Min 9.6.3.1		70.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	19.84	21.00	-40.59	40.59	179.69	0.40	43.94	PhiVc/2 < Vu <= Min 9.6.3.1		71.7	10.5	10.0
+1.20D+0.50Lr+1.60L	1	20.57	21.00	-44.26	44.26	148.52	0.52	45.81	PhiVc/2 < Vu <= Min 9.6.3.1		73.5	10.5	10.0
+1.20D+0.50Lr+1.60L	1	21.31	21.00	-47.94	47.94	114.65	0.73	48.93	PhiVc/2 < Vu <= Min 9.6.3.1		76.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	22.04	21.00	-51.62	51.62	78.08	1.00	52.90	PhiVc/2 < Vu <= Min 9.6.3.1		80.6	10.5	10.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-16**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	1	22.78	21.00	-55.30	55.30	38.80	1.00	52.90	PhiVc < Vu	2.396	108.3	10.5	5.0
+1.20D+0.50Lr+1.60L	1	23.51	21.00	-58.97	58.97	3.17	1.00	52.90	PhiVc < Vu	6.074	108.3	10.5	5.0
+1.20D+0.50Lr+1.60L	1	24.24	21.00	-62.65	62.65	47.85	1.00	52.90	PhiVc < Vu	9.751	108.3	10.5	5.0
+1.20D+0.50Lr+1.60L	1	24.98	21.00	-66.33	66.33	95.23	1.00	52.90	PhiVc < Vu	13.429	108.3	10.5	5.0
+1.20D+0.50Lr+1.60L	1	25.71	21.00	-70.01	70.01	145.32	0.84	50.58	PhiVc < Vu	19.431	106.0	10.5	5.0
+1.20D+0.50Lr+1.60L	1	26.45	21.00	-73.68	73.68	198.10	0.65	47.73	PhiVc < Vu	25.954	103.2	10.5	5.0
+1.20D+0.50Lr+1.60L	1	27.18	21.00	-77.36	77.36	253.59	0.53	46.00	PhiVc < Vu	31.366	101.4	8.8	5.0
+1.20D+0.50Lr+1.60L	1	27.92	21.00	-81.04	81.04	311.78	0.45	44.83	PhiVc < Vu	36.213	100.3	7.7	5.0
+1.20D+0.50Lr+1.60L	1	28.65	21.00	-84.72	84.72	372.67	0.40	43.98	PhiVc < Vu	40.736	99.4	6.8	5.0
+1.20D+0.50Lr+1.60L	1	29.39	21.00	-88.39	88.39	436.26	0.35	43.34	PhiVc < Vu	45.054	98.8	6.2	5.0
+1.20D+0.50Lr+1.60L	2	30.10	21.00	82.57	82.57	482.69	0.30	42.52	PhiVc < Vu	40.043	98.0	6.9	5.0
+1.20D+0.50Lr+1.60L	2	30.73	21.00	79.44	79.44	432.11	0.32	42.85	PhiVc < Vu	36.586	98.3	7.6	5.0
+1.20D+0.50Lr+1.60L	2	31.35	21.00	76.31	76.31	383.48	0.35	43.25	PhiVc < Vu	33.067	98.7	8.4	5.0
+1.20D+0.50Lr+1.60L	2	31.98	21.00	73.19	73.19	336.79	0.38	43.72	PhiVc < Vu	29.467	99.2	9.4	5.0
+1.20D+0.50Lr+1.60L	2	32.60	21.00	70.06	70.06	292.07	0.42	44.31	PhiVc < Vu	25.756	99.7	10.5	5.0
+1.20D+0.50Lr+1.60L	2	33.23	21.00	66.94	66.94	249.29	0.47	45.05	PhiVc < Vu	21.888	100.5	10.5	5.0
+1.20D+0.50Lr+1.60L	2	33.85	21.00	63.81	63.81	208.46	0.54	46.02	PhiVc < Vu	17.788	101.5	10.5	5.0
+1.20D+0.50Lr+1.60L	2	34.48	21.00	60.68	60.68	169.59	0.63	47.36	PhiVc < Vu	13.321	102.8	10.5	5.0
+1.20D+0.50Lr+1.60L	2	35.10	21.00	57.56	57.56	132.67	0.76	49.33	PhiVc < Vu	8.224	104.8	10.5	5.0
+1.20D+0.50Lr+1.60L	2	35.72	21.00	54.43	54.43	97.70	0.98	52.53	PhiVc < Vu	1.903	108.0	10.5	5.0
+1.20D+0.50Lr+1.60L	2	36.35	21.00	51.31	51.31	64.68	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	36.97	21.00	48.18	48.18	33.62	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	37.60	21.00	45.06	45.06	4.51	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	38.22	21.00	41.93	41.93	22.65	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	38.85	21.00	38.80	38.80	47.86	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	39.47	21.00	35.68	35.68	71.12	0.88	51.09	PhiVc/2 < Vu <=	Min 9.6.3.1	78.8	10.5	10.0
+1.20D+0.50Lr+1.60L	2	40.10	21.00	32.55	32.55	92.42	0.62	47.22	PhiVc/2 < Vu <=	Min 9.6.3.1	74.9	10.5	10.0
+1.20D+0.50Lr+1.60L	2	40.72	21.00	29.43	29.43	111.78	0.46	44.91	PhiVc/2 < Vu <=	Min 9.6.3.1	72.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	41.34	21.00	26.30	26.30	129.18	0.36	43.37	PhiVc/2 < Vu <=	Min 9.6.3.1	71.1	10.5	10.0
+1.20D+0.50Lr+1.60L	2	41.97	21.00	23.17	23.17	144.63	0.28	42.24	PhiVc/2 < Vu <=	Min 9.6.3.1	70.0	10.5	10.0
+1.20D+0.50Lr+1.60L	2	42.59	21.00	20.05	20.05	158.12	0.22	41.38	Vu < PhiVc/2	ot Reqd 9.6	41.4	0.0	0.0
+1.20D+0.50Lr+1.60L	2	43.22	21.00	16.92	16.92	169.67	0.17	40.67	Vu < PhiVc/2	ot Reqd 9.6	40.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	43.84	21.00	13.80	13.80	179.26	0.13	40.08	Vu < PhiVc/2	ot Reqd 9.6	40.1	0.0	0.0
+1.20D+0.50Lr+1.60L	2	44.47	21.00	10.67	10.67	186.90	0.10	39.57	Vu < PhiVc/2	ot Reqd 9.6	39.6	0.0	0.0
+1.20D+0.50Lr+1.60L	2	45.09	21.00	7.55	7.55	192.59	0.07	39.10	Vu < PhiVc/2	ot Reqd 9.6	39.1	0.0	0.0
+1.20D+0.50Lr+1.60L	2	45.72	21.00	4.42	4.42	196.32	0.04	38.67	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	46.34	21.00	1.29	1.29	198.11	0.01	38.26	Vu < PhiVc/2	ot Reqd 9.6	38.3	0.0	0.0
+1.20D+0.50Lr+1.60L	2	46.97	21.00	-1.83	1.83	197.94	0.02	38.33	Vu < PhiVc/2	ot Reqd 9.6	38.3	0.0	0.0
+1.20D+0.50Lr+1.60L	2	47.59	21.00	-4.96	4.96	195.82	0.04	38.74	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	48.21	21.00	-8.08	8.08	191.75	0.07	39.18	Vu < PhiVc/2	ot Reqd 9.6	39.2	0.0	0.0
+1.20D+0.50Lr+1.60L	2	48.84	21.00	-11.21	11.21	185.72	0.11	39.65	Vu < PhiVc/2	ot Reqd 9.6	39.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	49.46	21.00	-14.34	14.34	177.74	0.14	40.18	Vu < PhiVc/2	ot Reqd 9.6	40.2	0.0	0.0
+1.20D+0.50Lr+1.60L	2	50.09	21.00	-17.46	17.46	167.82	0.18	40.79	Vu < PhiVc/2	ot Reqd 9.6	40.8	0.0	0.0
+1.20D+0.50Lr+1.60L	2	50.71	21.00	-20.59	20.59	155.94	0.23	41.51	Vu < PhiVc/2	ot Reqd 9.6	41.5	0.0	0.0
+1.20D+0.50Lr+1.60L	2	51.34	21.00	-23.71	23.71	142.10	0.29	42.41	PhiVc/2 < Vu <=	Min 9.6.3.1	70.1	10.5	10.0
+1.20D+0.50Lr+1.60L	2	51.96	21.00	-26.84	26.84	126.32	0.37	43.60	PhiVc/2 < Vu <=	Min 9.6.3.1	71.3	10.5	10.0
+1.20D+0.50Lr+1.60L	2	52.59	21.00	-29.96	29.96	108.58	0.48	45.24	PhiVc/2 < Vu <=	Min 9.6.3.1	73.0	10.5	10.0
+1.20D+0.50Lr+1.60L	2	53.21	21.00	-33.09	33.09	88.89	0.65	47.74	PhiVc/2 < Vu <=	Min 9.6.3.1	75.5	10.5	10.0
+1.20D+0.50Lr+1.60L	2	53.83	21.00	-36.22	36.22	67.25	0.94	52.05	PhiVc/2 < Vu <=	Min 9.6.3.1	79.8	10.5	10.0
+1.20D+0.50Lr+1.60L	2	54.46	21.00	-39.34	39.34	43.66	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	55.08	21.00	-42.47	42.47	18.11	1.00	52.90	PhiVc/2 < Vu <=	Min 9.6.3.1	80.6	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	30.000	-480.15	631.90	0.76
Span # 2	2	25.500	-491.32	631.90	0.78

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 2B-16**

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.40D					
Span # 1	1	30.000	-367.19	631.90	0.58
Span # 2	2	25.500	-375.73	631.90	0.59
+1.20D+0.50Lr+1.60L					
Span # 1	1	30.000	-480.15	631.90	0.76
Span # 2	2	25.500	-491.32	631.90	0.78
+1.20D+1.60L					
Span # 1	1	30.000	-461.77	631.90	0.73
Span # 2	2	25.500	-472.51	631.90	0.75
+1.20D+1.60Lr+0.50L					
Span # 1	1	30.000	-419.50	631.90	0.66
Span # 2	2	25.500	-429.25	631.90	0.68
+1.20D+1.60Lr					
Span # 1	1	30.000	-373.55	631.90	0.59
Span # 2	2	25.500	-382.24	631.90	0.60
+1.20D+0.50L					
Span # 1	1	30.000	-360.69	631.90	0.57
Span # 2	2	25.500	-369.07	631.90	0.58
+1.20D					
Span # 1	1	30.000	-314.74	631.90	0.50
Span # 2	2	25.500	-322.05	631.90	0.51
+1.20D+0.50Lr+0.50L					
Span # 1	1	30.000	-379.07	631.90	0.60
Span # 2	2	25.500	-387.88	631.90	0.61
+0.90D					
Span # 1	1	30.000	-236.05	631.90	0.37
Span # 2	2	25.500	-241.54	631.90	0.38

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+0.750Lr+0.750L	1	0.6502	13.286	+D+0.750Lr+0.750L	-0.0052	30.364
+D+0.750Lr+0.750L	2	0.1939	15.664	+D+0.750Lr+0.750L	-0.0149	1.821

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

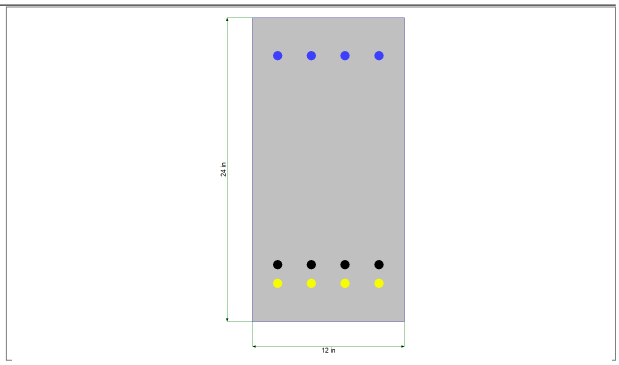
DESCRIPTION: 1B-2** P.O

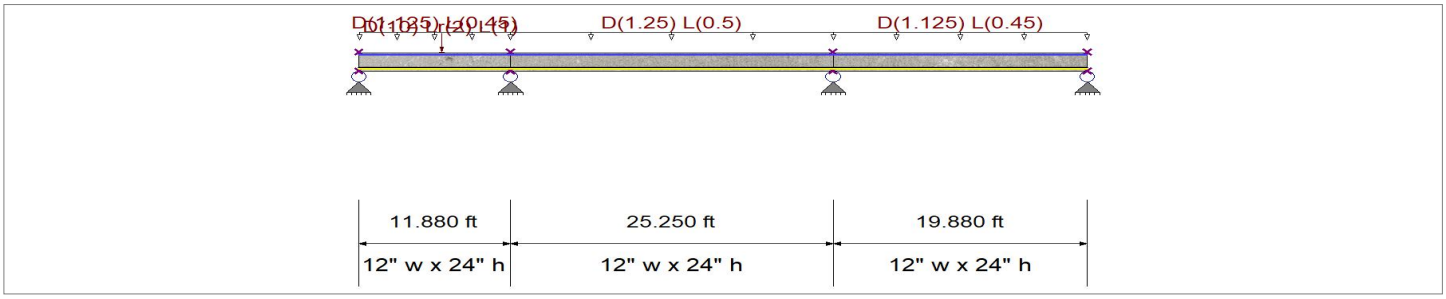
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c$^{1/2}$ * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β_1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	2	





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in

Span #1 Reinforcing....
- 4-#6 at 3.0 in from Top, from 0.0 to 11.880 ft in this span
- 4-#6 at 3.0 in from Bottom, from 0.0 to 11.880 ft in this span
- 4-#6 at 4.50 in from Bottom, from 0.0 to 11.880 ft in this

Span #2 Reinforcing....
- 4-#6 at 3.0 in from Top, from 0.0 to 25.250 ft in this span
- 4-#6 at 3.0 in from Bottom, from 0.0 to 25.250 ft in this span
- 4-#6 at 4.50 in from Bottom, from 0.0 to 25.250 ft in this

Span #3 Reinforcing....
- 4-#6 at 3.0 in from Top, from 0.0 to 19.880 ft in this span
- 4-#6 at 3.0 in from Bottom, from 0.0 to 19.880 ft in this span
- 4-#6 at 4.50 in from Bottom, from 0.0 to 19.880 ft in this

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 9.0 ft, (CONCRETE SLAB)

Point Load : D = 10.0, Lr = 2.0, L = 1.0 k @ 6.50 ft

Load for Span Number 2

Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 10.0 ft, (CONCRETE SLAB)

Load for Span Number 3

Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 9.0 ft, (CONCRETE SLAB)

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-2** P.O

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.829** : 1

Section used for this span	**Typical Section**
Mu : Applied	-136.985 k-ft
Mn * Phi : Allowable	165.262 k-ft
Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 3

Maximum Deflection

Max Downward Transient Deflection	0.023 in	Ratio =	13050	>=360.0	L Only
Max Upward Transient Deflection	-0.002 in	Ratio =	78923	>=360.0	L Only
Max Downward Total Deflection	0.149 in	Ratio =	2035	>=240.0	Span: 3 : +D+L
Max Upward Total Deflection	-0.005 in	Ratio =	31472	>=240.0	Span: 3 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	9.185	49.932	48.706	14.189
Overall MINimum	0.770	1.311	-0.104	0.023
D Only	7.183	38.978	37.151	10.513
+D+L	8.916	49.932	48.706	14.189
+D+Lr	8.030	40.157	37.128	10.510
+D+0.750Lr+0.750L	9.185	48.014	45.753	13.312
+D+0.750L	8.516	47.174	45.764	13.308
+0.60D	4.137	23.433	22.682	6.043
Lr Only	0.770	1.311	-0.104	0.023
L Only	1.316	11.162	12.278	3.162

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	1	0.00	21.00	10.76	10.76	0.00	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+0.50Lr+1.60L	1	0.48	21.00	9.62	9.62	4.84	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+0.50Lr+1.60L	1	0.95	21.00	8.47	8.47	9.14	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+1.60Lr+0.50L	1	1.43	21.00	7.42	7.42	12.54	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+1.60Lr+0.50L	1	1.90	21.00	6.51	6.51	15.85	0.72	30.14	Vu < PhiVc/2	ot Reqd 9.6	30.1	0.0	0.0
+1.20D+1.60Lr+0.50L	1	2.38	21.00	5.60	5.60	18.72	0.52	28.84	Vu < PhiVc/2	ot Reqd 9.6	28.8	0.0	0.0
+1.20D+1.60Lr+0.50L	1	2.85	21.00	4.68	4.68	21.16	0.39	27.95	Vu < PhiVc/2	ot Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60Lr	1	3.33	21.00	3.86	3.86	22.23	0.30	27.40	Vu < PhiVc/2	ot Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60Lr	1	3.80	21.00	3.05	3.05	23.87	0.22	26.87	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60Lr	1	4.28	21.00	2.24	2.24	25.13	0.16	26.42	Vu < PhiVc/2	ot Reqd 9.6	26.4	0.0	0.0
+1.20D+1.60Lr	1	4.75	21.00	1.44	1.44	26.00	0.10	26.03	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	1	5.23	21.00	-2.26	2.26	21.22	0.19	26.62	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60L	1	5.70	21.00	-3.41	3.41	19.87	0.30	27.37	Vu < PhiVc/2	ot Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	6.18	21.00	-4.56	4.56	17.98	0.44	28.32	Vu < PhiVc/2	ot Reqd 9.6	28.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	6.65	21.00	-19.92	19.92	15.87	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.13	21.00	-21.07	21.07	6.13	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.60	21.00	-22.22	22.22	4.15	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.08	21.00	-23.37	23.37	14.98	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.55	21.00	-24.52	24.52	26.36	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.03	21.00	-25.67	25.67	38.29	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.50	21.00	-26.82	26.82	50.76	0.92	28.44	PhiVc/2 < Vu <=	Min 9.6.3.1	42.3	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.98	21.00	-27.97	27.97	63.77	0.77	27.92	PhiVc < Vu	0.04048	41.8	10.5	10.0
+1.20D+0.50Lr+1.60L	1	10.45	21.00	-29.11	29.11	77.33	0.66	27.57	PhiVc < Vu	1.548	41.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	10.93	21.00	-30.26	30.26	91.44	0.58	27.30	PhiVc < Vu	2.960	41.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	11.40	21.00	-31.41	31.41	106.10	0.52	27.10	PhiVc < Vu	4.310	41.0	10.5	10.0
+1.20D+0.50Lr+1.60L	2	11.88	21.00	32.82	32.82	121.30	0.47	26.95	PhiVc < Vu	5.864	40.8	10.5	10.0
+1.20D+0.50Lr+1.60L	2	12.89	21.00	30.14	30.14	89.50	0.59	27.34	PhiVc < Vu	2.807	41.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	13.90	21.00	27.47	27.47	60.41	0.80	28.02	PhiVc/2 < Vu <=	Min 9.6.3.1	41.9	10.5	10.0
+1.20D+0.50Lr+1.60L	2	14.91	21.00	24.80	24.80	34.01	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	15.92	21.00	22.12	22.12	10.32	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	16.93	21.00	19.45	19.45	10.67	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-2** P.O

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	2	17.94	21.00	16.77	16.77	28.96	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0
+1.20D+0.50Lr+1.60L	2	18.95	21.00	14.10	14.10	44.55	0.55	29.05	Vu < PhiVc/2	ot Reqd 9.6	29.0	0.0	0.0
+1.20D+0.50Lr+1.60L	2	19.96	21.00	11.42	11.42	57.44	0.35	27.69	Vu < PhiVc/2	ot Reqd 9.6	27.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	20.97	21.00	8.75	8.75	67.63	0.23	26.89	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+0.50Lr+1.60L	2	21.98	21.00	6.07	6.07	75.11	0.14	26.33	Vu < PhiVc/2	ot Reqd 9.6	26.3	0.0	0.0
+1.20D+0.50Lr+1.60L	2	22.99	21.00	3.40	3.40	79.89	0.07	25.88	Vu < PhiVc/2	ot Reqd 9.6	25.9	0.0	0.0
+1.20D+1.60Lr+0.50L	2	24.00	21.00	0.74	0.74	63.60	0.02	25.53	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	25.01	21.00	-1.99	1.99	81.63	0.04	25.67	Vu < PhiVc/2	ot Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	2	26.02	21.00	-4.66	4.66	78.27	0.10	26.08	Vu < PhiVc/2	ot Reqd 9.6	26.1	0.0	0.0
+1.20D+1.60L	2	27.03	21.00	-7.34	7.34	72.20	0.18	26.57	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60L	2	28.04	21.00	-10.01	10.01	63.44	0.28	27.22	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	2	29.05	21.00	-12.69	12.69	51.98	0.43	28.21	Vu < PhiVc/2	ot Reqd 9.6	28.2	0.0	0.0
+1.20D+1.60L	2	30.06	21.00	-15.36	15.36	37.81	0.71	30.09	PhiVc/2 < Vu <=	Min 9.6.3.1	43.9	10.5	10.0
+1.20D+1.60L	2	31.07	21.00	-18.04	18.04	20.94	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0
+1.20D+1.60L	2	32.08	21.00	-20.71	20.71	1.38	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0
+1.20D+1.60L	2	33.09	21.00	-23.39	23.39	20.89	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+1.60L	2	34.10	21.00	-26.06	26.06	45.87	0.99	28.67	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	10.5	10.0
+1.20D+1.60L	2	35.11	21.00	-28.74	28.74	73.54	0.68	27.65	PhiVc < Vu	1.086	41.5	10.5	10.0
+1.20D+1.60L	2	36.12	21.00	-31.41	31.41	103.91	0.53	27.14	PhiVc < Vu	4.272	41.0	10.5	10.0
+1.20D+1.60L	3	37.13	21.00	30.93	30.93	136.98	0.40	26.70	PhiVc < Vu	4.230	40.6	10.5	10.0
+1.20D+1.60L	3	37.93	21.00	29.00	29.00	113.16	0.45	26.87	PhiVc < Vu	2.130	40.7	10.5	10.0
+1.20D+1.60L	3	38.72	21.00	27.08	27.08	90.86	0.52	27.11	PhiVc/2 < Vu <=	Min 9.6.3.1	41.0	10.5	10.0
+1.20D+1.60L	3	39.52	21.00	25.16	25.16	70.09	0.63	27.47	PhiVc/2 < Vu <=	Min 9.6.3.1	41.3	10.5	10.0
+1.20D+1.60L	3	40.31	21.00	23.23	23.23	50.85	0.80	28.03	PhiVc/2 < Vu <=	Min 9.6.3.1	41.9	10.5	10.0
+1.20D+1.60L	3	41.11	21.00	21.31	21.31	33.14	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+1.60L	3	41.90	21.00	19.39	19.39	16.96	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+1.60L	3	42.70	21.00	17.47	17.47	2.30	1.00	28.69	PhiVc/2 < Vu <=	Min 9.6.3.1	42.6	10.5	10.0
+1.20D+1.60L	3	43.49	21.00	15.54	15.54	10.82	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+1.60L	3	44.29	21.00	13.62	13.62	22.42	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+1.60L	3	45.08	21.00	11.70	11.70	32.48	0.63	29.55	Vu < PhiVc/2	ot Reqd 9.6	29.6	0.0	0.0
+1.20D+1.60L	3	45.88	21.00	9.77	9.77	41.02	0.42	28.14	Vu < PhiVc/2	ot Reqd 9.6	28.1	0.0	0.0
+1.20D+1.60L	3	46.67	21.00	7.85	7.85	48.03	0.29	27.28	Vu < PhiVc/2	ot Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	3	47.47	21.00	5.93	5.93	53.51	0.19	26.67	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	3	48.26	21.00	4.01	4.01	57.46	0.12	26.20	Vu < PhiVc/2	ot Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	3	49.06	21.00	2.08	2.08	59.88	0.06	25.79	Vu < PhiVc/2	ot Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	3	49.85	21.00	0.16	0.16	60.77	0.00	25.42	Vu < PhiVc/2	ot Reqd 9.6	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L	3	50.65	21.00	-1.77	1.77	60.21	0.05	25.73	Vu < PhiVc/2	ot Reqd 9.6	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L	3	51.44	21.00	-3.70	3.70	58.03	0.11	26.13	Vu < PhiVc/2	ot Reqd 9.6	26.1	0.0	0.0
+1.20D+0.50Lr+1.60L	3	52.24	21.00	-5.62	5.62	54.33	0.18	26.59	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+0.50Lr+1.60L	3	53.03	21.00	-7.54	7.54	49.10	0.27	27.17	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+0.50Lr+1.60L	3	53.83	21.00	-9.46	9.46	42.34	0.39	27.97	Vu < PhiVc/2	ot Reqd 9.6	28.0	0.0	0.0
+1.20D+0.50Lr+1.60L	3	54.62	21.00	-11.39	11.39	34.05	0.59	29.26	Vu < PhiVc/2	ot Reqd 9.6	29.3	0.0	0.0
+1.20D+0.50Lr+1.60L	3	55.42	21.00	-13.31	13.31	24.23	0.96	31.74	Vu < PhiVc/2	ot Reqd 9.6	31.7	0.0	0.0
+1.20D+0.50Lr+1.60L	3	56.21	21.00	-15.23	15.23	12.88	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+0.50Lr+1.60L	3	57.01	21.00	-17.16	17.16	0.00	1.00	31.99	PhiVc/2 < Vu <=	Min 9.6.3.1	45.9	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	11.880	-118.72	165.26	0.72
Span # 2	2	25.250	-131.28	165.26	0.79
Span # 3	3	19.880	-136.98	165.26	0.83
+1.40D					
Span # 1	1	11.880	-98.23	165.26	0.59
Span # 2	2	25.250	-106.52	165.26	0.64
Span # 3	3	19.880	-111.15	165.26	0.67
+1.20D+0.50Lr+1.60L					
Span # 1	1	11.880	-118.72	165.26	0.72
Span # 2	2	25.250	-131.07	165.26	0.79

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-2** P.O

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 3	3	19.880	-136.76	165.26	0.83
+1.20D+1.60L					
Span # 1	1	11.880	-117.97	165.26	0.71
Span # 2	2	25.250	-131.28	165.26	0.79
Span # 3	3	19.880	-136.98	165.26	0.83
+1.20D+1.60Lr+0.50L					
Span # 1	1	11.880	-97.17	165.26	0.59
Span # 2	2	25.250	-103.10	165.26	0.62
Span # 3	3	19.880	-107.58	165.26	0.65
+1.20D+1.60Lr					
Span # 1	1	11.880	-86.62	165.26	0.52
Span # 2	2	25.250	-90.61	165.26	0.55
Span # 3	3	19.880	-94.55	165.26	0.57
+1.20D+0.50L					
Span # 1	1	11.880	-94.75	165.26	0.57
Span # 2	2	25.250	-103.80	165.26	0.63
Span # 3	3	19.880	-108.31	165.26	0.66
+1.20D					
Span # 1	1	11.880	-84.20	165.26	0.51
Span # 2	2	25.250	-91.31	165.26	0.55
Span # 3	3	19.880	-95.27	165.26	0.58
+1.20D+0.50Lr+0.50L					
Span # 1	1	11.880	-95.51	165.26	0.58
Span # 2	2	25.250	-103.58	165.26	0.63
Span # 3	3	19.880	-108.08	165.26	0.65
+0.90D					
Span # 1	1	11.880	-63.15	165.26	0.38
Span # 2	2	25.250	-68.48	165.26	0.41
Span # 3	3	19.880	-71.45	165.26	0.43

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+Lr	1	0.0057	4.514	+D+L	-0.0045	10.217
+D+L	2	0.1488	12.625	+D+L	-0.0009	25.648
+D+L	3	0.0505	11.530	+D+L	-0.0009	1.193

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

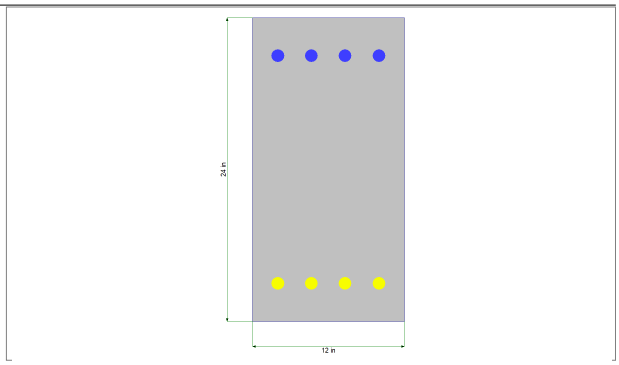
DESCRIPTION: 1B-3** P.O

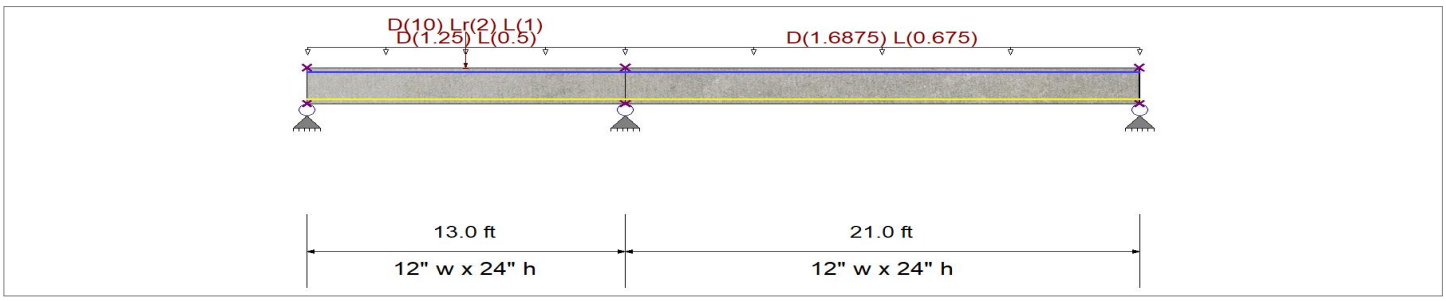
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
4-#8 at 3.0 in from Top, from 0.0 to 13.0 ft in this span
4-#8 at 3.0 in from Bottom, from 0.0 to 13.0 ft in this spa
Span #2 Reinforcing....
4-#8 at 3.0 in from Top, from 0.0 to 21.0 ft in this span
4-#8 at 3.0 in from Bottom, from 0.0 to 21.0 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 10.0 ft, (CONCRETE SLAB)
Point Load : D = 10.0, Lr = 2.0, L = 1.0 k @ 6.50 ft
Load for Span Number 2
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 13.50 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.559**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	-152.562	k-ft
Mn * Phi : Allowable	273.133	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.029 in	Ratio =	8552	>=360.0	Lr Only
Max Upward Transient Deflection	-0.003 in	Ratio =	53276	>=360.0	L Only
Max Downward Total Deflection	0.203 in	Ratio =	1238	>=240.0	Span: 2 : +D+L
Max Upward Total Deflection	-0.010 in	Ratio =	14883	>=240.0	Span: 2 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	10.205	60.993	22.352
Overall MINimum	0.857	1.232	-0.089

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-3** P.O

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
D Only	8.435	46.418	16.694
+D+L	9.877	60.993	22.352
+D+Lr	9.384	47.501	16.662
+D+0.750Lr+0.750L	10.205	58.199	20.900
+D+0.750L	9.503	57.372	20.929
+0.60D	4.895	28.120	9.913
Lr Only	0.857	1.232	-0.089
L Only	1.600	14.319	5.756

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+0.50Lr+1.60L	1	0.00	21.00	12.78	12.78	0.00	1.00	31.32	Vu < PhiVc/2	ıt Reqd 9.6	31.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	0.32	21.00	11.93	11.93	3.93	1.00	31.32	Vu < PhiVc/2	ıt Reqd 9.6	31.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	0.64	21.00	11.09	11.09	7.60	1.00	31.32	Vu < PhiVc/2	ıt Reqd 9.6	31.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	0.96	21.00	10.25	10.25	11.00	1.00	31.32	Vu < PhiVc/2	ıt Reqd 9.6	31.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	1.27	21.00	9.40	9.40	14.12	1.00	31.32	Vu < PhiVc/2	ıt Reqd 9.6	31.3	0.0	0.0
+1.20D+1.60Lr+0.50L	1	1.59	21.00	8.62	8.62	16.38	0.92	30.85	Vu < PhiVc/2	ıt Reqd 9.6	30.8	0.0	0.0
+1.20D+1.60Lr+0.50L	1	1.91	21.00	7.95	7.95	19.02	0.73	29.73	Vu < PhiVc/2	ıt Reqd 9.6	29.7	0.0	0.0
+1.20D+1.60Lr+0.50L	1	2.23	21.00	7.28	7.28	21.44	0.59	28.91	Vu < PhiVc/2	ıt Reqd 9.6	28.9	0.0	0.0
+1.20D+1.60Lr+0.50L	1	2.55	21.00	6.62	6.62	23.65	0.49	28.29	Vu < PhiVc/2	ıt Reqd 9.6	28.3	0.0	0.0
+1.20D+1.60Lr+0.50L	1	2.87	21.00	5.95	5.95	25.65	0.41	27.80	Vu < PhiVc/2	ıt Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60Lr+0.50L	1	3.18	21.00	5.28	5.28	27.44	0.34	27.39	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60Lr	1	3.50	21.00	4.69	4.69	27.75	0.30	27.14	Vu < PhiVc/2	ıt Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60Lr	1	3.82	21.00	4.10	4.10	29.15	0.25	26.85	Vu < PhiVc/2	ıt Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60Lr	1	4.14	21.00	3.51	3.51	30.36	0.20	26.59	Vu < PhiVc/2	ıt Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60Lr	1	4.46	21.00	2.92	2.92	31.38	0.16	26.36	Vu < PhiVc/2	ıt Reqd 9.6	26.4	0.0	0.0
+1.20D+1.60Lr	1	4.78	21.00	2.33	2.33	32.22	0.13	26.14	Vu < PhiVc/2	ıt Reqd 9.6	26.1	0.0	0.0
+1.20D+1.60Lr	1	5.09	21.00	1.75	1.75	32.87	0.09	25.94	Vu < PhiVc/2	ıt Reqd 9.6	25.9	0.0	0.0
+1.20D+1.60L	1	5.41	21.00	-1.98	1.98	28.05	0.12	26.13	Vu < PhiVc/2	ıt Reqd 9.6	26.1	0.0	0.0
+1.20D+1.60L	1	5.73	21.00	-2.83	2.83	27.28	0.18	26.47	Vu < PhiVc/2	ıt Reqd 9.6	26.5	0.0	0.0
+1.20D+1.60L	1	6.05	21.00	-3.67	3.67	26.25	0.24	26.84	Vu < PhiVc/2	ıt Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	1	6.37	21.00	-4.51	4.51	24.95	0.32	27.27	Vu < PhiVc/2	ıt Reqd 9.6	27.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	6.69	21.00	-19.53	19.53	23.53	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.00	21.00	-20.37	20.37	17.18	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.32	21.00	-21.21	21.21	10.56	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.64	21.00	-22.06	22.06	3.67	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	7.96	21.00	-22.90	22.90	3.49	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.28	21.00	-23.74	23.74	10.91	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.60	21.00	-24.59	24.59	18.61	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	8.91	21.00	-25.43	25.43	26.57	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.23	21.00	-26.27	26.27	34.80	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.55	21.00	-27.11	27.11	43.29	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	9.87	21.00	-27.96	27.96	52.06	0.94	30.96	PhiVc/2 < Vu <=	Min 9.6.3.1	44.8	10.5	10.0
+1.20D+0.50Lr+1.60L	1	10.19	21.00	-28.80	28.80	61.10	0.82	30.28	PhiVc/2 < Vu <=	Min 9.6.3.1	44.1	10.5	10.0
+1.20D+0.50Lr+1.60L	1	10.51	21.00	-29.64	29.64	70.40	0.74	29.76	PhiVc/2 < Vu <=	Min 9.6.3.1	43.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	10.82	21.00	-30.49	30.49	79.97	0.67	29.34	PhiVc < Vu	1.142	44.7	10.5	9.0
+1.20D+0.50Lr+1.60L	1	11.14	21.00	-31.33	31.33	89.81	0.61	29.01	PhiVc < Vu	2.321	44.4	10.5	9.0
+1.20D+0.50Lr+1.60L	1	11.46	21.00	-32.17	32.17	99.92	0.56	28.73	PhiVc < Vu	3.442	44.1	10.5	9.0
+1.20D+0.50Lr+1.60L	1	11.78	21.00	-33.02	33.02	110.30	0.52	28.50	PhiVc < Vu	4.520	43.9	10.5	9.0
+1.20D+0.50Lr+1.60L	1	12.10	21.00	-33.86	33.86	120.94	0.49	28.30	PhiVc < Vu	5.564	43.7	10.5	9.0
+1.20D+0.50Lr+1.60L	1	12.42	21.00	-34.70	34.70	131.86	0.46	28.12	PhiVc < Vu	6.581	43.5	10.5	9.0
+1.20D+0.50Lr+1.60L	1	12.73	21.00	-35.55	35.55	143.04	0.43	27.97	PhiVc < Vu	7.576	43.4	10.5	9.0
+1.20D+0.50Lr+1.60L	2	13.09	21.00	43.23	43.23	148.84	0.51	28.40	PhiVc < Vu	14.822	43.8	9.4	9.0
+1.20D+0.50Lr+1.60L	2	13.60	21.00	41.45	41.45	127.07	0.57	28.77	PhiVc < Vu	12.675	44.2	10.5	9.0
+1.20D+0.50Lr+1.60L	2	14.11	21.00	39.67	39.67	106.21	0.65	29.27	PhiVc < Vu	10.408	44.7	10.5	9.0
+1.20D+0.50Lr+1.60L	2	14.63	21.00	37.90	37.90	86.26	0.77	29.95	PhiVc < Vu	7.950	45.3	10.5	9.0
+1.20D+0.50Lr+1.60L	2	15.14	21.00	36.12	36.12	67.23	0.94	30.96	PhiVc < Vu	5.159	46.4	10.5	9.0
+1.20D+0.50Lr+1.60L	2	15.66	21.00	34.35	34.35	49.11	1.00	31.32	PhiVc < Vu	3.029	46.7	10.5	9.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-3** P.O

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	2	16.17	21.00	32.57	32.57	31.90	1.00	31.32	PhiVc < Vu	1.253	46.7	10.5	9.0
+1.20D+0.50Lr+1.60L	2	16.69	21.00	30.79	30.79	15.61	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	17.20	21.00	29.02	29.02	0.23	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	17.71	21.00	27.24	27.24	14.24	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	18.23	21.00	25.47	25.47	27.79	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	18.74	21.00	23.69	23.69	40.43	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+0.50Lr+1.60L	2	19.26	21.00	21.92	21.92	52.16	0.74	29.75	PhiVc/2 < Vu <= Min 9.6.3.1		43.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	19.77	21.00	20.14	20.14	62.98	0.56	28.71	PhiVc/2 < Vu <= Min 9.6.3.1		42.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	20.29	21.00	18.36	18.36	72.88	0.44	28.00	PhiVc/2 < Vu <= Min 9.6.3.1		41.9	10.5	10.0
+1.20D+0.50Lr+1.60L	2	20.80	21.00	16.59	16.59	81.86	0.35	27.49	PhiVc/2 < Vu <= Min 9.6.3.1		41.4	10.5	10.0
+1.20D+0.50Lr+1.60L	2	21.31	21.00	14.81	14.81	89.94	0.29	27.10	PhiVc/2 < Vu <= Min 9.6.3.1		41.0	10.5	10.0
+1.20D+0.50Lr+1.60L	2	21.83	21.00	13.04	13.04	97.10	0.23	26.78	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L	2	22.34	21.00	11.26	11.26	103.35	0.19	26.52	Vu < PhiVc/2	ot Reqd 9.6	26.5	0.0	0.0
+1.20D+0.50Lr+1.60L	2	22.86	21.00	9.48	9.48	108.68	0.15	26.30	Vu < PhiVc/2	ot Reqd 9.6	26.3	0.0	0.0
+1.20D+0.50Lr+1.60L	2	23.37	21.00	7.71	7.71	113.10	0.12	26.10	Vu < PhiVc/2	ot Reqd 9.6	26.1	0.0	0.0
+1.20D+0.50Lr+1.60L	2	23.89	21.00	5.93	5.93	116.61	0.09	25.92	Vu < PhiVc/2	ot Reqd 9.6	25.9	0.0	0.0
+1.20D+0.50Lr+1.60L	2	24.40	21.00	4.16	4.16	119.21	0.06	25.75	Vu < PhiVc/2	ot Reqd 9.6	25.8	0.0	0.0
+1.20D+0.50Lr+1.60L	2	24.91	21.00	2.38	2.38	120.89	0.03	25.60	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60Lr+0.50L	2	25.43	21.00	0.67	0.67	93.82	0.01	25.47	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	25.94	21.00	-1.21	1.21	121.87	0.02	25.50	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	26.46	21.00	-2.99	2.99	120.79	0.04	25.65	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60L	2	26.97	21.00	-4.77	4.77	118.79	0.07	25.81	Vu < PhiVc/2	ot Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	2	27.49	21.00	-6.54	6.54	115.88	0.10	25.98	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	2	28.00	21.00	-8.32	8.32	112.06	0.13	26.16	Vu < PhiVc/2	ot Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	2	28.51	21.00	-10.09	10.09	107.33	0.16	26.37	Vu < PhiVc/2	ot Reqd 9.6	26.4	0.0	0.0
+1.20D+1.60L	2	29.03	21.00	-11.87	11.87	101.68	0.20	26.60	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60L	2	29.54	21.00	-13.65	13.65	95.12	0.25	26.88	PhiVc/2 < Vu <= Min 9.6.3.1		40.7	10.5	10.0
+1.20D+1.60L	2	30.06	21.00	-15.42	15.42	87.64	0.31	27.22	PhiVc/2 < Vu <= Min 9.6.3.1		41.1	10.5	10.0
+1.20D+1.60L	2	30.57	21.00	-17.20	17.20	79.26	0.38	27.64	PhiVc/2 < Vu <= Min 9.6.3.1		41.5	10.5	10.0
+1.20D+1.60L	2	31.09	21.00	-18.97	18.97	69.96	0.47	28.20	PhiVc/2 < Vu <= Min 9.6.3.1		42.1	10.5	10.0
+1.20D+1.60L	2	31.60	21.00	-20.75	20.75	59.74	0.61	28.99	PhiVc/2 < Vu <= Min 9.6.3.1		42.9	10.5	10.0
+1.20D+1.60L	2	32.11	21.00	-22.52	22.52	48.61	0.81	30.20	PhiVc/2 < Vu <= Min 9.6.3.1		44.1	10.5	10.0
+1.20D+1.60L	2	32.63	21.00	-24.30	24.30	36.57	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+1.60L	2	33.14	21.00	-26.08	26.08	23.62	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0
+1.20D+1.60L	2	33.66	21.00	-27.85	27.85	9.75	1.00	31.32	PhiVc/2 < Vu <= Min 9.6.3.1		45.2	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	13.000	-150.64	273.13	0.55
Span # 2	2	21.000	-152.56	273.13	0.56
+1.40D					
Span # 1	1	13.000	-123.10	273.13	0.45
Span # 2	2	21.000	-124.72	273.13	0.46
+1.20D+0.50Lr+1.60L					
Span # 1	1	13.000	-150.64	273.13	0.55
Span # 2	2	21.000	-152.56	273.13	0.56
+1.20D+1.60L					
Span # 1	1	13.000	-149.74	273.13	0.55
Span # 2	2	21.000	-151.63	273.13	0.56
+1.20D+1.60Lr+0.50L					
Span # 1	1	13.000	-122.22	273.13	0.45
Span # 2	2	21.000	-123.86	273.13	0.45
+1.20D+1.60Lr					
Span # 1	1	13.000	-108.40	273.13	0.40
Span # 2	2	21.000	-109.89	273.13	0.40
+1.20D+0.50L					
Span # 1	1	13.000	-119.34	273.13	0.44
Span # 2	2	21.000	-120.88	273.13	0.44
+1.20D					

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-3** P.O

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	13.000	-105.52	273.13	0.39
Span # 2	2	21.000	-106.91	273.13	0.39
+1.20D+0.50Lr+0.50L					
Span # 1	1	13.000	-120.24	273.13	0.44
Span # 2	2	21.000	-121.81	273.13	0.45
+0.90D					
Span # 1	1	13.000	-79.14	273.13	0.29
Span # 2	2	21.000	-80.18	273.13	0.29

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+Lr	1	0.0072	4.643	+D+L	-0.0105	10.957
+D+L	2	0.2034	11.700		0.0000	10.957

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

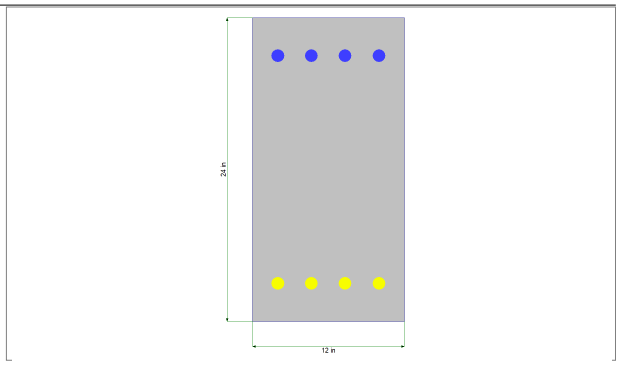
DESCRIPTION: 1B-5** P.O

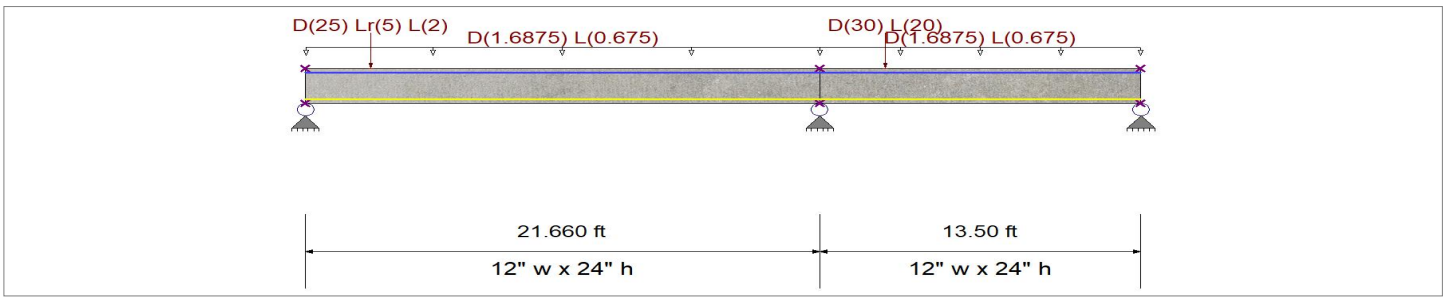
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	4.0





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
4-#8 at 3.0 in from Top, from 0.0 to 21.660 ft in this span
4-#8 at 3.0 in from Bottom, from 0.0 to 21.660 ft in this s
Span #2 Reinforcing....
4-#8 at 3.0 in from Top, from 0.0 to 13.50 ft in this span
4-#8 at 3.0 in from Bottom, from 0.0 to 13.50 ft in this s

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 13.50 ft, (CONCRETE SLAB)
Point Load : D = 25.0, Lr = 5.0, L = 2.0 k @ 2.750 ft
Load for Span Number 2
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 13.50 ft, (CONCRETE SLAB)
Point Load : D = 30.0, L = 20.0 k @ 2.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.864** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-236.055	k-ft
Mn * Phi : Allowable	273.133	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.024 in	Ratio =	10951	>=360.0	Lr Only
Max Upward Transient Deflection	-0.002 in	Ratio =	107354	>=360.0	L Only
Max Downward Total Deflection	0.315 in	Ratio =	825	>=240.0	Span: 2 : +D+L
Max Upward Total Deflection	-0.006 in	Ratio =	29339	>=240.0	Span: 2 : +D+Lr

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-5** P.O

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	45.698	110.482	15.394
Overall MINimum	4.173	1.136	-0.309
D Only	37.256	77.418	9.855
+D+L	44.386	110.482	15.394
+D+Lr	41.377	78.689	9.463
+D+0.750Lr+0.750L	45.698	103.159	13.722
+D+0.750L	42.605	102.211	14.012
+0.60D	22.403	46.321	5.993
Lr Only	4.173	1.136	-0.309
L Only	6.884	33.705	5.144

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L	1	0.00	21.00	57.67	57.67	0.00	1.00	31.32	PhiVc < Vu	26.348	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	0.53	21.00	55.83	55.83	30.10	1.00	31.32	PhiVc < Vu	24.516	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	1.06	21.00	54.00	54.00	59.23	1.00	31.32	PhiVc < Vu	22.685	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	1.59	21.00	52.17	52.17	87.39	1.00	31.32	PhiVc < Vu	20.853	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	2.12	21.00	50.34	50.34	114.58	0.77	29.95	PhiVc < Vu	20.391	57.7	10.5	10.0
+1.20D+0.50Lr+1.60L	1	2.65	21.00	48.51	48.51	140.80	0.60	28.96	PhiVc < Vu	19.543	56.7	10.5	10.0
+1.20D+1.60L	1	3.18	21.00	11.39	11.39	145.04	0.14	26.21	Vu < PhiVc/2	)t Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	1	3.71	21.00	9.56	9.56	150.59	0.11	26.05	Vu < PhiVc/2	)t Reqd 9.6	26.1	0.0	0.0
+1.20D+1.60L	1	4.24	21.00	7.73	7.73	155.18	0.09	25.91	Vu < PhiVc/2	)t Reqd 9.6	25.9	0.0	0.0
+1.20D+1.60L	1	4.77	21.00	5.89	5.89	158.79	0.06	25.78	Vu < PhiVc/2	)t Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	1	5.30	21.00	4.06	4.06	161.43	0.04	25.65	Vu < PhiVc/2	)t Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	1	5.83	21.00	2.23	2.23	163.10	0.02	25.53	Vu < PhiVc/2	)t Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60Lr	1	6.37	21.00	-1.86	1.86	140.71	0.02	25.53	Vu < PhiVc/2	)t Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60Lr	1	6.90	21.00	-3.12	3.12	139.39	0.04	25.62	Vu < PhiVc/2	)t Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60Lr+0.50L	1	7.43	21.00	-4.45	4.45	148.98	0.05	25.70	Vu < PhiVc/2	)t Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60Lr+0.50L	1	7.96	21.00	-5.88	5.88	146.24	0.07	25.81	Vu < PhiVc/2	)t Reqd 9.6	25.8	0.0	0.0
+1.20D+0.50Lr+1.60L	1	8.49	21.00	-7.34	7.34	160.23	0.08	25.87	Vu < PhiVc/2	)t Reqd 9.6	25.9	0.0	0.0
+1.20D+0.50Lr+1.60L	1	9.02	21.00	-9.17	9.17	155.85	0.10	26.00	Vu < PhiVc/2	)t Reqd 9.6	26.0	0.0	0.0
+1.20D+0.50Lr+1.60L	1	9.55	21.00	-11.00	11.00	150.50	0.13	26.15	Vu < PhiVc/2	)t Reqd 9.6	26.2	0.0	0.0
+1.20D+0.50Lr+1.60L	1	10.08	21.00	-12.84	12.84	144.18	0.16	26.32	Vu < PhiVc/2	)t Reqd 9.6	26.3	0.0	0.0
+1.20D+0.50Lr+1.60L	1	10.61	21.00	-14.67	14.67	136.89	0.19	26.50	PhiVc/2 < Vu <=	Min 9.6.3.1	54.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	11.14	21.00	-16.50	16.50	128.62	0.22	26.72	PhiVc/2 < Vu <=	Min 9.6.3.1	54.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	11.67	21.00	-18.33	18.33	119.38	0.27	26.98	PhiVc/2 < Vu <=	Min 9.6.3.1	54.7	10.5	10.0
+1.20D+0.50Lr+1.60L	1	12.20	21.00	-20.16	20.16	109.17	0.32	27.31	PhiVc/2 < Vu <=	Min 9.6.3.1	55.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	12.73	21.00	-21.99	21.99	97.99	0.39	27.72	PhiVc/2 < Vu <=	Min 9.6.3.1	55.4	10.5	10.0
+1.20D+0.50Lr+1.60L	1	13.26	21.00	-23.83	23.83	85.84	0.49	28.27	PhiVc/2 < Vu <=	Min 9.6.3.1	56.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	13.79	21.00	-25.66	25.66	72.71	0.62	29.05	PhiVc/2 < Vu <=	Min 9.6.3.1	56.8	10.5	10.0
+1.20D+0.50Lr+1.60L	1	14.32	21.00	-27.49	27.49	58.62	0.82	30.25	PhiVc/2 < Vu <=	Min 9.6.3.1	58.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	14.85	21.00	-29.32	29.32	43.55	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	15.38	21.00	-31.15	31.15	27.51	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	15.91	21.00	-32.98	32.98	10.50	1.00	31.32	PhiVc < Vu	1.667	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	16.44	21.00	-34.82	34.82	7.48	1.00	31.32	PhiVc < Vu	3.498	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	16.97	21.00	-36.65	36.65	26.43	1.00	31.32	PhiVc < Vu	5.330	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	17.50	21.00	-38.48	38.48	46.36	1.00	31.32	PhiVc < Vu	7.162	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	18.04	21.00	-40.31	40.31	67.26	1.00	31.32	PhiVc < Vu	8.993	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	18.57	21.00	-42.14	42.14	89.12	0.83	30.30	PhiVc < Vu	11.847	58.0	10.5	10.0
+1.20D+0.50Lr+1.60L	1	19.10	21.00	-43.97	43.97	111.96	0.69	29.46	PhiVc < Vu	14.509	57.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	19.63	21.00	-45.81	45.81	135.78	0.59	28.89	PhiVc < Vu	16.915	56.6	10.5	10.0
+1.20D+0.50Lr+1.60L	1	20.16	21.00	-47.64	47.64	160.56	0.52	28.47	PhiVc < Vu	19.169	56.2	10.5	10.0
+1.20D+0.50Lr+1.60L	1	20.69	21.00	-49.47	49.47	186.31	0.46	28.15	PhiVc < Vu	21.323	55.9	10.5	10.0
+1.20D+0.50Lr+1.60L	1	21.22	21.00	-51.30	51.30	213.04	0.42	27.89	PhiVc < Vu	23.411	55.6	10.5	10.0
+1.20D+0.50Lr+1.60L	2	21.72	21.00	94.75	94.75	230.83	0.72	29.65	Vs>(4bdf'c^.5)	65.103	98.9	4.3	4.0
+1.20D+0.50Lr+1.60L	2	22.05	21.00	93.61	93.61	199.69	0.82	30.25	Vs>(4bdf'c^.5)	63.357	99.6	4.4	4.0
+1.20D+0.50Lr+1.60L	2	22.38	21.00	92.47	92.47	168.93	0.96	31.07	Vs>(4bdf'c^.5)	61.40	100.4	4.5	4.0
+1.20D+0.50Lr+1.60L	2	22.71	21.00	91.33	91.33	138.55	1.00	31.32	Vs>(4bdf'c^.5)	60.009	100.6	4.6	4.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-5** P.O

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+0.50Lr+1.60L	2	23.04	21.00	90.18	90.18	108.54	1.00	31.32	Vs>(4bdf'c^.5)	58.868	100.6	4.7	4.0
+1.20D+0.50Lr+1.60L	2	23.37	21.00	89.04	89.04	78.92	1.00	31.32	Vs>(4bdf'c^.5)	57.726	100.6	4.8	4.0
+1.20D+0.50Lr+1.60L	2	23.70	21.00	87.90	87.90	49.67	1.00	31.32	Vs>(4bdf'c^.5)	56.584	100.6	4.9	4.0
+1.20D+0.50Lr+1.60L	2	24.03	21.00	86.76	86.76	20.79	1.00	31.32	Vs>(4bdf'c^.5)	55.443	100.6	5.0	4.0
+1.20D+0.50Lr+1.60L	2	24.36	21.00	85.62	85.62	7.70	1.00	31.32	Vs>(4bdf'c^.5)	54.301	100.6	5.1	4.0
+1.20D+0.50Lr+1.60L	2	24.69	21.00	16.48	16.48	16.74	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0
+1.20D+0.50Lr+1.60L	2	25.02	21.00	15.34	15.34	22.00	1.00	31.32	Vu < PhiVc/2	)t Reqd 9.6	31.3	0.0	0.0
+1.20D+0.50Lr+1.60L	2	25.35	21.00	14.19	14.19	26.88	0.92	30.87	Vu < PhiVc/2	)t Reqd 9.6	30.9	0.0	0.0
+1.20D+0.50Lr+1.60L	2	25.68	21.00	13.05	13.05	31.38	0.73	29.70	Vu < PhiVc/2	)t Reqd 9.6	29.7	0.0	0.0
+1.20D+0.50Lr+1.60L	2	26.01	21.00	11.91	11.91	35.51	0.59	28.87	Vu < PhiVc/2	)t Reqd 9.6	28.9	0.0	0.0
+1.40D	2	26.34	21.00	10.88	10.88	11.69	1.00	31.32	Vu < PhiVc/2	)t Reqd 9.6	31.3	0.0	0.0
+1.40D	2	26.67	21.00	9.96	9.96	15.14	1.00	31.32	Vu < PhiVc/2	)t Reqd 9.6	31.3	0.0	0.0
+1.40D	2	27.00	21.00	9.05	9.05	18.28	0.87	30.52	Vu < PhiVc/2	)t Reqd 9.6	30.5	0.0	0.0
+1.40D	2	27.34	21.00	8.13	8.13	21.12	0.67	29.38	Vu < PhiVc/2	)t Reqd 9.6	29.4	0.0	0.0
+1.40D	2	27.67	21.00	7.22	7.22	23.66	0.53	28.56	Vu < PhiVc/2	)t Reqd 9.6	28.6	0.0	0.0
+1.40D	2	28.00	21.00	6.30	6.30	25.89	0.43	27.92	Vu < PhiVc/2	)t Reqd 9.6	27.9	0.0	0.0
+1.40D	2	28.33	21.00	5.39	5.39	27.82	0.34	27.40	Vu < PhiVc/2	)t Reqd 9.6	27.4	0.0	0.0
+1.40D	2	28.66	21.00	4.47	4.47	29.45	0.27	26.97	Vu < PhiVc/2	)t Reqd 9.6	27.0	0.0	0.0
+1.40D	2	28.99	21.00	3.56	3.56	30.78	0.20	26.59	Vu < PhiVc/2	)t Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60Lr	2	29.32	21.00	2.76	2.76	24.38	0.20	26.56	Vu < PhiVc/2	)t Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60Lr	2	29.65	21.00	1.97	1.97	25.16	0.14	26.21	Vu < PhiVc/2	)t Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	2	29.98	21.00	-1.94	1.94	56.38	0.06	25.75	Vu < PhiVc/2	)t Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	2	30.31	21.00	-3.08	3.08	55.55	0.10	25.97	Vu < PhiVc/2	)t Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	2	30.64	21.00	-4.23	4.23	54.34	0.14	26.20	Vu < PhiVc/2	)t Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	2	30.97	21.00	-5.37	5.37	52.76	0.18	26.45	Vu < PhiVc/2	)t Reqd 9.6	26.4	0.0	0.0
+1.20D+1.60L	2	31.30	21.00	-6.51	6.51	50.79	0.22	26.72	Vu < PhiVc/2	)t Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	2	31.63	21.00	-7.65	7.65	48.45	0.28	27.03	Vu < PhiVc/2	)t Reqd 9.6	27.0	0.0	0.0
+1.20D+1.60L	2	31.96	21.00	-8.79	8.79	45.74	0.34	27.39	Vu < PhiVc/2	)t Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	2	32.29	21.00	-9.93	9.93	42.64	0.41	27.81	Vu < PhiVc/2	)t Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	2	32.63	21.00	-11.08	11.08	39.17	0.49	28.32	Vu < PhiVc/2	)t Reqd 9.6	28.3	0.0	0.0
+1.20D+1.60L	2	32.96	21.00	-12.22	12.22	35.32	0.61	28.98	Vu < PhiVc/2	)t Reqd 9.6	29.0	0.0	0.0
+1.20D+1.60L	2	33.29	21.00	-13.36	13.36	31.09	0.75	29.85	Vu < PhiVc/2	)t Reqd 9.6	29.8	0.0	0.0
+1.20D+1.60L	2	33.62	21.00	-14.50	14.50	26.48	0.96	31.07	Vu < PhiVc/2	)t Reqd 9.6	31.1	0.0	0.0
+1.20D+1.60L	2	33.95	21.00	-15.64	15.64	21.50	1.00	31.32	Vu < PhiVc/2	)t Reqd 9.6	31.3	0.0	0.0
+1.20D+1.60L	2	34.28	21.00	-16.78	16.78	16.14	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0
+1.20D+1.60L	2	34.61	21.00	-17.93	17.93	10.40	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0
+1.20D+1.60L	2	34.94	21.00	-19.07	19.07	4.29	1.00	31.32	PhiVc/2 < Vu <=	Min 9.6.3.1	59.0	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	21.660	-231.40	273.13	0.85
Span # 2	2	13.500	-236.05	273.13	0.86
+1.40D					
Span # 1	1	21.660	-181.33	273.13	0.66
Span # 2	2	13.500	-185.12	273.13	0.68
+1.20D+0.50Lr+1.60L					
Span # 1	1	21.660	-231.40	273.13	0.85
Span # 2	2	13.500	-236.05	273.13	0.86
+1.20D+1.60L					
Span # 1	1	21.660	-229.35	273.13	0.84
Span # 2	2	13.500	-233.97	273.13	0.86
+1.20D+1.60Lr+0.50L					
Span # 1	1	21.660	-185.08	273.13	0.68
Span # 2	2	13.500	-188.87	273.13	0.69
+1.20D+1.60Lr					
Span # 1	1	21.660	-161.98	273.13	0.59
Span # 2	2	13.500	-165.34	273.13	0.61
+1.20D+0.50L					
Span # 1	1	21.660	-178.53	273.13	0.65

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-5** P.O

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	13.500	-182.21	273.13	0.67
+1.20D					
Span # 1	1	21.660	-155.43	273.13	0.57
Span # 2	2	13.500	-158.67	273.13	0.58
+1.20D+0.50Lr+0.50L					
Span # 1	1	21.660	-180.58	273.13	0.66
Span # 2	2	13.500	-184.29	273.13	0.67
+0.90D					
Span # 1	1	21.660	-116.57	273.13	0.43
Span # 2	2	13.500	-119.01	273.13	0.44

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.3148	8.973	+D+Lr	-0.0015	21.853
+D+L	2	0.0193	7.521	+D+Lr	-0.0055	1.350

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

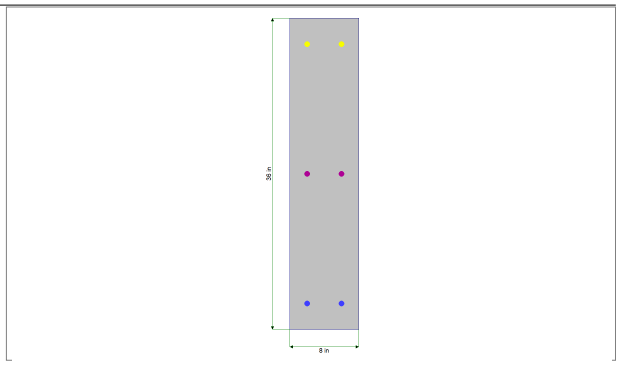
DESCRIPTION: 1B-6** P.O.

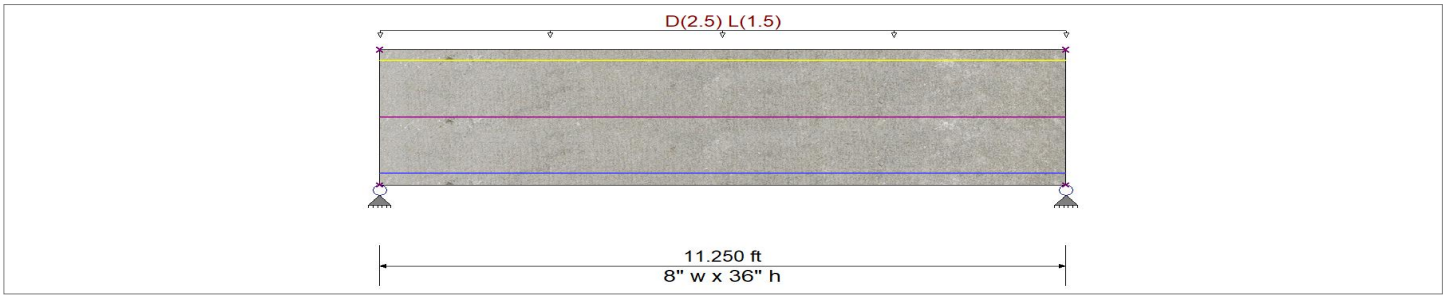
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 8.0 in, Height = 36.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 11.250 ft in this span
2-#5 at 18.0 in from Bottom, from 0.0 to 11.250 ft in this
2-#5 at 3.0 in from Top, from 0.0 to 11.250 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.250, L = 0.150 ksf, Tributary Width = 10.0 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.667** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	90.935	k-ft
Mn * Phi : Allowable	136.355	k-ft
Location of maximum on span	5.635	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.004 in	Ratio =	31315	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.012 in	Ratio =	10949	>=240.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	24.131	24.131
Overall MINimum	8.437	8.437
D Only	15.694	15.694
+D+L	24.131	24.131
+D+0.750L	22.022	22.022
+0.60D	9.416	9.416

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-6** P.O.

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
L Only	8.437	8.437

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	1	0.00	33.00	32.33	32.33	0.00	1.00	28.93	PhiVc < Vu	3.406	42.5	16.5	16.0
+1.20D+1.60L	1	0.12	33.00	31.63	31.63	3.93	1.00	28.93	PhiVc < Vu	2.699	42.5	16.5	16.0
+1.20D+1.60L	1	0.25	33.00	30.92	30.92	7.78	1.00	28.93	PhiVc < Vu	1.993	42.5	16.5	16.0
+1.20D+1.60L	1	0.37	33.00	30.21	30.21	11.53	1.00	28.93	PhiVc < Vu	1.286	42.5	16.5	16.0
+1.20D+1.60L	1	0.49	33.00	29.51	29.51	15.21	1.00	28.93	PhiVc < Vu	0.5793	42.5	16.5	16.0
+1.20D+1.60L	1	0.61	33.00	28.80	28.80	18.79	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	0.74	33.00	28.09	28.09	22.29	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	0.86	33.00	27.39	27.39	25.70	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	0.98	33.00	26.68	26.68	29.02	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.11	33.00	25.97	25.97	32.26	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.23	33.00	25.27	25.27	35.41	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.35	33.00	24.56	24.56	38.47	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.48	33.00	23.85	23.85	41.45	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.60	33.00	23.15	23.15	44.34	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.72	33.00	22.44	22.44	47.14	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.84	33.00	21.73	21.73	49.85	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	1.97	33.00	21.02	21.02	52.48	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	2.09	33.00	20.32	20.32	55.02	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	2.21	33.00	19.61	19.61	57.48	0.94	28.78	PhiVc/2 < Vu <=	Min 9.6.3.1	42.4	16.5	16.0
+1.20D+1.60L	1	2.34	33.00	18.90	18.90	59.85	0.87	28.62	PhiVc/2 < Vu <=	Min 9.6.3.1	42.2	16.5	16.0
+1.20D+1.60L	1	2.46	33.00	18.20	18.20	62.13	0.81	28.47	PhiVc/2 < Vu <=	Min 9.6.3.1	42.1	16.5	16.0
+1.20D+1.60L	1	2.58	33.00	17.49	17.49	64.32	0.75	28.34	PhiVc/2 < Vu <=	Min 9.6.3.1	42.0	16.5	16.0
+1.20D+1.60L	1	2.70	33.00	16.78	16.78	66.43	0.69	28.22	PhiVc/2 < Vu <=	Min 9.6.3.1	41.8	16.5	16.0
+1.20D+1.60L	1	2.83	33.00	16.08	16.08	68.45	0.65	28.10	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	16.5	16.0
+1.20D+1.60L	1	2.95	33.00	15.37	15.37	70.38	0.60	28.00	PhiVc/2 < Vu <=	Min 9.6.3.1	41.6	16.5	16.0
+1.20D+1.60L	1	3.07	33.00	14.66	14.66	72.23	0.56	27.90	PhiVc/2 < Vu <=	Min 9.6.3.1	41.5	16.5	16.0
+1.20D+1.60L	1	3.20	33.00	13.96	13.96	73.99	0.52	27.81	PhiVc/2 < Vu <=	Min 9.6.3.1	41.4	16.5	16.0
+1.20D+1.60L	1	3.32	33.00	13.25	13.25	75.66	0.48	27.72	Vu < PhiVc/2	ot Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	3.44	33.00	12.54	12.54	77.25	0.45	27.64	Vu < PhiVc/2	ot Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	3.57	33.00	11.84	11.84	78.75	0.41	27.56	Vu < PhiVc/2	ot Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	3.69	33.00	11.13	11.13	80.16	0.38	27.49	Vu < PhiVc/2	ot Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	3.81	33.00	10.42	10.42	81.48	0.35	27.42	Vu < PhiVc/2	ot Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	3.93	33.00	9.72	9.72	82.72	0.32	27.35	Vu < PhiVc/2	ot Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	4.06	33.00	9.01	9.01	83.87	0.30	27.29	Vu < PhiVc/2	ot Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	4.18	33.00	8.30	8.30	84.94	0.27	27.23	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	4.30	33.00	7.60	7.60	85.91	0.24	27.17	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	4.43	33.00	6.89	6.89	86.81	0.22	27.11	Vu < PhiVc/2	ot Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60L	1	4.55	33.00	6.18	6.18	87.61	0.19	27.05	Vu < PhiVc/2	ot Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60L	1	4.67	33.00	5.48	5.48	88.33	0.17	27.00	Vu < PhiVc/2	ot Reqd 9.6	27.0	0.0	0.0
+1.20D+1.60L	1	4.80	33.00	4.77	4.77	88.96	0.15	26.94	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60L	1	4.92	33.00	4.06	4.06	89.50	0.12	26.89	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60L	1	5.04	33.00	3.36	3.36	89.95	0.10	26.84	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	1	5.16	33.00	2.65	2.65	90.32	0.08	26.79	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	1	5.29	33.00	1.94	1.94	90.61	0.06	26.74	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	1	5.41	33.00	1.24	1.24	90.80	0.04	26.69	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	1	5.53	33.00	0.53	0.53	90.91	0.02	26.64	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60L	1	5.66	33.00	-0.18	0.18	90.93	0.01	26.61	Vu < PhiVc/2	ot Reqd 9.6	26.6	0.0	0.0
+1.20D+1.60L	1	5.78	33.00	-0.88	0.88	90.87	0.03	26.66	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	1	5.90	33.00	-1.59	1.59	90.72	0.05	26.71	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	1	6.02	33.00	-2.30	2.30	90.48	0.07	26.76	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	1	6.15	33.00	-3.00	3.00	90.15	0.09	26.81	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	1	6.27	33.00	-3.71	3.71	89.74	0.11	26.87	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60L	1	6.39	33.00	-4.42	4.42	89.24	0.14	26.92	Vu < PhiVc/2	ot Reqd 9.6	26.9	0.0	0.0
+1.20D+1.60L	1	6.52	33.00	-5.12	5.12	88.65	0.16	26.97	Vu < PhiVc/2	ot Reqd 9.6	27.0	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-6** P.O.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	6.64	33.00	-5.83	5.83	87.98	0.18	27.03	Vu < PhiVc/2	ot Reqd 9.6	27.0	0.0	0.0
+1.20D+1.60L	1	6.76	33.00	-6.54	6.54	87.22	0.21	27.08	Vu < PhiVc/2	ot Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60L	1	6.89	33.00	-7.24	7.24	86.37	0.23	27.14	Vu < PhiVc/2	ot Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60L	1	7.01	33.00	-7.95	7.95	85.44	0.26	27.20	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	7.13	33.00	-8.66	8.66	84.42	0.28	27.26	Vu < PhiVc/2	ot Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	7.25	33.00	-9.36	9.36	83.31	0.31	27.32	Vu < PhiVc/2	ot Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	7.38	33.00	-10.07	10.07	82.11	0.34	27.39	Vu < PhiVc/2	ot Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	7.50	33.00	-10.78	10.78	80.83	0.37	27.45	Vu < PhiVc/2	ot Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	7.62	33.00	-11.48	11.48	79.46	0.40	27.53	Vu < PhiVc/2	ot Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	7.75	33.00	-12.19	12.19	78.01	0.43	27.60	Vu < PhiVc/2	ot Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	7.87	33.00	-12.90	12.90	76.46	0.46	27.68	Vu < PhiVc/2	ot Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	7.99	33.00	-13.60	13.60	74.84	0.50	27.76	Vu < PhiVc/2	ot Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	8.11	33.00	-14.31	14.31	73.12	0.54	27.85	PhiVc/2 < Vu <=	Min 9.6.3.1	41.5	16.5	16.0
+1.20D+1.60L	1	8.24	33.00	-15.02	15.02	71.32	0.58	27.95	PhiVc/2 < Vu <=	Min 9.6.3.1	41.6	16.5	16.0
+1.20D+1.60L	1	8.36	33.00	-15.72	15.72	69.43	0.62	28.05	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	16.5	16.0
+1.20D+1.60L	1	8.48	33.00	-16.43	16.43	67.45	0.67	28.16	PhiVc/2 < Vu <=	Min 9.6.3.1	41.8	16.5	16.0
+1.20D+1.60L	1	8.61	33.00	-17.14	17.14	65.39	0.72	28.28	PhiVc/2 < Vu <=	Min 9.6.3.1	41.9	16.5	16.0
+1.20D+1.60L	1	8.73	33.00	-17.84	17.84	63.24	0.78	28.41	PhiVc/2 < Vu <=	Min 9.6.3.1	42.0	16.5	16.0
+1.20D+1.60L	1	8.85	33.00	-18.55	18.55	61.00	0.84	28.55	PhiVc/2 < Vu <=	Min 9.6.3.1	42.2	16.5	16.0
+1.20D+1.60L	1	8.98	33.00	-19.26	19.26	58.67	0.90	28.70	PhiVc/2 < Vu <=	Min 9.6.3.1	42.3	16.5	16.0
+1.20D+1.60L	1	9.10	33.00	-19.96	19.96	56.26	0.98	28.87	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.22	33.00	-20.67	20.67	53.76	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.34	33.00	-21.38	21.38	51.18	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.47	33.00	-22.09	22.09	48.51	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.59	33.00	-22.79	22.79	45.75	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.71	33.00	-23.50	23.50	42.90	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.84	33.00	-24.21	24.21	39.97	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	9.96	33.00	-24.91	24.91	36.95	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.08	33.00	-25.62	25.62	33.84	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.20	33.00	-26.33	26.33	30.65	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.33	33.00	-27.03	27.03	27.37	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.45	33.00	-27.74	27.74	24.00	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.57	33.00	-28.45	28.45	20.55	1.00	28.93	PhiVc/2 < Vu <=	Min 9.6.3.1	42.5	16.5	16.0
+1.20D+1.60L	1	10.70	33.00	-29.15	29.15	17.01	1.00	28.93	PhiVc < Vu	0.2259	42.5	16.5	16.0
+1.20D+1.60L	1	10.82	33.00	-29.86	29.86	13.38	1.00	28.93	PhiVc < Vu	0.9326	42.5	16.5	16.0
+1.20D+1.60L	1	10.94	33.00	-30.57	30.57	9.67	1.00	28.93	PhiVc < Vu	1.639	42.5	16.5	16.0
+1.20D+1.60L	1	11.07	33.00	-31.27	31.27	5.87	1.00	28.93	PhiVc < Vu	2.346	42.5	16.5	16.0
+1.20D+1.60L	1	11.19	33.00	-31.98	31.98	1.98	1.00	28.93	PhiVc < Vu	3.053	42.5	16.5	16.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	11.250	90.93	136.36	0.67
+1.40D					
Span # 1	1	11.250	61.79	136.36	0.45
+1.20D+1.60L					
Span # 1	1	11.250	90.93	136.36	0.67
+1.20D+0.50L					
Span # 1	1	11.250	64.83	136.36	0.48
+1.20D					
Span # 1	1	11.250	52.97	136.36	0.39
+0.90D					
Span # 1	1	11.250	39.72	136.36	0.29

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0123	5.625		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

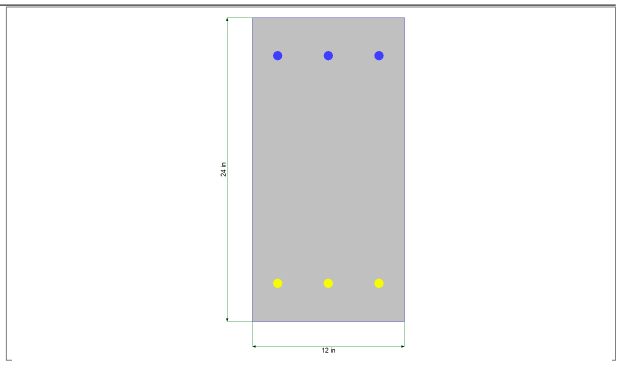
DESCRIPTION: 1B-15** M.H

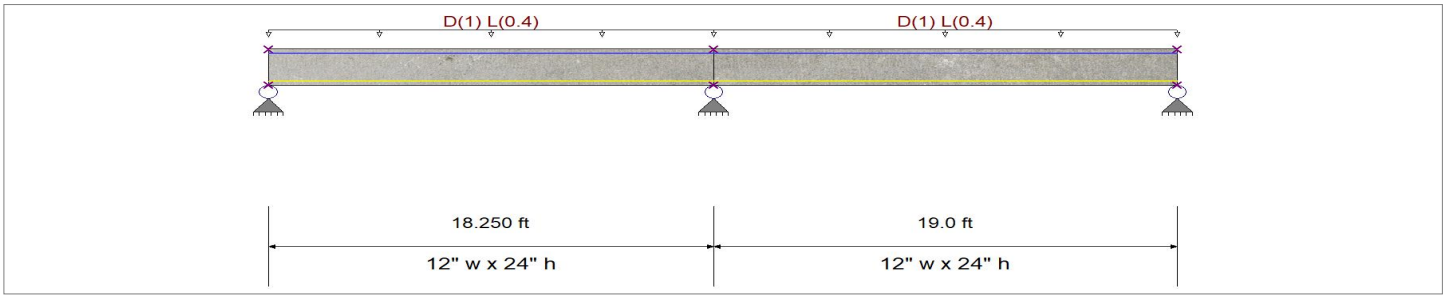
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
3-#6 at 3.0 in from Top, from 0.0 to 18.250 ft in this span
3-#6 at 3.0 in from Bottom, from 0.0 to 18.250 ft in this
Span #2 Reinforcing....
3-#6 at 3.0 in from Top, from 0.0 to 19.0 ft in this span
3-#6 at 3.0 in from Bottom, from 0.0 to 19.0 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 8.0 ft, (CONCRETE SLAB)
Load for Span Number 2
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 8.0 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.777** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-94.990	k-ft
Mn * Phi : Allowable	122.225	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.009 in	Ratio =	24837	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.044 in	Ratio =	5201	>=240.0	Span: 2 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 2 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	11.842	38.493	12.617
Overall MINimum	2.698	9.316	2.886
D Only	8.720	30.008	9.324

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-15** M.H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
+D+L	11.842	38.493	12.617
+D+0.750L	11.029	36.437	11.762
+0.60D	5.222	18.026	5.584
L Only	2.698	9.316	2.886

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	21.00	14.76	14.76	0.00	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	0.45	21.00	13.78	13.78	6.38	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	0.89	21.00	12.80	12.80	12.32	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	1.34	21.00	11.83	11.83	17.82	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	1.79	21.00	10.85	10.85	22.89	0.83	27.44	Vu < PhiVc/2 ot Reqd 9.6	27.4	0.0	0.0	
+1.20D+1.60L	1	2.23	21.00	9.87	9.87	27.52	0.63	26.95	Vu < PhiVc/2 ot Reqd 9.6	26.9	0.0	0.0	
+1.20D+1.60L	1	2.68	21.00	8.89	8.89	31.72	0.49	26.61	Vu < PhiVc/2 ot Reqd 9.6	26.6	0.0	0.0	
+1.20D+1.60L	1	3.13	21.00	7.92	7.92	35.47	0.39	26.36	Vu < PhiVc/2 ot Reqd 9.6	26.4	0.0	0.0	
+1.20D+1.60L	1	3.58	21.00	6.94	6.94	38.79	0.31	26.17	Vu < PhiVc/2 ot Reqd 9.6	26.2	0.0	0.0	
+1.20D+1.60L	1	4.02	21.00	5.96	5.96	41.67	0.25	26.01	Vu < PhiVc/2 ot Reqd 9.6	26.0	0.0	0.0	
+1.20D+1.60L	1	4.47	21.00	4.98	4.98	44.12	0.20	25.88	Vu < PhiVc/2 ot Reqd 9.6	25.9	0.0	0.0	
+1.20D+1.60L	1	4.92	21.00	4.00	4.00	46.13	0.15	25.77	Vu < PhiVc/2 ot Reqd 9.6	25.8	0.0	0.0	
+1.20D+1.60L	1	5.36	21.00	3.03	3.03	47.70	0.11	25.67	Vu < PhiVc/2 ot Reqd 9.6	25.7	0.0	0.0	
+1.20D+1.60L	1	5.81	21.00	2.05	2.05	48.83	0.07	25.57	Vu < PhiVc/2 ot Reqd 9.6	25.6	0.0	0.0	
+1.20D+1.60L	1	6.26	21.00	1.07	1.07	49.53	0.04	25.49	Vu < PhiVc/2 ot Reqd 9.6	25.5	0.0	0.0	
+1.20D+1.60L	1	6.70	21.00	0.09	0.09	49.79	0.00	25.40	Vu < PhiVc/2 ot Reqd 9.6	25.4	0.0	0.0	
+1.20D+1.60L	1	7.15	21.00	-0.89	0.89	49.61	0.03	25.47	Vu < PhiVc/2 ot Reqd 9.6	25.5	0.0	0.0	
+1.20D+1.60L	1	7.60	21.00	-1.86	1.86	48.99	0.07	25.56	Vu < PhiVc/2 ot Reqd 9.6	25.6	0.0	0.0	
+1.20D+1.60L	1	8.04	21.00	-2.84	2.84	47.94	0.10	25.65	Vu < PhiVc/2 ot Reqd 9.6	25.6	0.0	0.0	
+1.20D+1.60L	1	8.49	21.00	-3.82	3.82	46.45	0.14	25.75	Vu < PhiVc/2 ot Reqd 9.6	25.7	0.0	0.0	
+1.20D+1.60L	1	8.94	21.00	-4.80	4.80	44.53	0.19	25.86	Vu < PhiVc/2 ot Reqd 9.6	25.9	0.0	0.0	
+1.20D+1.60L	1	9.39	21.00	-5.78	5.78	42.17	0.24	25.99	Vu < PhiVc/2 ot Reqd 9.6	26.0	0.0	0.0	
+1.20D+1.60L	1	9.83	21.00	-6.75	6.75	39.37	0.30	26.14	Vu < PhiVc/2 ot Reqd 9.6	26.1	0.0	0.0	
+1.20D+1.60L	1	10.28	21.00	-7.73	7.73	36.13	0.37	26.32	Vu < PhiVc/2 ot Reqd 9.6	26.3	0.0	0.0	
+1.20D+1.60L	1	10.73	21.00	-8.71	8.71	32.46	0.47	26.55	Vu < PhiVc/2 ot Reqd 9.6	26.6	0.0	0.0	
+1.20D+1.60L	1	11.17	21.00	-9.69	9.69	28.34	0.60	26.87	Vu < PhiVc/2 ot Reqd 9.6	26.9	0.0	0.0	
+1.20D+1.60L	1	11.62	21.00	-10.66	10.66	23.80	0.78	27.33	Vu < PhiVc/2 ot Reqd 9.6	27.3	0.0	0.0	
+1.20D+1.60L	1	12.07	21.00	-11.64	11.64	18.81	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	12.51	21.00	-12.62	12.62	13.39	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	12.96	21.00	-13.60	13.60	7.53	1.00	27.87	Vu < PhiVc/2 ot Reqd 9.6	27.9	0.0	0.0	
+1.20D+1.60L	1	13.41	21.00	-14.58	14.58	1.23	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	13.86	21.00	-15.55	15.55	5.50	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	14.30	21.00	-16.53	16.53	12.67	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	14.75	21.00	-17.51	17.51	20.28	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	15.20	21.00	-18.49	18.49	28.32	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	1	15.64	21.00	-19.47	19.47	36.80	0.93	27.68	PhiVc/2 < Vu <= Min 9.6.3.1	41.5	10.5	10.0	
+1.20D+1.60L	1	16.09	21.00	-20.44	20.44	45.72	0.78	27.33	PhiVc/2 < Vu <= Min 9.6.3.1	41.2	10.5	10.0	
+1.20D+1.60L	1	16.54	21.00	-21.42	21.42	55.08	0.68	27.08	PhiVc/2 < Vu <= Min 9.6.3.1	40.9	10.5	10.0	
+1.20D+1.60L	1	16.98	21.00	-22.40	22.40	64.87	0.60	26.89	PhiVc/2 < Vu <= Min 9.6.3.1	40.7	10.5	10.0	
+1.20D+1.60L	1	17.43	21.00	-23.38	23.38	75.10	0.54	26.74	PhiVc/2 < Vu <= Min 9.6.3.1	40.6	10.5	10.0	
+1.20D+1.60L	1	17.88	21.00	-24.36	24.36	85.77	0.50	26.62	PhiVc/2 < Vu <= Min 9.6.3.1	40.5	10.5	10.0	
+1.20D+1.60L	2	18.33	21.00	25.62	25.62	93.00	0.48	26.59	PhiVc/2 < Vu <= Min 9.6.3.1	40.4	10.5	10.0	
+1.20D+1.60L	2	18.79	21.00	24.60	24.60	81.31	0.53	26.70	PhiVc/2 < Vu <= Min 9.6.3.1	40.6	10.5	10.0	
+1.20D+1.60L	2	19.26	21.00	23.58	23.58	70.11	0.59	26.85	PhiVc/2 < Vu <= Min 9.6.3.1	40.7	10.5	10.0	
+1.20D+1.60L	2	19.72	21.00	22.56	22.56	59.37	0.67	27.04	PhiVc/2 < Vu <= Min 9.6.3.1	40.9	10.5	10.0	
+1.20D+1.60L	2	20.19	21.00	21.54	21.54	49.11	0.77	27.29	PhiVc/2 < Vu <= Min 9.6.3.1	41.2	10.5	10.0	
+1.20D+1.60L	2	20.65	21.00	20.53	20.53	39.32	0.91	27.65	PhiVc/2 < Vu <= Min 9.6.3.1	41.5	10.5	10.0	
+1.20D+1.60L	2	21.12	21.00	19.51	19.51	30.01	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	2	21.58	21.00	18.49	18.49	21.17	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	2	22.05	21.00	17.47	17.47	12.80	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	
+1.20D+1.60L	2	22.52	21.00	16.45	16.45	4.91	1.00	27.87	PhiVc/2 < Vu <= Min 9.6.3.1	41.7	10.5	10.0	

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-15** M.H

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	2	22.98	21.00	15.43	15.43	2.51	1.00	27.87	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	10.5	10.0
+1.20D+1.60L	2	23.45	21.00	14.42	14.42	9.45	1.00	27.87	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	10.5	10.0
+1.20D+1.60L	2	23.91	21.00	13.40	13.40	15.93	1.00	27.87	Vu < PhiVc/2	ot Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	2	24.38	21.00	12.38	12.38	21.92	0.99	27.84	Vu < PhiVc/2	ot Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	2	24.84	21.00	11.36	11.36	27.45	0.72	27.19	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	2	25.31	21.00	10.34	10.34	32.50	0.56	26.77	Vu < PhiVc/2	ot Reqd 9.6	26.8	0.0	0.0
+1.20D+1.60L	2	25.77	21.00	9.33	9.33	37.07	0.44	26.48	Vu < PhiVc/2	ot Reqd 9.6	26.5	0.0	0.0
+1.20D+1.60L	2	26.24	21.00	8.31	8.31	41.18	0.35	26.27	Vu < PhiVc/2	ot Reqd 9.6	26.3	0.0	0.0
+1.20D+1.60L	2	26.70	21.00	7.29	7.29	44.81	0.28	26.10	Vu < PhiVc/2	ot Reqd 9.6	26.1	0.0	0.0
+1.20D+1.60L	2	27.17	21.00	6.27	6.27	47.96	0.23	25.96	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	2	27.63	21.00	5.25	5.25	50.64	0.18	25.84	Vu < PhiVc/2	ot Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	2	28.10	21.00	4.24	4.24	52.85	0.14	25.74	Vu < PhiVc/2	ot Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	2	28.56	21.00	3.22	3.22	54.58	0.10	25.65	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60L	2	29.03	21.00	2.20	2.20	55.84	0.07	25.56	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60L	2	29.49	21.00	1.18	1.18	56.63	0.04	25.48	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	29.96	21.00	0.16	0.16	56.94	0.01	25.40	Vu < PhiVc/2	ot Reqd 9.6	25.4	0.0	0.0
+1.20D+1.60L	2	30.43	21.00	-0.85	0.85	56.78	0.03	25.46	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	30.89	21.00	-1.87	1.87	56.15	0.06	25.54	Vu < PhiVc/2	ot Reqd 9.6	25.5	0.0	0.0
+1.20D+1.60L	2	31.36	21.00	-2.89	2.89	55.04	0.09	25.62	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60L	2	31.82	21.00	-3.91	3.91	53.46	0.13	25.71	Vu < PhiVc/2	ot Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	2	32.29	21.00	-4.93	4.93	51.40	0.17	25.81	Vu < PhiVc/2	ot Reqd 9.6	25.8	0.0	0.0
+1.20D+1.60L	2	32.75	21.00	-5.94	5.94	48.87	0.21	25.92	Vu < PhiVc/2	ot Reqd 9.6	25.9	0.0	0.0
+1.20D+1.60L	2	33.22	21.00	-6.96	6.96	45.87	0.27	26.05	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	2	33.68	21.00	-7.98	7.98	42.39	0.33	26.21	Vu < PhiVc/2	ot Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	2	34.15	21.00	-9.00	9.00	38.44	0.41	26.41	Vu < PhiVc/2	ot Reqd 9.6	26.4	0.0	0.0
+1.20D+1.60L	2	34.61	21.00	-10.02	10.02	34.02	0.52	26.67	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	2	35.08	21.00	-11.04	11.04	29.12	0.66	27.03	Vu < PhiVc/2	ot Reqd 9.6	27.0	0.0	0.0
+1.20D+1.60L	2	35.54	21.00	-12.05	12.05	23.75	0.89	27.59	Vu < PhiVc/2	ot Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	2	36.01	21.00	-13.07	13.07	17.90	1.00	27.87	Vu < PhiVc/2	ot Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	2	36.47	21.00	-14.09	14.09	11.58	1.00	27.87	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	10.5	10.0
+1.20D+1.60L	2	36.94	21.00	-15.11	15.11	4.79	1.00	27.87	PhiVc/2 < Vu <=	Min 9.6.3.1	41.7	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	18.250	-93.12	122.23	0.76
Span # 2	2	19.000	-94.99	122.23	0.78
+1.40D					
Span # 1	1	18.250	-76.86	122.23	0.63
Span # 2	2	19.000	-78.41	122.23	0.64
+1.20D+1.60L					
Span # 1	1	18.250	-93.12	122.23	0.76
Span # 2	2	19.000	-94.99	122.23	0.78
+1.20D+0.50L					
Span # 1	1	18.250	-74.39	122.23	0.61
Span # 2	2	19.000	-75.89	122.23	0.62
+1.20D					
Span # 1	1	18.250	-65.88	122.23	0.54
Span # 2	2	19.000	-67.20	122.23	0.55
+0.90D					
Span # 1	1	18.250	-49.41	122.23	0.40
Span # 2	2	19.000	-50.40	122.23	0.41

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0342	8.082		0.0000	0.000
+D+L	2	0.0438	10.586		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

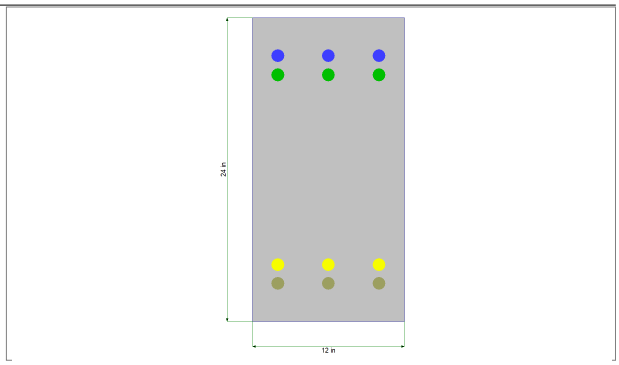
DESCRIPTION: 1B-23 & 1B-24** M.H

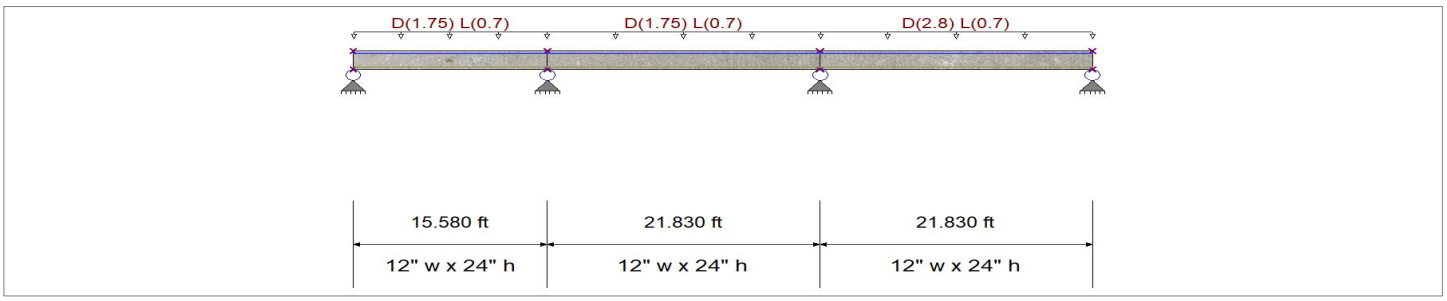
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	4.0





Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in
Span #1 Reinforcing....
8-#6 at 3.0 in from Top, from 0.0 to 15.580 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 15.580 ft in this s
Span #2 Reinforcing....
8-#8 at 3.0 in from Top, from 0.0 to 21.830 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 21.830 ft in this s
Span #3 Reinforcing....
8-#6 at 3.0 in from Top, from 0.0 to 21.830 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 21.830 ft in this s

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)
Load for Span Number 2
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)
Load for Span Number 3
Uniform Load : D = 0.20, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Check As Max Limits!

Maximum Bending Stress Ratio =	**0.741** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-224.140	k-ft
Mn * Phi : Allowable	302.332	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 3	

Maximum Deflection

Max Downward Transient Deflection	0.031 in	Ratio =	8328	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.352 in	Ratio =	743	>=240.0	Span: 3 : +D+L
Max Upward Total Deflection	-0.025 in	Ratio =	10505	>=240.0	Span: 3 : +D+L

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-23 & 1B-24** M.H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	16.777	50.517	85.139	32.806
Overall MINimum	3.998	13.936	17.544	5.990
D Only	12.522	37.089	67.275	26.884
+D+L	16.777	50.517	85.139	32.806
+D+0.750L	15.697	47.191	80.655	31.329
+0.60D	7.437	22.527	40.025	16.273
L Only	3.998	13.936	17.544	5.990

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	21.00	21.14	21.14	0.00	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	0.62	21.00	18.91	18.91	12.48	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	1.25	21.00	16.69	16.69	23.57	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	1.87	21.00	14.47	14.47	33.28	0.76	30.41	Vu < PhiVc/2	ot Reqd 9.6	30.4	0.0	0.0
+1.20D+1.60L	1	2.49	21.00	12.24	12.24	41.61	0.51	28.79	Vu < PhiVc/2	ot Reqd 9.6	28.8	0.0	0.0
+1.20D+1.60L	1	3.12	21.00	10.02	10.02	48.54	0.36	27.78	Vu < PhiVc/2	ot Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	3.74	21.00	7.80	7.80	54.10	0.25	27.06	Vu < PhiVc/2	ot Reqd 9.6	27.1	0.0	0.0
+1.20D+1.60L	1	4.36	21.00	5.57	5.57	58.26	0.17	26.50	Vu < PhiVc/2	ot Reqd 9.6	26.5	0.0	0.0
+1.20D+1.60L	1	4.99	21.00	3.35	3.35	61.04	0.10	26.03	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.40D	1	5.61	21.00	1.18	1.18	51.53	0.04	25.66	Vu < PhiVc/2	ot Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	1	6.23	21.00	-1.10	1.10	62.44	0.03	25.60	Vu < PhiVc/2	ot Reqd 9.6	25.6	0.0	0.0
+1.20D+1.60L	1	6.86	21.00	-3.32	3.32	61.07	0.10	26.02	Vu < PhiVc/2	ot Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	1	7.48	21.00	-5.55	5.55	58.30	0.17	26.49	Vu < PhiVc/2	ot Reqd 9.6	26.5	0.0	0.0
+1.20D+1.60L	1	8.10	21.00	-7.77	7.77	54.16	0.25	27.05	Vu < PhiVc/2	ot Reqd 9.6	27.0	0.0	0.0
+1.20D+1.60L	1	8.72	21.00	-9.99	9.99	48.62	0.36	27.77	Vu < PhiVc/2	ot Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	9.35	21.00	-12.22	12.22	41.70	0.51	28.78	Vu < PhiVc/2	ot Reqd 9.6	28.8	0.0	0.0
+1.20D+1.60L	1	9.97	21.00	-14.44	14.44	33.40	0.76	30.39	Vu < PhiVc/2	ot Reqd 9.6	30.4	0.0	0.0
+1.20D+1.60L	1	10.59	21.00	-16.66	16.66	23.70	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	11.22	21.00	-18.89	18.89	12.63	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	11.84	21.00	-21.11	21.11	0.16	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	12.46	21.00	-23.33	23.33	13.69	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	13.09	21.00	-25.56	25.56	28.92	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	13.71	21.00	-27.78	27.78	45.54	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	1	14.33	21.00	-30.00	30.00	63.55	0.83	30.85	PhiVc/2 < Vu <= Min 9.6.3.1		58.6	10.5	10.0
+1.20D+1.60L	1	14.96	21.00	-32.23	32.23	82.94	0.68	29.88	PhiVc < Vu	2.348	57.6	10.5	10.0
+1.20D+1.60L	2	15.58	21.00	33.43	33.43	103.71	0.56	32.08	PhiVc < Vu	1.352	59.8	10.5	10.0
+1.20D+1.60L	2	16.45	21.00	30.31	30.31	75.89	0.70	33.68	PhiVc/2 < Vu <= Min 9.6.3.1		61.4	10.5	10.0
+1.20D+1.60L	2	17.33	21.00	27.20	27.20	50.78	0.94	36.50	PhiVc/2 < Vu <= Min 9.6.3.1		64.2	10.5	10.0
+1.20D+1.60L	2	18.20	21.00	24.08	24.08	28.39	1.00	37.24	PhiVc/2 < Vu <= Min 9.6.3.1		65.0	10.5	10.0
+1.20D+1.60L	2	19.07	21.00	20.97	20.97	8.72	1.00	37.24	PhiVc/2 < Vu <= Min 9.6.3.1		65.0	10.5	10.0
+1.20D+1.60L	2	19.95	21.00	17.85	17.85	8.23	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	2	20.82	21.00	14.73	14.73	22.45	1.00	31.99	Vu < PhiVc/2	ot Reqd 9.6	32.0	0.0	0.0
+1.20D+1.60L	2	21.69	21.00	11.62	11.62	33.96	0.60	29.34	Vu < PhiVc/2	ot Reqd 9.6	29.3	0.0	0.0
+1.20D+1.60L	2	22.57	21.00	8.50	8.50	42.74	0.35	27.69	Vu < PhiVc/2	ot Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	2	23.44	21.00	5.39	5.39	48.81	0.19	26.67	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	2	24.31	21.00	2.27	2.27	52.15	0.08	25.90	Vu < PhiVc/2	ot Reqd 9.6	25.9	0.0	0.0
+1.40D	2	25.19	21.00	-1.55	1.55	38.15	0.07	25.86	Vu < PhiVc/2	ot Reqd 9.6	25.9	0.0	0.0
+1.40D	2	26.06	21.00	-4.05	4.05	35.70	0.20	26.70	Vu < PhiVc/2	ot Reqd 9.6	26.7	0.0	0.0
+1.20D+1.60L	2	26.93	21.00	-7.07	7.07	45.86	0.27	27.17	Vu < PhiVc/2	ot Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	2	27.80	21.00	-10.19	10.19	38.33	0.47	28.46	Vu < PhiVc/2	ot Reqd 9.6	28.5	0.0	0.0
+1.20D+1.60L	2	28.68	21.00	-13.31	13.31	28.07	0.83	30.87	Vu < PhiVc/2	ot Reqd 9.6	30.9	0.0	0.0
+1.20D+1.60L	2	29.55	21.00	-16.42	16.42	15.09	1.00	31.99	PhiVc/2 < Vu <= Min 9.6.3.1		59.7	10.5	10.0
+1.20D+1.60L	2	30.42	21.00	-19.54	19.54	0.61	1.00	37.24	PhiVc/2 < Vu <= Min 9.6.3.1		65.0	10.5	10.0
+1.20D+1.60L	2	31.30	21.00	-22.65	22.65	19.03	1.00	37.24	PhiVc/2 < Vu <= Min 9.6.3.1		65.0	10.5	10.0
+1.20D+1.60L	2	32.17	21.00	-25.77	25.77	40.17	1.00	37.24	PhiVc/2 < Vu <= Min 9.6.3.1		65.0	10.5	10.0
+1.20D+1.60L	2	33.04	21.00	-28.88	28.88	64.03	0.79	34.75	PhiVc/2 < Vu <= Min 9.6.3.1		62.5	10.5	10.0
+1.20D+1.60L	2	33.92	21.00	-32.00	32.00	90.61	0.62	32.72	PhiVc/2 < Vu <= Min 9.6.3.1		60.4	10.5	10.0
+1.20D+1.60L	2	34.79	21.00	-35.11	35.11	119.91	0.51	31.46	PhiVc < Vu	3.650	66.1	10.5	8.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-23 & 1B-24** M.H

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	2	35.66	21.00	-38.23	38.23	151.93	0.44	30.61	PhiVc < Vu	7.620	65.3	10.5	8.0
+1.20D+1.60L	2	36.54	21.00	-41.35	41.35	186.68	0.39	29.99	PhiVc < Vu	11.360	64.6	10.5	8.0
+1.20D+1.60L	3	37.41	21.00	62.97	62.97	224.14	0.49	28.64	PhiVc < Vu	34.328	63.3	8.1	8.0
+1.20D+1.60L	3	38.28	21.00	58.75	58.75	171.00	0.60	29.36	PhiVc < Vu	29.389	64.0	9.4	8.0
+1.20D+1.60L	3	39.16	21.00	54.53	54.53	121.54	0.79	30.57	PhiVc < Vu	23.959	65.2	10.5	8.0
+1.20D+1.60L	3	40.03	21.00	50.32	50.32	75.76	1.00	31.99	PhiVc < Vu	18.326	66.6	10.5	8.0
+1.20D+1.60L	3	40.90	21.00	46.10	46.10	33.67	1.00	31.99	PhiVc < Vu	14.110	66.6	10.5	8.0
+1.20D+1.60L	3	41.78	21.00	41.89	41.89	4.75	1.00	31.99	PhiVc < Vu	9.894	66.6	10.5	8.0
+1.20D+1.60L	3	42.65	21.00	37.67	37.67	39.48	1.00	31.99	PhiVc < Vu	5.678	66.6	10.5	8.0
+1.20D+1.60L	3	43.52	21.00	33.45	33.45	70.54	0.83	30.87	PhiVc < Vu	2.584	65.5	10.5	8.0
+1.20D+1.60L	3	44.40	21.00	29.24	29.24	97.91	0.52	28.84	PhiVc < Vu	0.3973	63.5	10.5	8.0
+1.20D+1.60L	3	45.27	21.00	25.02	25.02	121.60	0.36	27.77	PhiVc/2 < Vu <=	Min 9.6.3.1	55.5	10.5	10.0
+1.20D+1.60L	3	46.14	21.00	20.81	20.81	141.61	0.26	27.09	PhiVc/2 < Vu <=	Min 9.6.3.1	54.8	10.5	10.0
+1.20D+1.60L	3	47.02	21.00	16.59	16.59	157.94	0.18	26.61	PhiVc/2 < Vu <=	Min 9.6.3.1	54.3	10.5	10.0
+1.20D+1.60L	3	47.89	21.00	12.38	12.38	170.58	0.13	26.23	Vu < PhiVc/2	)t Reqd 9.6	26.2	0.0	0.0
+1.20D+1.60L	3	48.76	21.00	8.16	8.16	179.55	0.08	25.92	Vu < PhiVc/2	)t Reqd 9.6	25.9	0.0	0.0
+1.20D+1.60L	3	49.63	21.00	3.94	3.94	184.83	0.04	25.64	Vu < PhiVc/2	)t Reqd 9.6	25.6	0.0	0.0
+1.40D	3	50.51	21.00	-0.55	0.55	169.69	0.01	25.43	Vu < PhiVc/2	)t Reqd 9.6	25.4	0.0	0.0
+1.20D+1.60L	3	51.38	21.00	-4.49	4.49	184.36	0.04	25.67	Vu < PhiVc/2	)t Reqd 9.6	25.7	0.0	0.0
+1.20D+1.60L	3	52.25	21.00	-8.70	8.70	178.60	0.09	25.96	Vu < PhiVc/2	)t Reqd 9.6	26.0	0.0	0.0
+1.20D+1.60L	3	53.13	21.00	-12.92	12.92	169.16	0.13	26.27	Vu < PhiVc/2	)t Reqd 9.6	26.3	0.0	0.0
+1.20D+1.60L	3	54.00	21.00	-17.14	17.14	156.04	0.19	26.66	PhiVc/2 < Vu <=	Min 9.6.3.1	54.4	10.5	10.0
+1.20D+1.60L	3	54.87	21.00	-21.35	21.35	139.23	0.27	27.16	PhiVc/2 < Vu <=	Min 9.6.3.1	54.9	10.5	10.0
+1.20D+1.60L	3	55.75	21.00	-25.57	25.57	118.75	0.38	27.88	PhiVc/2 < Vu <=	Min 9.6.3.1	55.6	10.5	10.0
+1.20D+1.60L	3	56.62	21.00	-29.78	29.78	94.58	0.55	29.03	PhiVc < Vu	0.7536	56.7	10.5	10.0
+1.20D+1.60L	3	57.49	21.00	-34.00	34.00	66.74	0.89	31.28	PhiVc < Vu	2.722	59.0	10.5	10.0
+1.20D+1.60L	3	58.37	21.00	-38.21	38.21	35.21	1.00	31.99	PhiVc < Vu	6.222	59.7	10.5	10.0
+1.20D+1.60L	3	59.24	21.00	-42.43	42.43	0.00	1.00	31.99	PhiVc < Vu	10.438	59.7	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.580	-100.16	302.33	0.33
Span # 2	2	21.830	-217.71	523.59	0.42
Span # 3	3	21.830	-224.14	302.33	0.74
+1.40D					
Span # 1	1	15.580	-75.87	302.33	0.25
Span # 2	2	21.830	-188.96	523.59	0.36
Span # 3	3	21.830	-194.24	302.33	0.64
+1.20D+1.60L					
Span # 1	1	15.580	-100.16	302.33	0.33
Span # 2	2	21.830	-217.71	523.59	0.42
Span # 3	3	21.830	-224.14	302.33	0.74
+1.20D+0.50L					
Span # 1	1	15.580	-76.01	302.33	0.25
Span # 2	2	21.830	-179.39	523.59	0.34
Span # 3	3	21.830	-184.51	302.33	0.61
+1.20D					
Span # 1	1	15.580	-65.03	302.33	0.22
Span # 2	2	21.830	-161.97	523.59	0.31
Span # 3	3	21.830	-166.49	302.33	0.55
+0.90D					
Span # 1	1	15.580	-48.78	302.33	0.16
Span # 2	2	21.830	-121.47	523.59	0.23
Span # 3	3	21.830	-124.87	302.33	0.41

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	.ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+L	1	0.0321	6.544	D Only	-0.0004	16.017
+D+L	2	0.0143	7.422	+D+L	-0.0249	18.774
+D+L	3	0.3522	11.788		0.0000	18.774

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

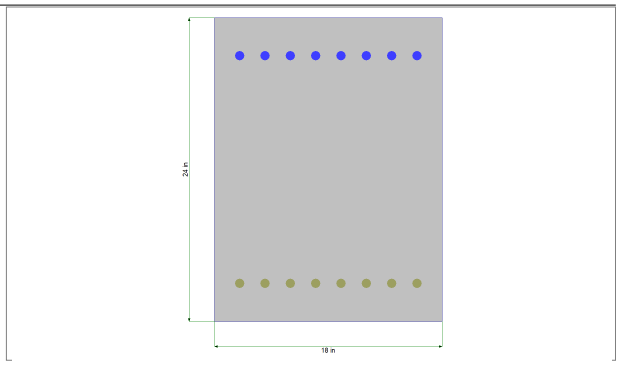
DESCRIPTION: 1B-25** M.H

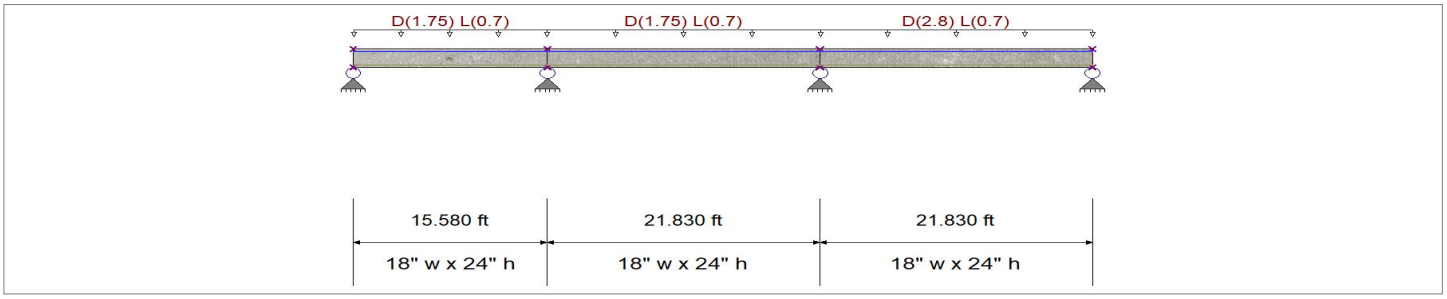
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90	
fr = f'c^1/2 * 7.50	= 530.33 psi		Shear :	0.750	
ψ Density	= 145.0 pcf	β 1	=	0.80	
λ LtWt Factor	= 1.0				
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi	
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi	
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3	
		Number of Resisting Legs Per Stirrup	=	4.0	





Cross Section & Reinforcing Details

Rectangular Section, Width = 18.0 in, Height = 24.0 in
Span #1 Reinforcing....
8-#6 at 3.0 in from Top, from 0.0 to 15.580 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 15.580 ft in this s
Span #2 Reinforcing....
8-#6 at 3.0 in from Top, from 0.0 to 21.830 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 21.830 ft in this s
Span #3 Reinforcing....
8-#6 at 3.0 in from Top, from 0.0 to 21.830 ft in this span
8-#6 at 3.0 in from Bottom, from 0.0 to 21.830 ft in this s

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)
Load for Span Number 2
Uniform Load : D = 0.1250, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)
Load for Span Number 3
Uniform Load : D = 0.20, L = 0.050 ksf, Tributary Width = 14.0 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.751** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-233.097	k-ft
Mn * Phi : Allowable	310.332	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 3	

Maximum Deflection

Max Downward Transient Deflection	0.021 in	Ratio =	12492	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.300 in	Ratio =	873	>=240.0	Span: 3 : +D+L
Max Upward Total Deflection	-0.019 in	Ratio =	13652	>=240.0	Span: 3 : +D+L

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-25** M.H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	17.219	54.705	87.219	34.686
Overall MINimum	3.998	13.936	17.544	5.990
D Only	13.186	40.730	69.848	28.597
+D+L	17.219	54.705	87.219	34.686
+D+0.750L	16.214	51.193	82.903	33.152
+0.60D	7.852	24.589	41.768	17.207
L Only	3.998	13.936	17.544	5.990

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	21.00	22.13	22.13	0.00	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	0.62	21.00	19.80	19.80	13.07	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	1.25	21.00	17.47	17.47	24.68	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	1.87	21.00	15.14	15.14	34.84	0.76	43.11	Vu < PhiVc/2	ot Reqd 9.6	43.1	0.0	0.0
+1.20D+1.60L	1	2.49	21.00	12.80	12.80	43.54	0.51	41.48	Vu < PhiVc/2	ot Reqd 9.6	41.5	0.0	0.0
+1.20D+1.60L	1	3.12	21.00	10.47	10.47	50.80	0.36	40.47	Vu < PhiVc/2	ot Reqd 9.6	40.5	0.0	0.0
+1.20D+1.60L	1	3.74	21.00	8.14	8.14	56.60	0.25	39.75	Vu < PhiVc/2	ot Reqd 9.6	39.7	0.0	0.0
+1.20D+1.60L	1	4.36	21.00	5.81	5.81	60.94	0.17	39.19	Vu < PhiVc/2	ot Reqd 9.6	39.2	0.0	0.0
+1.20D+1.60L	1	4.99	21.00	3.48	3.48	63.83	0.10	38.72	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.40D	1	5.61	21.00	1.20	1.20	54.84	0.04	38.34	Vu < PhiVc/2	ot Reqd 9.6	38.3	0.0	0.0
+1.20D+1.60L	1	6.23	21.00	-1.19	1.19	65.26	0.03	38.30	Vu < PhiVc/2	ot Reqd 9.6	38.3	0.0	0.0
+1.20D+1.60L	1	6.86	21.00	-3.52	3.52	63.79	0.10	38.73	Vu < PhiVc/2	ot Reqd 9.6	38.7	0.0	0.0
+1.20D+1.60L	1	7.48	21.00	-5.85	5.85	60.87	0.17	39.20	Vu < PhiVc/2	ot Reqd 9.6	39.2	0.0	0.0
+1.20D+1.60L	1	8.10	21.00	-8.18	8.18	56.50	0.25	39.76	Vu < PhiVc/2	ot Reqd 9.6	39.8	0.0	0.0
+1.20D+1.60L	1	8.72	21.00	-10.52	10.52	50.67	0.36	40.49	Vu < PhiVc/2	ot Reqd 9.6	40.5	0.0	0.0
+1.20D+1.60L	1	9.35	21.00	-12.85	12.85	43.39	0.52	41.51	Vu < PhiVc/2	ot Reqd 9.6	41.5	0.0	0.0
+1.20D+1.60L	1	9.97	21.00	-15.18	15.18	34.66	0.77	43.15	Vu < PhiVc/2	ot Reqd 9.6	43.1	0.0	0.0
+1.20D+1.60L	1	10.59	21.00	-17.51	17.51	24.47	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	11.22	21.00	-19.84	19.84	12.83	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	11.84	21.00	-22.18	22.18	0.27	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	1	12.46	21.00	-24.51	24.51	14.81	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	1	13.09	21.00	-26.84	26.84	30.81	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	1	13.71	21.00	-29.17	29.17	48.27	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	1	14.33	21.00	-31.50	31.50	67.17	0.82	43.51	PhiVc/2 < Vu <=	Min 9.6.3.1	71.2	10.5	10.0
+1.20D+1.60L	1	14.96	21.00	-33.84	33.84	87.53	0.68	42.55	PhiVc/2 < Vu <=	Min 9.6.3.1	70.3	10.5	10.0
+1.20D+1.60L	2	15.58	21.00	35.18	35.18	109.35	0.56	41.80	PhiVc/2 < Vu <=	Min 9.6.3.1	69.5	10.5	10.0
+1.20D+1.60L	2	16.45	21.00	31.91	31.91	80.06	0.70	42.69	PhiVc/2 < Vu <=	Min 9.6.3.1	70.4	10.5	10.0
+1.20D+1.60L	2	17.33	21.00	28.64	28.64	53.63	0.93	44.26	PhiVc/2 < Vu <=	Min 9.6.3.1	72.0	10.5	10.0
+1.20D+1.60L	2	18.20	21.00	25.37	25.37	30.04	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	2	19.07	21.00	22.11	22.11	9.31	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	2	19.95	21.00	18.84	18.84	8.56	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	2	20.82	21.00	15.57	15.57	23.58	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	2	21.69	21.00	12.30	12.30	35.75	0.60	42.06	Vu < PhiVc/2	ot Reqd 9.6	42.1	0.0	0.0
+1.20D+1.60L	2	22.57	21.00	9.04	9.04	45.07	0.35	40.40	Vu < PhiVc/2	ot Reqd 9.6	40.4	0.0	0.0
+1.20D+1.60L	2	23.44	21.00	5.77	5.77	51.53	0.20	39.38	Vu < PhiVc/2	ot Reqd 9.6	39.4	0.0	0.0
+1.20D+1.60L	2	24.31	21.00	2.50	2.50	55.14	0.08	38.61	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.40D	2	25.19	21.00	-1.46	1.46	41.79	0.06	38.49	Vu < PhiVc/2	ot Reqd 9.6	38.5	0.0	0.0
+1.40D	2	26.06	21.00	-4.13	4.13	39.34	0.18	39.30	Vu < PhiVc/2	ot Reqd 9.6	39.3	0.0	0.0
+1.20D+1.60L	2	26.93	21.00	-7.30	7.30	48.85	0.26	39.81	Vu < PhiVc/2	ot Reqd 9.6	39.8	0.0	0.0
+1.20D+1.60L	2	27.80	21.00	-10.57	10.57	41.05	0.45	41.06	Vu < PhiVc/2	ot Reqd 9.6	41.1	0.0	0.0
+1.20D+1.60L	2	28.68	21.00	-13.84	13.84	30.39	0.80	43.35	Vu < PhiVc/2	ot Reqd 9.6	43.3	0.0	0.0
+1.20D+1.60L	2	29.55	21.00	-17.11	17.11	16.88	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	2	30.42	21.00	-20.37	20.37	0.52	1.00	44.69	Vu < PhiVc/2	ot Reqd 9.6	44.7	0.0	0.0
+1.20D+1.60L	2	31.30	21.00	-23.64	23.64	18.70	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	2	32.17	21.00	-26.91	26.91	40.77	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	2	33.04	21.00	-30.18	30.18	65.69	0.80	43.39	PhiVc/2 < Vu <=	Min 9.6.3.1	71.1	10.5	10.0
+1.20D+1.60L	2	33.92	21.00	-33.44	33.44	93.46	0.63	42.22	PhiVc/2 < Vu <=	Min 9.6.3.1	69.9	10.5	10.0
+1.20D+1.60L	2	34.79	21.00	-36.71	36.71	124.09	0.52	41.51	PhiVc/2 < Vu <=	Min 9.6.3.1	69.2	10.5	10.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 1B-25** M.H

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	2	35.66	21.00	-39.98	39.98	157.57	0.44	41.02	PhiVc/2 < Vu <=	Min 9.6.3.1	68.7	10.5	10.0
+1.20D+1.60L	2	36.54	21.00	-43.25	43.25	193.91	0.39	40.66	PhiVc < Vu	2.581	68.4	10.5	10.0
+1.20D+1.60L	3	37.41	21.00	65.27	65.27	233.10	0.49	41.32	PhiVc < Vu	23.952	69.0	10.5	10.0
+1.20D+1.60L	3	38.28	21.00	60.91	60.91	178.01	0.60	42.04	PhiVc < Vu	18.867	69.8	10.5	10.0
+1.20D+1.60L	3	39.16	21.00	56.54	56.54	126.73	0.78	43.24	PhiVc < Vu	13.298	71.0	10.5	10.0
+1.20D+1.60L	3	40.03	21.00	52.17	52.17	79.27	1.00	44.69	PhiVc < Vu	7.483	72.4	10.5	10.0
+1.20D+1.60L	3	40.90	21.00	47.80	47.80	35.62	1.00	44.69	PhiVc < Vu	3.115	72.4	10.5	10.0
+1.20D+1.60L	3	41.78	21.00	43.44	43.44	4.22	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	3	42.65	21.00	39.07	39.07	40.24	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	3	43.52	21.00	34.70	34.70	72.45	0.84	43.62	PhiVc/2 < Vu <=	Min 9.6.3.1	71.3	10.5	10.0
+1.20D+1.60L	3	44.40	21.00	30.33	30.33	100.84	0.53	41.56	PhiVc/2 < Vu <=	Min 9.6.3.1	69.3	10.5	10.0
+1.20D+1.60L	3	45.27	21.00	25.96	25.96	125.42	0.36	40.48	PhiVc/2 < Vu <=	Min 9.6.3.1	68.2	10.5	10.0
+1.20D+1.60L	3	46.14	21.00	21.60	21.60	146.19	0.26	39.79	PhiVc/2 < Vu <=	Min 9.6.3.1	67.5	10.5	10.0
+1.20D+1.60L	3	47.02	21.00	17.23	17.23	163.14	0.18	39.31	Vu < PhiVc/2	ot Reqd 9.6	39.3	0.0	0.0
+1.20D+1.60L	3	47.89	21.00	12.86	12.86	176.28	0.13	38.93	Vu < PhiVc/2	ot Reqd 9.6	38.9	0.0	0.0
+1.20D+1.60L	3	48.76	21.00	8.49	8.49	185.60	0.08	38.62	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.20D+1.60L	3	49.63	21.00	4.13	4.13	191.11	0.04	38.34	Vu < PhiVc/2	ot Reqd 9.6	38.3	0.0	0.0
+1.40D	3	50.51	21.00	-0.51	0.51	177.12	0.01	38.12	Vu < PhiVc/2	ot Reqd 9.6	38.1	0.0	0.0
+1.20D+1.60L	3	51.38	21.00	-4.61	4.61	190.69	0.04	38.37	Vu < PhiVc/2	ot Reqd 9.6	38.4	0.0	0.0
+1.20D+1.60L	3	52.25	21.00	-8.98	8.98	184.76	0.09	38.65	Vu < PhiVc/2	ot Reqd 9.6	38.6	0.0	0.0
+1.20D+1.60L	3	53.13	21.00	-13.34	13.34	175.01	0.13	38.97	Vu < PhiVc/2	ot Reqd 9.6	39.0	0.0	0.0
+1.20D+1.60L	3	54.00	21.00	-17.71	17.71	161.45	0.19	39.36	Vu < PhiVc/2	ot Reqd 9.6	39.4	0.0	0.0
+1.20D+1.60L	3	54.87	21.00	-22.08	22.08	144.08	0.27	39.86	PhiVc/2 < Vu <=	Min 9.6.3.1	67.6	10.5	10.0
+1.20D+1.60L	3	55.75	21.00	-26.45	26.45	122.89	0.38	40.57	PhiVc/2 < Vu <=	Min 9.6.3.1	68.3	10.5	10.0
+1.20D+1.60L	3	56.62	21.00	-30.82	30.82	97.89	0.55	41.72	PhiVc/2 < Vu <=	Min 9.6.3.1	69.4	10.5	10.0
+1.20D+1.60L	3	57.49	21.00	-35.18	35.18	69.07	0.89	43.97	PhiVc/2 < Vu <=	Min 9.6.3.1	71.7	10.5	10.0
+1.20D+1.60L	3	58.37	21.00	-39.55	39.55	36.44	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0
+1.20D+1.60L	3	59.24	21.00	-43.92	43.92	0.00	1.00	44.69	PhiVc/2 < Vu <=	Min 9.6.3.1	72.4	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.580	-105.61	310.33	0.34
Span # 2	2	21.830	-226.37	310.33	0.73
Span # 3	3	21.830	-233.10	310.33	0.75
+1.40D					
Span # 1	1	15.580	-82.24	310.33	0.27
Span # 2	2	21.830	-199.06	310.33	0.64
Span # 3	3	21.830	-204.69	310.33	0.66
+1.20D+1.60L					
Span # 1	1	15.580	-105.61	310.33	0.34
Span # 2	2	21.830	-226.37	310.33	0.73
Span # 3	3	21.830	-233.10	310.33	0.75
+1.20D+0.50L					
Span # 1	1	15.580	-81.47	310.33	0.26
Span # 2	2	21.830	-188.05	310.33	0.61
Span # 3	3	21.830	-193.46	310.33	0.62
+1.20D					
Span # 1	1	15.580	-70.49	310.33	0.23
Span # 2	2	21.830	-170.63	310.33	0.55
Span # 3	3	21.830	-175.45	310.33	0.57
+0.90D					
Span # 1	1	15.580	-52.87	310.33	0.17
Span # 2	2	21.830	-127.97	310.33	0.41
Span # 3	3	21.830	-131.58	310.33	0.42

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.0206	6.544		0.0000	0.000
+D+L	2	0.0118	8.295	+D+L	-0.0192	18.774
+D+L	3	0.2998	11.788		0.0000	18.774

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

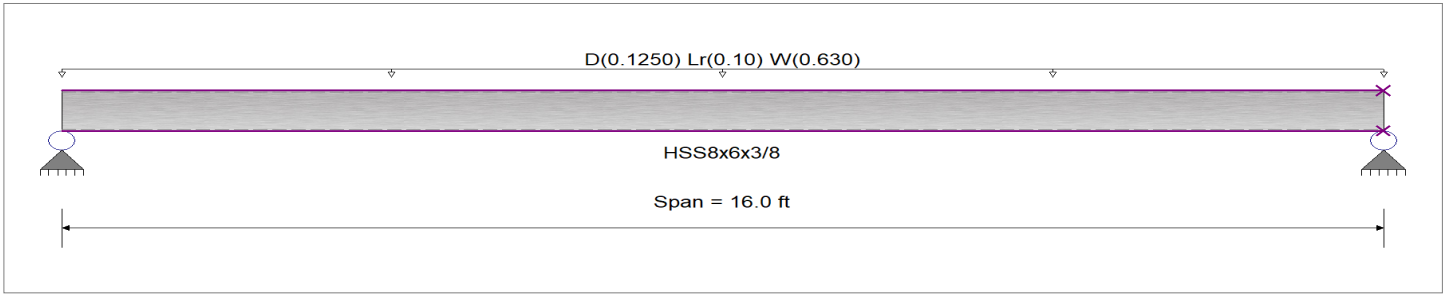
DESCRIPTION: Steel Beam HSS 8x6x3/8

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

Analysis Method :	Load Resistance Factor Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, Lr = 0.020, W = 0.1260 ksf, Tributary Width = 5.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.308** : 1	Maximum Shear Stress Ratio =	**0.053** : 1
Section used for this span	**HSS8x6x3/8**	Section used for this span	**HSS8x6x3/8**
Mu : Applied	27.811 k-ft	Vu : Applied	6.953 k
Mn * Phi : Allowable	90.375 k-ft	Vn * Phi : Allowable	131.036 k
Load Combination	+1.20D+0.50Lr+W	Load Combination	+1.20D+0.50Lr+W
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.407 in	Ratio =	471	>=360	
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360	Span: 1 : W Only
Max Downward Total Deflection	0.346 in	Ratio =	555	>=240.	Span: 1 : +D+0.60W
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values max Mu +	max Mu -	Mu Max	Mnx	Phi*Mnx	Cb	Rm	Summary of Shear Values VuMax	Vnx	Phi*Vnx
+1.40D													
Dsgn. L = 16.00 ft	1	0.078	0.013	7.06		7.06	100.42	90.38	1.00	1.00	1.76	145.60	131.04
+1.20D+0.50Lr													
Dsgn. L = 16.00 ft	1	0.085	0.015	7.65		7.65	100.42	90.38	1.00	1.00	1.91	145.60	131.04
+1.20D													
Dsgn. L = 16.00 ft	1	0.067	0.012	6.05		6.05	100.42	90.38	1.00	1.00	1.51	145.60	131.04
+1.20D+1.60Lr													
Dsgn. L = 16.00 ft	1	0.124	0.021	11.17		11.17	100.42	90.38	1.00	1.00	2.79	145.60	131.04
+1.20D+1.60Lr+0.50W													
Dsgn. L = 16.00 ft	1	0.235	0.041	21.25		21.25	100.42	90.38	1.00	1.00	5.31	145.60	131.04
+1.20D+0.50W													
Dsgn. L = 16.00 ft	1	0.178	0.031	16.13		16.13	100.42	90.38	1.00	1.00	4.03	145.60	131.04
+1.20D+0.50Lr+W													
Dsgn. L = 16.00 ft	1	0.308	0.053	27.81		27.81	100.42	90.38	1.00	1.00	6.95	145.60	131.04
+1.20D+W													
Dsgn. L = 16.00 ft	1	0.290	0.050	26.21		26.21	100.42	90.38	1.00	1.00	6.55	145.60	131.04
+0.90D+W													
Dsgn. L = 16.00 ft	1	0.273	0.047	24.70		24.70	100.42	90.38	1.00	1.00	6.17	145.60	131.04
+0.90D													
Dsgn. L = 16.00 ft	1	0.050	0.009	4.54		4.54	100.42	90.38	1.00	1.00	1.13	145.60	131.04

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Steel Beam HSS 8x6x3/8

Overall Maximum Deflections

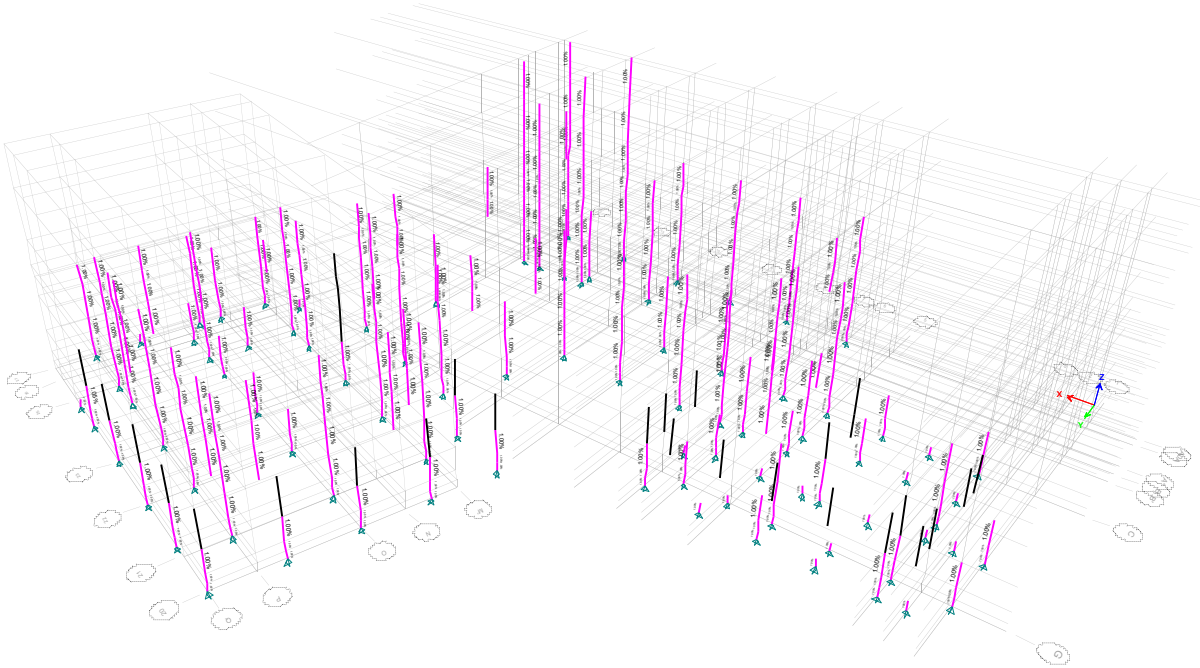
Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
W Only	1	0.4068	8.046		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	5.040	5.040
Overall MINimum	0.756	0.756
D Only	1.261	1.261
+D+Lr	2.061	2.061
+D+0.750Lr	1.861	1.861
+D+0.60W	4.285	4.285
+D+0.750Lr+0.450W	4.129	4.129
+D+0.450W	3.529	3.529
+0.60D+0.60W	3.780	3.780
+0.60D	0.756	0.756
Lr Only	0.800	0.800
W Only	5.040	5.040

COLUMN DESIGN



Job. No.: **Date:**

Column Reinforcement Processing

					VERTICAL BARS										TIES/SHEAR REINF.								
Col. No.	Level	Section Size			$As_{,req}$	Min. No.	Final No.	Vert.	Quant.	%	Min. Steel	# of Mech.	Req. A_{sh}	Shear Dir.	No. of	Horz.	Size	Req. Spacing	ACI 314 Min.	Suggested	Final Spacing	Check
		b (in.)	h (in.)	f'c (ksi)	in^2	of Bars	of Bars	Bar No.	Check	Steel	Check	Splices	in^2/ft	b or h	Legs	Bar No.	Check	(in. o.c.)	Tie Spacing	Spacing (in. o.c.)	(in. o.c.)	Spng.
C1		16	16	5	2.56	9	(10)	#5	O.K.	1.21	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	10.0	O.K.
C2		12	16	5	1.92	7	(8)	#5	O.K.	1.29	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	10.0	O.K.
C3		12	24	5	2.88	10	(10)	#5	O.K.	1.08	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	10.0	O.K.
C4		12	44	5	5.28	18	(18)	#5	O.K.	1.06	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	10.0	O.K.
C5		18	18	5	3.24	11	(12)	#5	O.K.	1.15	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	10.0	O.K.
TC1		8	12	5	0.96	4	(4)	#5	O.K.	1.29	O.K.	0	0.0000	h	2	#3	O.K.	0.00	8.0	8.0	8.0	O.K.
TC2		8	16	5	1.28	5	(6)	#5	O.K.	1.45	O.K.	0	0.0000	h	2	#3	O.K.	0.00	8.0	8.0	8.0	O.K.
TC3		8	18	5	1.44	5	(6)	#5	O.K.	1.29	O.K.	0	0.0000	h	2	#3	O.K.	0.00	8.0	8.0	8.0	O.K.
TC4		8	28	5	2.24	8	(8)	#5	O.K.	1.11	O.K.	0	0.0000	h	2	#3	O.K.	0.00	8.0	8.0	8.0	O.K.
TC5		16	16	5	2.56	9	(11)	#5	O.K.	1.33	O.K.	0	0.0000	h	2	#3	O.K.	0.00	10.0	10.0	8.0	O.K.

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: ST1-HSS6x6x3/8

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name : **HSS6x6x3/8**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	
Fy : Steel Yield	36.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	16.0 ft
Top & Bottom Fixity	Top & Bottom Pinned

Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 16.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 16.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 439.680 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 16.0 ft, D = 14.0, LR = 4.0, L = 0.380 k
BENDING LOADS . . .
Lat. Uniform Load creating Mx-x, W = 1.008 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8138** : 1

Load Combination	+1.20D+0.50Lr+0.50L+W	
Location of max.above base	7.946	ft
At maximum location values are . . .		
Pu	19.518	k
0.9 * Pn	169.076	k
Mu-x	32.255	k-ft
0.9 * Mn-x :	42.660	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	42.660	k-ft

PASS Maximum Shear Stress Ratio **0.0** : 1

Load Combination	0.0	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	0.0	k
Vn * Phi : Allowable	0.0	k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	8.064 k
Bottom along Y-Y	8.064 k

Maximum Load Deflections . . .

Along Y-Y 1.312 in at 8.054 ft above base
for load combination : W Only

Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Max. Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Max. Shear Ratios: Stress Ratio	Status	Location
+1.40D	0.120	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+0.50Lr+1.60L	0.118	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+1.60L	0.106	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+1.60Lr+0.50L	0.141	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+1.60Lr+0.50W	0.448	PASS	7.95 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+0.50L	0.104	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+0.50W	0.429	PASS	7.95 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+0.50Lr+0.50L+W	0.814	PASS	7.95 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+1.20D+0.50L+W	0.808	PASS	7.95 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+0.90D+W	0.795	PASS	7.95 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft
+0.90D	0.077	PASS	0.00 ft	1.14	1.00	84.21	84.21	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	14.440									
+D+L	14.820									

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: ST1-HSS6x6x3/8

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
+D+Lr	18.440									
+D+0.750Lr+0.750L	17.725									
+D+0.750L	14.725									
+D+0.60W	14.440				4.838	4.838				
+D+0.750Lr+0.750L+0.450W	17.725				3.629	3.629				
+D+0.750L+0.450W	14.725				3.629	3.629				
+0.60D+0.60W	8.664				4.838	4.838				
+0.60D	8.664									
Lr Only	4.000									
L Only	0.380									
W Only					8.064	8.064				

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	18.440									
"	Minimum					8.064	8.064				
Reaction, X-X Axis Base	Maximum	14.440									
"	Minimum	14.440									
Reaction, Y-Y Axis Base	Maximum					8.064	8.064				
"	Minimum	14.440									
Reaction, X-X Axis Top	Maximum	14.440									
"	Minimum	14.440									
Reaction, Y-Y Axis Top	Maximum	14.440									
"	Minimum	14.440									
Moment, X-X Axis Base	Maximum	14.440									
"	Minimum	14.440									
Moment, Y-Y Axis Base	Maximum	14.440									
"	Minimum	14.440									
Moment, X-X Axis Top	Maximum	14.440									
"	Minimum	14.440									
Moment, Y-Y Axis Top	Maximum	14.440									
"	Minimum	14.440									

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.60W	0.0000 in	0.000 ft	0.787 in	8.054 ft
+D+0.750Lr+0.750L+0.450W	0.0000 in	0.000 ft	0.590 in	8.054 ft
+D+0.750L+0.450W	0.0000 in	0.000 ft	0.590 in	8.054 ft
+0.60D+0.60W	0.0000 in	0.000 ft	0.787 in	8.054 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
W Only	0.0000 in	0.000 ft	1.312 in	8.054 ft

Steel Section Properties : HSS6x6x3/8

Steel Section Properties : HSS6x6x3/8

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 21 0580 City of key Colony Beach V00.ec6

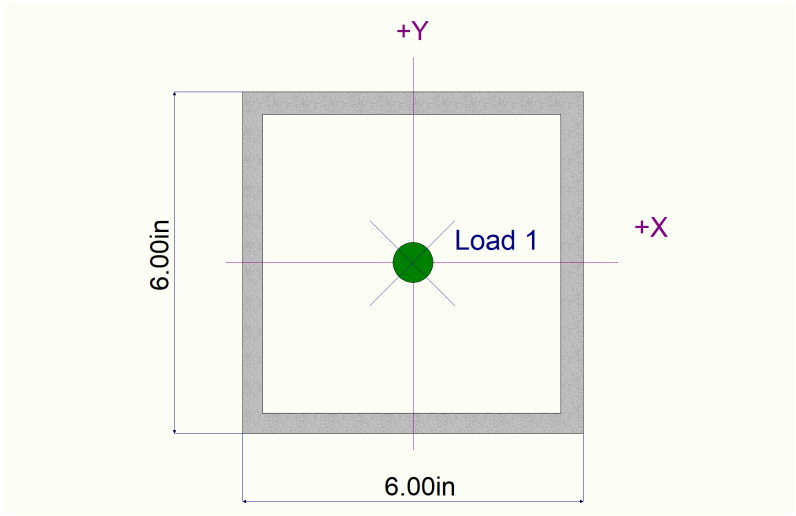
LIC# : KW-06018068, Build:20.22.5.16 Eastern Engineering Group (c) ENERCALC INC 1983-2022

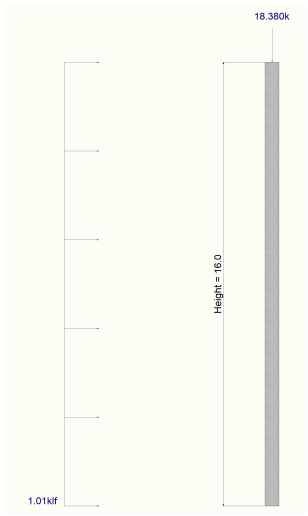
DESCRIPTION: ST1-HSS6x6x3/8

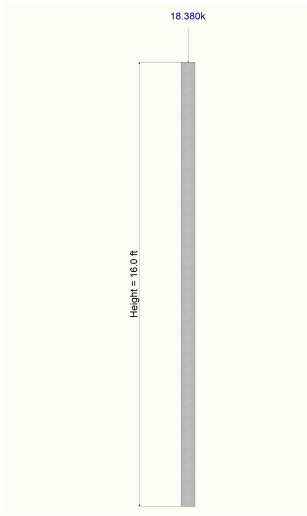
Depth	=	6.000	in	I xx	=	39.50	in^4	J	=	64.600 in^4
Design Thick	=	0.349	in	S xx	=	13.20	in^3			
Width	=	6.000	in	R xx	=	2.280	in			
Wall Thick	=	0.375	in	Zx	=	15.800	in^3			
Area	=	7.580	in^2	I yy	=	39.500	in^4	C	=	22.100 in^3
Weight	=	27.480	plf	S yy	=	13.200	in^3			
				R yy	=	2.280	in			

Ycg = 0.000 in

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: ST2-HSS6x6x3/8

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name : **HSS6x6x3/8**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	36.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	13.0 ft
Top & Bottom Fixity	Top & Bottom Pinned

Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 13.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 13.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 357.240 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 13.0 ft, D = 62.0, LR = 10.0, L = 22.0, W = 0.50 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6780** : 1

Load Combination	+D+0.750Lr+0.750L+0.450W	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pa : Axial	86.582	k
Pn / Omega : Allowable	127.709	k
Ma-x : Applied	0.0	k-ft
Mn-x / Omega : Allowable	28.383	k-ft
Ma-y : Applied	0.0	k-ft
Mn-y / Omega : Allowable	28.383	k-ft

PASS Maximum Shear Stress Ratio **0.0** : 1

Load Combination	0.0	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Va : Applied	0.0	k
Vn / Omega : Allowable	0.0	k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

Maximum Load Deflections . . .

Along Y-Y 0.0 in at 0.0ft above base
for load combination :

Along X-X 0.0 in at 0.0ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.488	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+L	0.661	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+Lr	0.567	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L	0.676	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+0.750L	0.617	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+0.60W	0.491	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L+0.45(	0.678	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+D+0.750L+0.450W	0.619	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+0.60D+0.60W	0.295	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft
+0.60D	0.293	PASS	0.00 ft	1.00	1.00	68.42	68.42	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	62.357								
+D+L	84.357								
+D+Lr	72.357								
+D+0.750Lr+0.750L	86.357								
+D+0.750L	78.857								

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: ST2-HSS6x6x3/8

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
+D+0.60W	62.657									
+D+0.750Lr+0.750L+0.450W	86.582									
+D+0.750L+0.450W	79.082									
+0.60D+0.60W	37.714									
+0.60D	37.414									
Lr Only	10.000									
L Only	22.000									
W Only	0.500									

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	86.582									
"	Minimum	0.500									
Reaction, X-X Axis Base	Maximum	62.357									
"	Minimum	62.357									
Reaction, Y-Y Axis Base	Maximum	62.357									
"	Minimum	62.357									
Reaction, X-X Axis Top	Maximum	62.357									
"	Minimum	62.357									
Reaction, Y-Y Axis Top	Maximum	62.357									
"	Minimum	62.357									
Moment, X-X Axis Base	Maximum	62.357									
"	Minimum	62.357									
Moment, Y-Y Axis Base	Maximum	62.357									
"	Minimum	62.357									
Moment, X-X Axis Top	Maximum	62.357									
"	Minimum	62.357									
Moment, Y-Y Axis Top	Maximum	62.357									
"	Minimum	62.357									

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.60W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L+0.450W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L+0.450W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D+0.60W	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
W Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : HSS6x6x3/8

Steel Section Properties : HSS6x6x3/8

Project Title:
Engineer:
Project ID:
Project Descr:

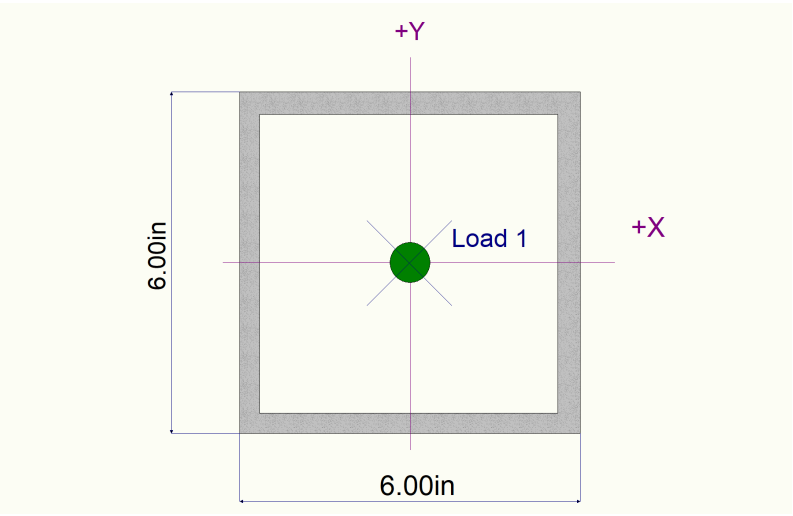
Steel Column

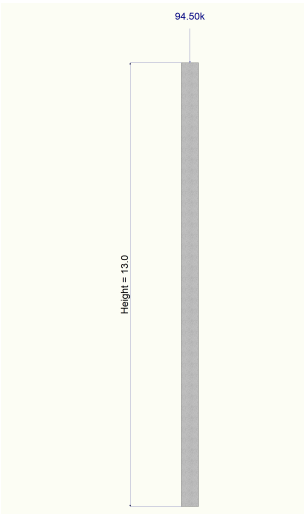
Project File: 21 0580 City of key Colony Beach V00.ec6

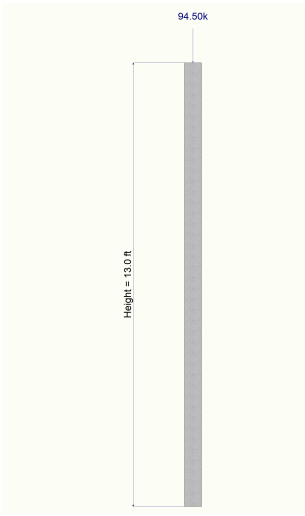
DESCRIPTION: ST2-HSS6x6x3/8

Depth	=	6.000	in	I xx	=	39.50	in^4	J	=	64.600	in^4
Design Thick	=	0.349	in	S xx	=	13.20	in^3				
Width	=	6.000	in	R xx	=	2.280	in				
Wall Thick	=	0.375	in	Zx	=	15.800	in^3				
Area	=	7.580	in^2	I yy	=	39.500	in^4	C	=	22.100	in^3
Weight	=	27.480	plf	S yy	=	13.200	in^3				
				R yy	=	2.280	in				
Ycg	=	0.000	in								

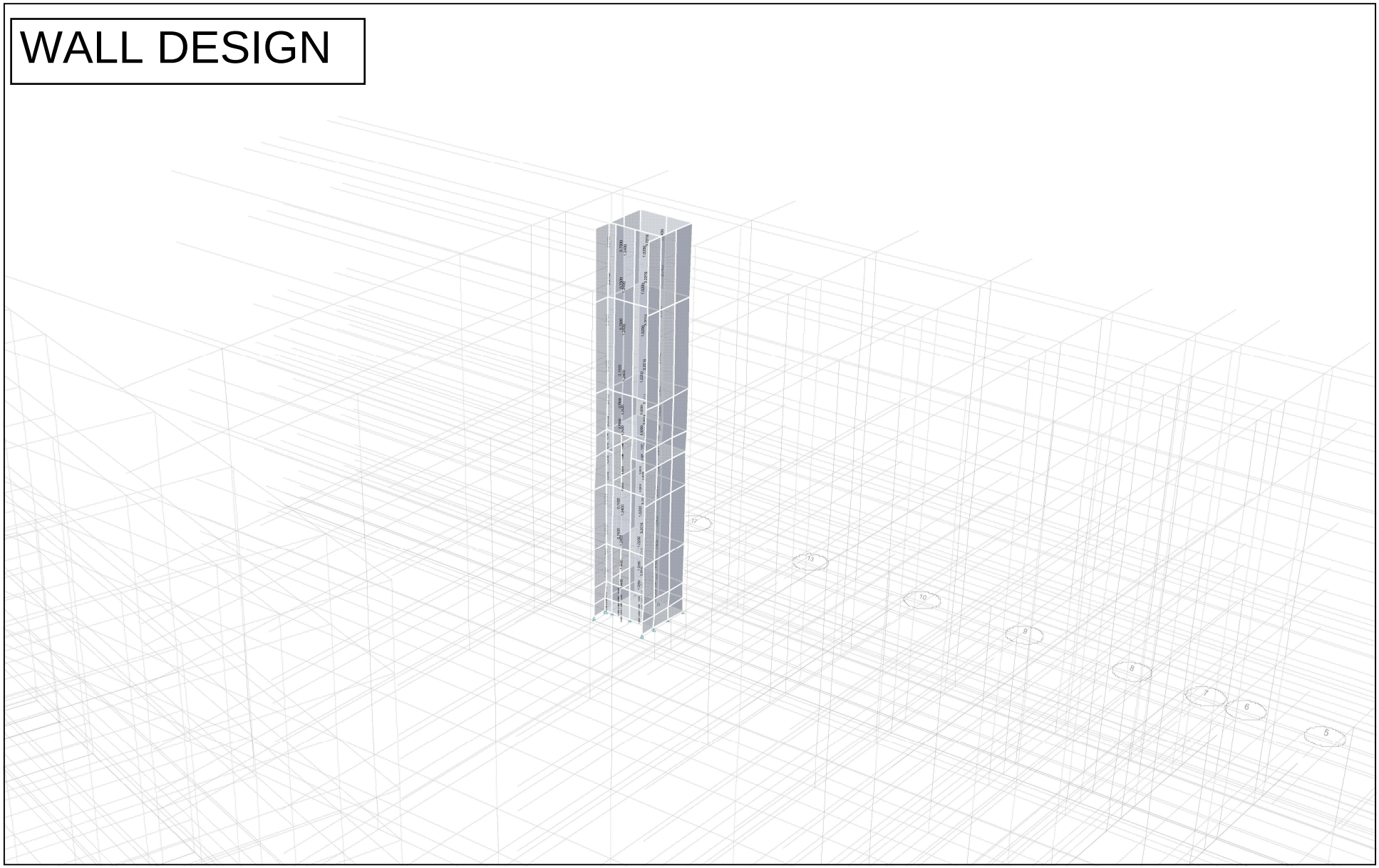
Sketches







WALL DESIGN



3-D View Pier Longitudinal Reinforcing Areas (in²) (ACI 318-14)

Job. No.: **Date:**

Shear Wall Pier Uniform Reinforcement Distribution

					VERTICAL BARS (TENSION/COMPRESSION REINF.)								HORIZONTAL BARS (SHEAR REINF.)							CONFINEMENT BARS	
SW No.	Pier Label	Level	Thickness (in.)	f'c (ksi)	Req. ρ_v in^2/in^2	Req. A_{sv} in^2/ft	No. Vert. Mats	Vert. Bar No.	Req. Spacing (in. o.c.)	Rnded Spacing (in. o.c.)	Final Spacing (in. o.c.)	Check Spng.	Req. A_{sh} in^2/ft	No. Horz. Mats	Horz. Bar No.	Req. Spacing (in. o.c.)	Rnded Spacing (in. o.c.)	Final Spacing (in. o.c.)	Check Spng.	Hairpin Ties?	Vertical Spng. (in.)
SW1	P1	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW2	P2	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW3	P3	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW4	P4	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW5	P4	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW6	P4	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW7	P4	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-
SW8	P4	R-G	8	5	0.00300	0.29	2	#5	18.00	18.0	12.0	O.K.	0.24	2	#4	18.00	18.0	12.0	O.K.	-	-

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 INCHES THK (RETAINING WALL)**

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

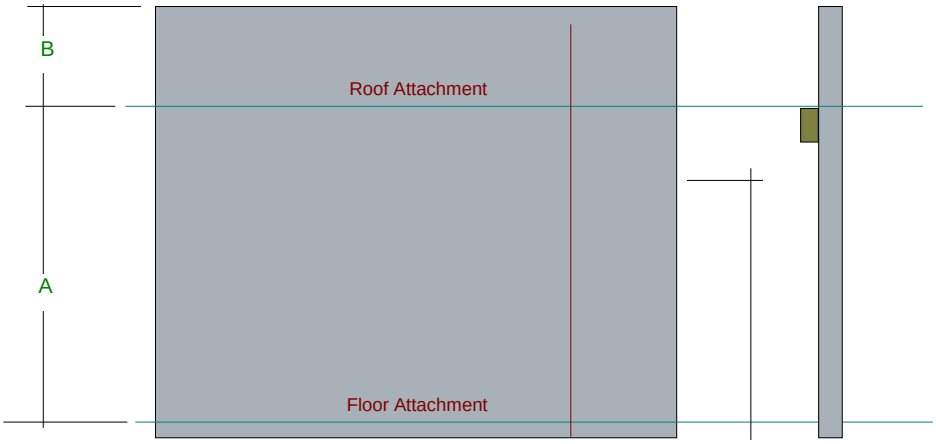
Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	61.0 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009513	Bar Size #	5				
Grout Density	=	140 pcf	Bar Spacing	16	in			
Block Weight		Normal Weight						
Wall Weight	=	86.0 psf						
		Wall is Solid Grouted						

One-Story Wall Dimensions

A Clear Height = 7.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

(Applied to full "STRIP Width")

	D	Lr	L	E	W		Endpoints from Base top	bottom
Distributed Lateral Load	0.3350					k/ft	9.0	2.50 ft

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 8 INCHES THK (RETAINING WALL)**

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check	Maximum Bending Stress Rat	**0.6948**		
	+1.60D	Max Mu	2.362 k-ft	Phi * Mn	3.40 k-ft
PASS	Service Deflection Check	Actual Defl. Ratio L/	611	Allowable Defl. Ratio	180.0
	D Only	Max. Deflection	0.1374 in		
PASS	Axial Load Check	Max Pu / Ag	4.559 psi	Max. Allow. Defl.	0.4667 in
	+1.60D	Location	4.083 ft	0.2 * f'm	400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.005082	Max Allow As/bd	0.009513

Maximum Reactions *for Load Combination...*

Top Horizontal	D Only	0.9943 k
Base Horizontal	D Only	0.4350 k
Vertical Reaction	D Only	0.6020 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
+1.40D at 3.97 to 4.20	0.365	36.624	0.59	2.07	0.90	3.39	0.233	0.0051	0.0094	0.00
+1.60D at 3.97 to 4.20	0.417	36.624	0.59	2.36	0.90	3.40	0.233	0.0051	0.0094	0.00
+1.20D at 3.97 to 4.20	0.313	36.624	0.59	1.77	0.90	3.38	0.233	0.0051	0.0094	0.00
+0.90D at 3.97 to 4.20	0.235	36.624	0.59	1.33	0.90	3.36	0.233	0.0051	0.0094	0.00
+1.20D+E at 3.97 to 4.20	0.313	36.624	0.59	1.77	0.90	3.38	0.233	0.0051	0.0094	0.00
+0.90D+E at 3.97 to 4.20	0.235	36.624	0.59	1.33	0.90	3.36	0.233	0.0051	0.0094	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D Only at 3.73 to 3.97	0.281	0.59	1.47	443.30	32.90	33.425	0.137	611.5
+0.60D at 3.73 to 3.97	0.169	0.59	0.88	443.30	32.70	36.206	0.044	1,899.2
+D+0.70E at 3.73 to 3.97	0.281	0.59	1.47	443.30	32.90	33.425	0.137	611.5
+D+0.5250E at 3.73 to 3.97	0.281	0.59	1.47	443.30	32.90	33.425	0.137	611.5
+0.60D+0.70E at 3.73 to 3.97	0.169	0.59	0.88	443.30	32.70	36.206	0.044	1,899.2
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.4 k	0.99 k	0.602 k
+0.60D	0.3 k	0.60 k	0.361 k
+D+0.70E	0.4 k	0.99 k	0.602 k
+D+0.5250E	0.4 k	0.99 k	0.602 k
+0.60D+0.70E	0.3 k	0.60 k	0.361 k
E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 12 INCHES THK (RETAINING WALL)

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

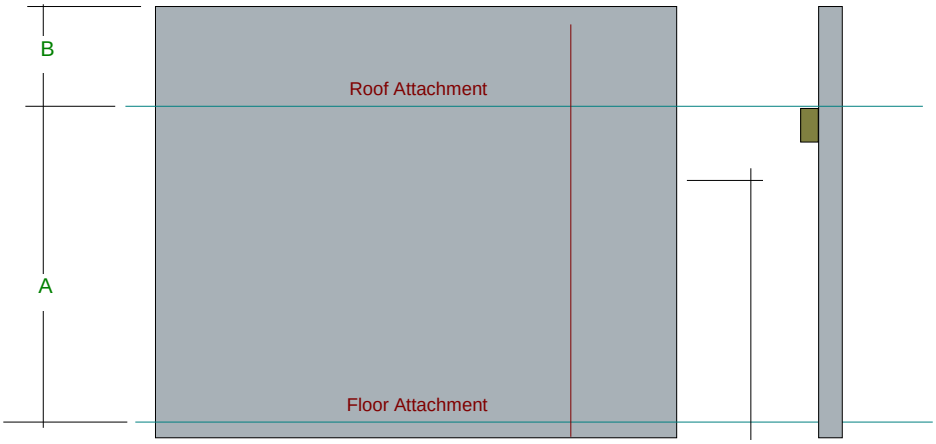
Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.0 ksi	Nom. Wall Thickness	12	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	11.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	61.0 psi	Rebar "d" distance	5.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009510	Bar Size	# 5				
Grout Density	=	140 pcf	Bar Spacing	16	in			
Block Weight		Normal Weight						
Wall Weight	=	132.0 psf						
		Wall is Solid Grouted						

One-Story Wall Dimensions

A Clear Height = 9.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

(Applied to full "STRIP Width")

	D	Lr	L	E	W		Endpoints from Base top	bottom
Distributed Lateral Load	0.3350					k/ft	9.0	2.50 ft

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: 12 INCHES THK (RETAINING WALL)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check	Maximum Bending Stress Rat	**0.8033**		
	+1.60D	Max Mu	4.441 k-ft	Phi * Mn	5.528 k-ft
PASS	Service Deflection Check	Actual Defl. Ratio L/	767	Allowable Defl. Ratio	180.0
	D Only	Max. Deflection	0.1408 in		
PASS	Axial Load Check	Max Pu / Ag	6.356 psi	Max. Allow. Defl.	0.60 in
	+1.60D	Location	4.950 ft	0.2 * f'm	400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003333	Max Allow As/bd	0.009510

Maximum Reactions *for Load Combination...*

Top Horizontal	D Only	1.363 k
Base Horizontal	D Only	0.7145 k
Vertical Reaction	D Only	1.188 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
+1.40D at 4.80 to 5.10	0.776	55.824	1.37	3.88	0.90	5.48	0.233	0.0033	0.0093	0.00
+1.60D at 4.80 to 5.10	0.887	55.824	1.37	4.44	0.90	5.53	0.233	0.0033	0.0093	0.00
+1.20D at 4.80 to 5.10	0.665	55.824	1.37	3.33	0.90	5.44	0.233	0.0033	0.0094	0.00
+0.90D at 4.80 to 5.10	0.499	55.824	1.37	2.49	0.90	5.38	0.233	0.0033	0.0094	0.00
+1.20D+E at 4.80 to 5.10	0.665	55.824	1.37	3.33	0.90	5.44	0.233	0.0033	0.0094	0.00
+0.90D+E at 4.80 to 5.10	0.499	55.824	1.37	2.49	0.90	5.38	0.233	0.0033	0.0094	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D Only at 4.50 to 4.80	0.594	1.37	2.76	1,571.00	85.63	88.600	0.141	767.3
+0.60D at 4.50 to 4.80	0.356	1.37	1.65	1,571.00	84.52	111.630	0.027	3,972.0
+D+0.70E at 4.50 to 4.80	0.594	1.37	2.76	1,571.00	85.63	88.600	0.141	767.3
+D+0.5250E at 4.50 to 4.80	0.594	1.37	2.76	1,571.00	85.63	88.600	0.141	767.3
+0.60D+0.70E at 4.50 to 4.80	0.356	1.37	1.65	1,571.00	84.52	111.630	0.027	3,972.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.7 k	1.36 k	1.188 k
+0.60D	0.4 k	0.82 k	0.713 k
+D+0.70E	0.7 k	1.36 k	1.188 k
+D+0.5250E	0.7 k	1.36 k	1.188 k
+0.60D+0.70E	0.4 k	0.82 k	0.713 k
E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 1 M.H (8 THK) (1 SPAN)

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

Construction Type : Grouted Hollow Concrete Masonry

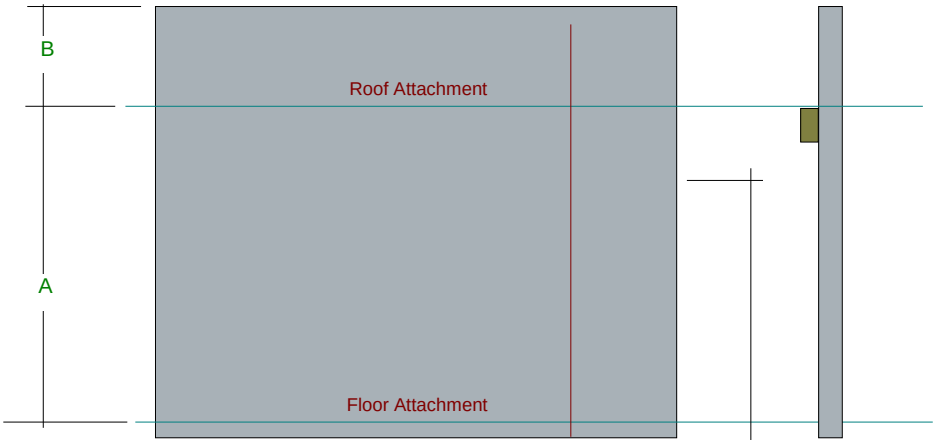
F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.0 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009510	Bar Size	# 5				
Grout Density	=	140 pcf	Bar Spacing	16	in			
Block Weight		Normal Weight						
Wall Weight	=	63.0 psf						

Wall is grouted at rebar cells only

One-Story Wall Dimensions

A Clear Height = 12.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load 132.850 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 1 M.H (8 THK) (1 SPAN)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+W	Maximum Bending Stress Rat	**0.7110**		
		Max Mu	2.404 k-ft	Phi * Mn	3.382 k-ft
PASS	Service Deflection Check +0.60D+0.60W	Actual Defl. Ratio L/ Max. Deflection	654 0.2202 in	Allowable Defl. Ratio	180.0
PASS	Axial Load Check +1.20D+W	Max Pu / Ag Location	7.798 psi 5.80 ft	Max. Allow. Defl. 0.2 * f'm	0.80 in 400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.005082	Max Allow As/bd	0.009513

Maximum Reactions *for Load Combination...*

Top Horizontal	W Only	0.7971 k
Base Horizontal	W Only	0.7971 k
Vertical Reaction	D Only	0.7560 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 5.60 to 6.00	0.484	24.816	1.01	1.20	0.90	3.42	0.233	0.0051	0.0093	0.00
+1.20D-0.50W at 5.60 to 6.00	0.484	24.816	1.01	1.20	0.90	3.42	0.233	0.0051	0.0093	0.00
+1.20D+W at 5.60 to 6.00	0.484	24.816	1.01	2.41	0.90	3.42	0.233	0.0051	0.0093	0.00
+1.20D-W at 5.60 to 6.00	0.484	24.816	1.01	2.41	0.90	3.42	0.233	0.0051	0.0093	0.00
+0.90D+W at 5.60 to 6.00	0.363	24.816	1.01	2.40	0.90	3.39	0.233	0.0051	0.0094	0.00
+0.90D-W at 5.60 to 6.00	0.363	24.816	1.01	2.40	0.90	3.39	0.233	0.0051	0.0094	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 6.00 to 6.40	0.378	1.01	1.44	376.00	33.06	37.313	0.220	654.6
+D-0.60W at 6.00 to 6.40	0.378	1.01	1.44	376.00	33.06	37.313	0.220	654.6
+D+0.450W at 5.60 to 6.00	0.403	1.01	1.08	376.00	33.11	60.206	0.055	2,621.6
+D-0.450W at 5.60 to 6.00	0.403	1.01	1.08	376.00	33.11	60.206	0.055	2,621.6
+0.60D+0.60W at 6.00 to 6.40	0.227	1.01	1.44	376.00	32.80	37.057	0.220	654.1
+0.60D-0.60W at 6.00 to 6.40	0.227	1.01	1.44	376.00	32.80	37.057	0.220	654.1
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	0.756 k
+D+0.60W	0.5 k	0.48 k	0.756 k
+D-0.60W	0.5 k	0.48 k	0.756 k
+D+0.450W	0.4 k	0.36 k	0.756 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 1 M.H (8 THK) (1 SPAN)

+D-0.450W	0.4 k	0.36 k	0.756 k
+0.60D+0.60W	0.5 k	0.48 k	0.454 k
+0.60D-0.60W	0.5 k	0.48 k	0.454 k
+D+0.70E	0.0 k	0.00 k	0.756 k
+D+0.5250E	0.0 k	0.00 k	0.756 k
+0.60D+0.70E	0.0 k	0.00 k	0.454 k
W Only	0.8 k	0.80 k	0.000 k
-W	0.8 k	0.80 k	0.000 k
E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 2 M.H (8 THK) (1 SPAN)

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

Construction Type : Grouted Hollow Concrete Masonry

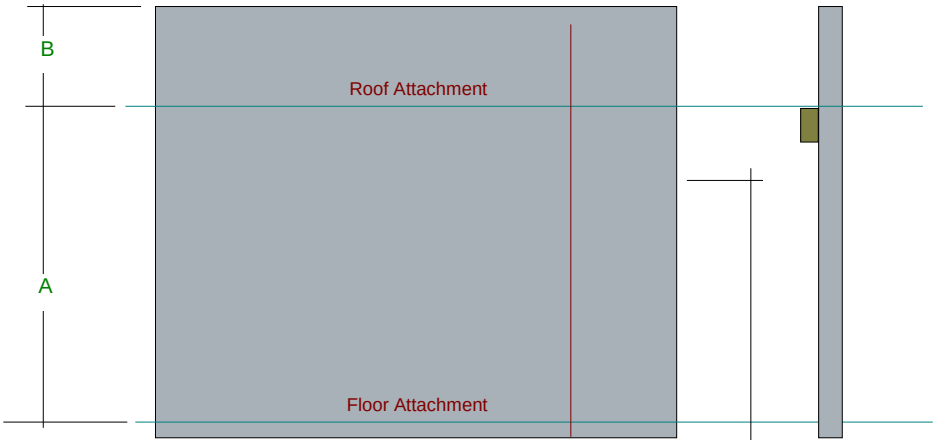
F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.0 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009509	Bar Size	# 5				
Grout Density	=	140 pcf	Bar Spacing	16	in			
Block Weight		Normal Weight						
Wall Weight	=	63.0 psf						

Wall is grouted at rebar cells only

One-Story Wall Dimensions

A Clear Height = 13 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load 132.850 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 2 M.H (8 THK) (1 SPAN)

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS Moment Capacity Check +0.90D+W	Maximum Bending Stress Rat	**0.8353**		
	Max Mu	2.830 k-ft	Phi * Mn	3.388 k-ft
PASS Service Deflection Check +0.60D+0.60W	Actual Defl. Ratio L/ Max. Deflection	381 0.4090 in	Allowable Defl. Ratio	180.0
PASS Axial Load Check +1.20D+W	Max Pu / Ag Location	8.448 psi 6.283 ft	Max. Allow. Defl. 0.2 * f'm	0.8667 in 400.0 psi
Reinforcing Limit Check	Actual As/bd	0.005082	Max Allow As/bd	0.009515

Maximum Reactions *for Load Combination...*

Top Horizontal	W Only	0.8635 k
Base Horizontal	W Only	0.8635 k
Vertical Reaction	D Only	0.8190 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 6.07 to 6.50	0.524	24.816	1.01	1.41	0.90	3.43	0.233	0.0051	0.0093	0.00
+1.20D-0.50W at 6.07 to 6.50	0.524	24.816	1.01	1.41	0.90	3.43	0.233	0.0051	0.0093	0.00
+1.20D+W at 6.07 to 6.50	0.524	24.816	1.01	2.84	0.90	3.43	0.233	0.0051	0.0093	0.00
+1.20D-W at 6.07 to 6.50	0.524	24.816	1.01	2.84	0.90	3.43	0.233	0.0051	0.0093	0.00
+0.90D+W at 6.07 to 6.50	0.393	24.816	1.01	2.83	0.90	3.39	0.233	0.0051	0.0094	0.00
+0.90D-W at 6.07 to 6.50	0.393	24.816	1.01	2.83	0.90	3.39	0.233	0.0051	0.0094	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 6.50 to 6.93	0.409	1.01	1.69	376.00	33.12	35.279	0.409	381.4
+D-0.60W at 6.50 to 6.93	0.409	1.01	1.69	376.00	33.12	35.279	0.409	381.4
+D+0.450W at 6.50 to 6.93	0.409	1.01	1.27	376.00	33.12	41.097	0.158	984.7
+D-0.450W at 6.50 to 6.93	0.409	1.01	1.27	376.00	33.12	41.097	0.158	984.7
+0.60D+0.60W at 6.50 to 6.93	0.246	1.01	1.69	376.00	32.83	35.006	0.409	381.4
+0.60D-0.60W at 6.50 to 6.93	0.246	1.01	1.69	376.00	32.83	35.006	0.409	381.4
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	0.819 k
+D+0.60W	0.5 k	0.52 k	0.819 k
+D-0.60W	0.5 k	0.52 k	0.819 k
+D+0.450W	0.4 k	0.39 k	0.819 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Case 2 M.H (8 THK) (1 SPAN)

+D-0.450W	0.4 k	0.39 k	0.819 k
+0.60D+0.60W	0.5 k	0.52 k	0.491 k
+0.60D-0.60W	0.5 k	0.52 k	0.491 k
+D+0.70E	0.0 k	0.00 k	0.819 k
+D+0.5250E	0.0 k	0.00 k	0.819 k
+0.60D+0.70E	0.0 k	0.00 k	0.491 k
W Only	0.9 k	0.86 k	0.000 k
-W	0.9 k	0.86 k	0.000 k
E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Gravity"

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

Construction Type : Grouted Hollow Concrete Masonry

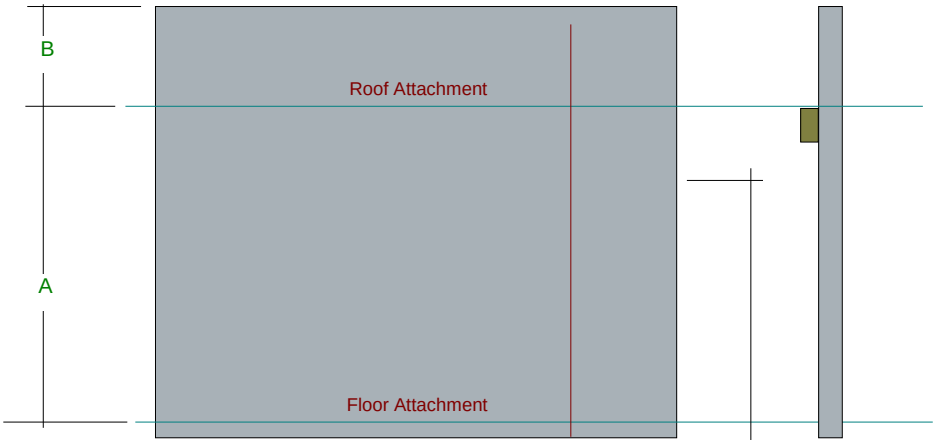
F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.50 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.008160	Bar Size	#	5			
Grout Density	=	140 pcf	Bar Spacing		24 in			
Block Weight		Normal Weight						
Wall Weight	=	55.0 psf						

Wall is grouted at rebar cells only

One-Story Wall Dimensions

A Clear Height = 6.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Vertical Loads

Vertical Uniform Loads . . . (Applied per foot of Strip Width)

			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	6.52 in	4.130		0.490		k/ft
Concentric Load							k/ft

Lateral Loads

Wind Loads :
Full area WIND load psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Gravity"

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check	Maximum Bending Stress Rat	**0.8530**		
	+1.40D	Max Mu	3.142 k-ft	Phi * Mn	3.683 k-ft
PASS	Service Deflection Check	Actual Defl. Ratio L/	795	Allowable Defl. Ratio	240.0
	+D+L	Max. Deflection	0.09058 in		
PASS	Axial Load Check	Max Pu / Ag	112.970 psi	Max. Allow. Defl.	0.30 in
	+1.40D	Location	5.90 ft	0.2 * f'm	400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003388	Max Allow As/bd	0.008160

Maximum Reactions *for Load Combination...*

Top Horizontal	+D+L	0.4181 k
Base Horizontal	+D+L	0.4181 k
Vertical Reaction	+D+L	4.950 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
+1.40D at 5.80 to 6.00	5.802	20.544	0.95	3.14	0.90	3.68	0.155	0.0034	0.0074	0.00
+1.20D+1.60L at 5.80 to 6.00	5.758	20.544	0.95	3.12	0.90	3.67	0.155	0.0034	0.0074	0.00
+1.20D+0.50L at 5.80 to 6.00	5.218	20.544	0.95	2.83	0.90	3.55	0.155	0.0034	0.0076	0.00
+1.20D at 5.80 to 6.00	4.972	20.544	0.95	2.69	0.90	3.49	0.155	0.0034	0.0077	0.00
+1.20D+0.50L+E at 5.80 to 6.00	5.218	20.544	0.95	2.83	0.90	3.55	0.155	0.0034	0.0076	0.00
+0.90D at 5.80 to 6.00	3.728	20.544	0.95	2.02	0.90	3.19	0.155	0.0034	0.0082	0.00
+0.90D+E at 5.80 to 6.00	3.728	20.544	0.95	2.02	0.90	3.19	0.155	0.0034	0.0082	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
D Only at 3.80 to 4.00	4.251	0.95	1.48	353.60	31.71	34.491	0.072	1,002.9
+D+L at 3.80 to 4.00	4.741	0.95	1.67	353.60	32.57	34.367	0.091	794.9
+D+0.750L at 3.80 to 4.00	4.619	0.95	1.62	353.60	32.35	34.346	0.086	838.3
+D+0.70E at 3.80 to 4.00	4.251	0.95	1.48	353.60	31.71	34.491	0.072	1,002.9
+D+0.750L+0.5250E at 3.80 to 4.00	4.619	0.95	1.62	353.60	32.35	34.346	0.086	838.3
+0.60D at 4.00 to 4.20	2.544	0.95	0.92	353.60	28.61	353.600	0.014	5,072.5
+0.60D+0.70E at 4.00 to 4.20	2.544	0.95	0.92	353.60	28.61	353.600	0.014	5,072.5
L Only at 3.40 to 3.60	0.490	0.95	0.16	353.60	24.66	353.600	0.002	43,177.8
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.4 k	0.37 k	4.460 k
+D+L	0.4 k	0.42 k	4.950 k
+D+0.750L	0.4 k	0.41 k	4.827 k
+D+0.70E	0.4 k	0.37 k	4.460 k
+D+0.750L+0.5250E	0.4 k	0.41 k	4.827 k
+0.60D	0.2 k	0.22 k	2.676 k
+0.60D+0.70E	0.2 k	0.22 k	2.676 k
L Only	0.0 k	0.04 k	0.490 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Gravity"

E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Zone 5"

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

Construction Type : Grouted Hollow Concrete Masonry

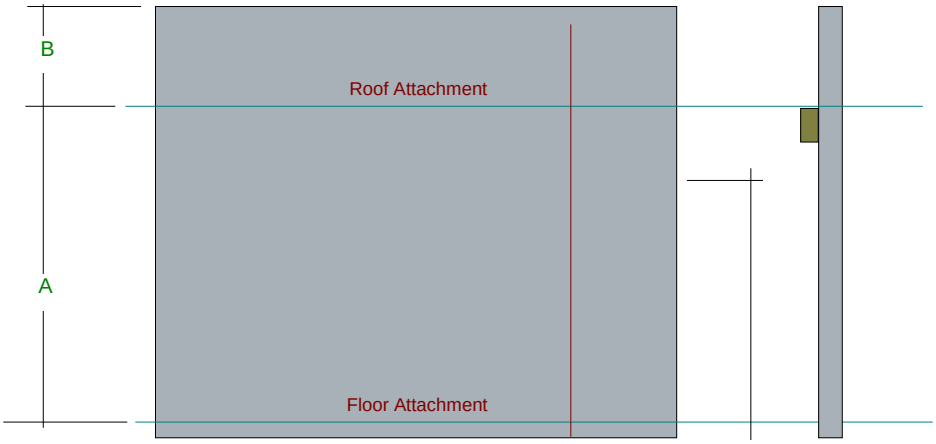
F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.50 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009515	Bar Size	#	5			
Grout Density	=	140 pcf	Bar Spacing		48 in			
Block Weight		Normal Weight						
Wall Weight	=	47.0 psf						

Wall is grouted at rebar cells only

One-Story Wall Dimensions

A Clear Height = 6.0 ft
B Parapet height = ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load 131.550 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Zone 5"

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check	Maximum Bending Stress Rat	**0.4928**		
	+0.90D+W	Max Mu	0.5907 k-ft	Phi * Mn	1.199 k-ft
PASS	Service Deflection Check	Actual Defl. Ratio L/	11211	Allowable Defl. Ratio	240.0
	W Only	Max. Deflection	0.006422 in		
PASS	Axial Load Check	Max Pu / Ag	4.437 psi	Max. Allow. Defl.	0.30 in
	+1.20D+W	Location	2.90 ft	0.2 * f'm	400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.001694	Max Allow As/bd	0.009515

Maximum Reactions *for Load Combination...*

Top Horizontal	W Only	0.3947 k
Base Horizontal	W Only	0.3947 k
Vertical Reaction	+D+0.60W	0.2820 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 2.80 to 3.00	0.180	16.272	0.89	0.30	0.90	1.21	0.078	0.0017	0.0095	0.00
+1.20D+W at 2.80 to 3.00	0.180	16.272	0.89	0.59	0.90	1.21	0.078	0.0017	0.0095	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+0.90D+W at 2.80 to 3.00	0.135	16.272	0.89	0.59	0.90	1.20	0.078	0.0017	0.0095	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 2.80 to 3.00	0.150	0.89	0.35	331.10	13.75	331.100	0.004	18,683.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.450W at 2.80 to 3.00	0.150	0.89	0.27	331.10	13.75	331.100	0.003	24,910.7
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+0.60D+0.60W at 2.80 to 3.00	0.090	0.89	0.35	331.10	13.60	331.100	0.004	18,683.9
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
W Only at 3.00 to 3.20	0.000	0.89	0.59	331.10	13.38	331.100	0.006	11,211.2
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	0.282 k
+D+0.60W	0.2 k	0.24 k	0.282 k
+D+0.70E	0.0 k	0.00 k	0.282 k
+D+0.450W	0.2 k	0.18 k	0.282 k
+D+0.5250E	0.0 k	0.00 k	0.282 k
+0.60D+0.60W	0.2 k	0.24 k	0.169 k
+0.60D+0.70E	0.0 k	0.00 k	0.169 k
W Only	0.4 k	0.39 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Tower Mansory Wall "Zone 5"

E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 8' Mansory Wall "Zone 5"** P.O.

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

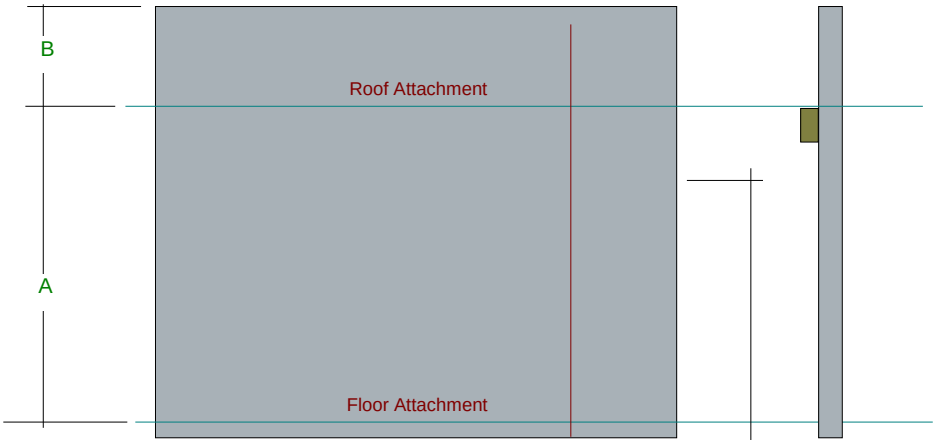
Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.50 psi	Rebar "d" distance	5.124	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009512	Bar Size	#	5			
Grout Density	=	140 pcf	Bar Spacing		16 in			
Block Weight		Normal Weight						
Wall Weight	=	86.0 psf						
		Wall is Solid Grouted						

One-Story Wall Dimensions

A Clear Height = 8.0 ft
B Parapet height = ft

Wall Support Condition Top Free, Bottom Fix



Lateral Loads

Wind Loads :
Full area WIND load 131.550 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 8' Mansory Wall "Zone 5"** P.O.

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+W	Maximum Bending Stress Rat	**0.9017**		
		Max Mu	-4.223 k-ft	Phi * Mn	4.683 k-ft
PASS	Service Deflection Check W Only	Actual Defl. Ratio L/ Max. Deflection	276 0.6956 in	Allowable Defl. Ratio	240.0 /2 for Cantilever
PASS	Axial Load Check +1.20D+W	Max Pu / Ag Location	9.011 psi 0.1333 ft	Max. Allow. Defl. 0.2 * f'm	0.80 in 400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003781	Max Allow As/bd	0.009512

Maximum Reactions *for Load Combination...*

Top Horizontal		0.0 k
Base Horizontal	W Only	1.052 k
Vertical Reaction	+D+0.450W	0.6880 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 0.00 to 0.27	0.825	36.624	1.20	2.11	0.90	4.73	0.233	0.0038	0.0093	0.00
+1.20D+W at 0.00 to 0.27	0.825	36.624	1.20	4.23	0.90	4.73	0.233	0.0038	0.0093	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+0.90D+W at 0.00 to 0.27	0.619	36.624	1.20	4.22	0.90	4.68	0.233	0.0038	0.0094	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 7.73 to 8.00	0.025	1.20	0.00	443.30	62.78	443.300	0.273	703.5
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.450W at 7.73 to 8.00	0.024	1.20	0.00	443.30	62.78	443.300	0.137	1,401.8
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+0.60D+0.60W at 7.73 to 8.00	0.015	1.20	0.00	443.30	62.75	443.300	0.275	697.6
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
W Only at 7.73 to 8.00	0.007	1.20	0.00	443.30	62.72	443.300	0.696	276.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	0.688 k
+D+0.60W	0.6 k	0.00 k	0.688 k
+D+0.70E	0.0 k	0.00 k	0.688 k
+D+0.450W	0.5 k	0.00 k	0.688 k
+D+0.5250E	0.0 k	0.00 k	0.688 k
+0.60D+0.60W	0.6 k	0.00 k	0.413 k
+0.60D+0.70E	0.0 k	0.00 k	0.413 k
W Only	1.1 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 8' Mansory Wall "Zone 5"** P.O.

E Only	0.0 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 5' Mansory Wall "Zone 5" M.H.**

Code References

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Calculations per TMS 402-16, IBC 2018, CBC 2019, ASCE 7-16

Construction Type : Grouted Hollow Concrete Masonry

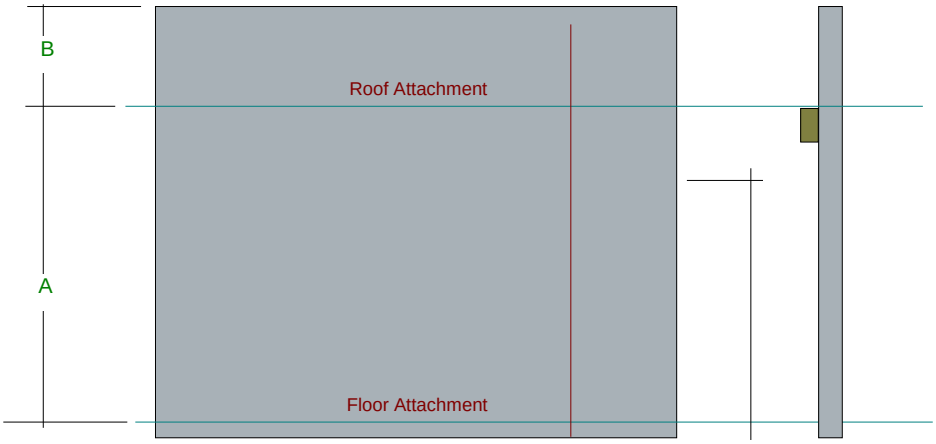
F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	123.50 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009515	Bar Size	# 5				
Grout Density	=	140 pcf	Bar Spacing	24	in			
Block Weight		Normal Weight						
Wall Weight	=	55.0 psf						

Wall is grouted at rebar cells only

One-Story Wall Dimensions

A Clear Height = 5.0 ft
B Parapet height = ft

Wall Support Condition Top Free, Bottom Fix



Lateral Loads

Wind Loads :
Full area WIND load 131.550 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 5' Mansory Wall "Zone 5" M.H.**

DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

	Governing Load Combination . . .	Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +0.90D+W	Maximum Bending Stress Rat	**0.7069**		
		Max Mu	-1.645 k-ft	Phi * Mn	2.328 k-ft
PASS	Service Deflection Check W Only	Actual Defl. Ratio L/ Max. Deflection	995 0.1207 in	Allowable Defl. Ratio	240.0 /2 for Cantilever
PASS	Axial Load Check +1.20D+W	Max Pu / Ag Location	6.422 psi 0.08333 ft	Max. Allow. Defl. 0.2 * f'm	0.50 in 400.0 psi
	Reinforcing Limit Check	Actual As/bd	0.003388	Max Allow As/bd	0.009515

Maximum Reactions *for Load Combination...*

Top Horizontal		0.0 k
Base Horizontal	W Only	0.6578 k
Vertical Reaction	+D+0.60W	0.2750 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 0.00 to 0.17	0.330	20.544	0.95	0.82	0.90	2.35	0.155	0.0034	0.0094	0.00
+1.20D+W at 0.00 to 0.17	0.330	20.544	0.95	1.65	0.90	2.35	0.155	0.0034	0.0094	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+0.90D+W at 0.00 to 0.17	0.247	20.544	0.95	1.65	0.90	2.33	0.155	0.0034	0.0094	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 4.83 to 5.00	0.009	0.95	0.00	353.60	23.70	353.600	0.018	6,760.9
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.450W at 4.83 to 5.00	0.009	0.95	0.00	353.60	23.70	353.600	0.012	9,774.3
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+0.60D+0.60W at 4.83 to 5.00	0.006	0.95	0.00	353.60	23.69	353.600	0.018	6,757.2
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
W Only at 4.83 to 5.00	0.001	0.95	0.00	353.60	23.69	353.600	0.121	994.6
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	0.275 k
+D+0.60W	0.4 k	0.00 k	0.275 k
+D+0.70E	0.0 k	0.00 k	0.275 k
+D+0.450W	0.3 k	0.00 k	0.275 k
+D+0.5250E	0.0 k	0.00 k	0.275 k
+0.60D+0.60W	0.4 k	0.00 k	0.165 k
+0.60D+0.70E	0.0 k	0.00 k	0.165 k
W Only	0.7 k	0.00 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Parapet 5' Mansory Wall "Zone 5" M.H.**

E Only	0.0 k	0.00 k	0.000 k

STAIR DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

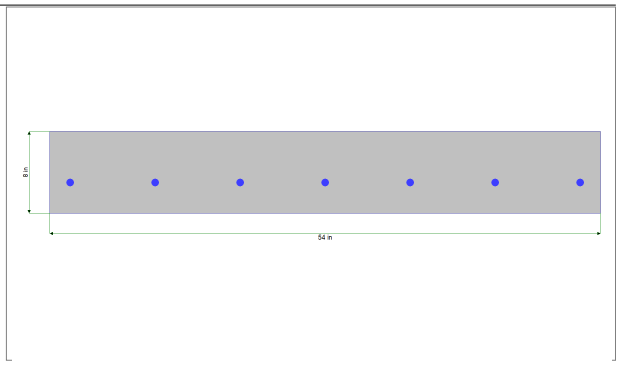
DESCRIPTION: Concrete Stair P.O**

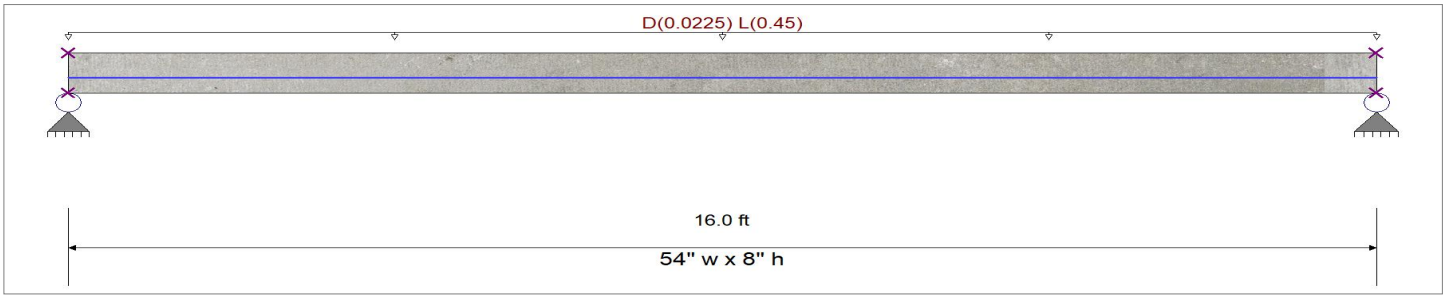
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	= 5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	= 530.33 psi		Shear :	0.750
ψ Density	= 145.0 pcf	β_1	=	0.80
λ LtWt Factor	= 1.0			
Elastic Modulus	= 4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 54.0 in, Height = 8.0 in
Span #1 Reinforcing....
7-#6 at 3.0 in from Bottom, from 0.0 to 16.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0050, L = 0.10 ksf, Tributary Width = 4.50 ft, (CONCRETE SLAB)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.637** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	40.608	k-ft
Mn * Phi : Allowable	63.720	k-ft
Location of maximum on span	8.015	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.071 in	Ratio =	2687	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.180 in	Ratio =	1064	>=180.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	7.260	7.260
Overall MINimum	2.196	2.196
D Only	3.660	3.660
+D+L	7.260	7.260
+D+0.750L	6.360	6.360
+0.60D	2.196	2.196
L Only	3.600	3.600

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Stair P.O**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	5.00	10.15	10.15	0.00	1.00	32.98	Vu < PhiVc/2	ɔt Reqd 9.6	33.0	0.0	0.0
+1.20D+1.60L	1	0.17	5.00	9.93	9.93	1.76	1.00	32.98	Vu < PhiVc/2	ɔt Reqd 9.6	33.0	0.0	0.0
+1.20D+1.60L	1	0.35	5.00	9.71	9.71	3.47	1.00	32.98	Vu < PhiVc/2	ɔt Reqd 9.6	33.0	0.0	0.0
+1.20D+1.60L	1	0.52	5.00	9.49	9.49	5.15	0.77	31.64	Vu < PhiVc/2	ɔt Reqd 9.6	31.6	0.0	0.0
+1.20D+1.60L	1	0.70	5.00	9.26	9.26	6.79	0.57	30.49	Vu < PhiVc/2	ɔt Reqd 9.6	30.5	0.0	0.0
+1.20D+1.60L	1	0.87	5.00	9.04	9.04	8.39	0.45	29.80	Vu < PhiVc/2	ɔt Reqd 9.6	29.8	0.0	0.0
+1.20D+1.60L	1	1.05	5.00	8.82	8.82	9.95	0.37	29.34	Vu < PhiVc/2	ɔt Reqd 9.6	29.3	0.0	0.0
+1.20D+1.60L	1	1.22	5.00	8.60	8.60	11.48	0.31	29.01	Vu < PhiVc/2	ɔt Reqd 9.6	29.0	0.0	0.0
+1.20D+1.60L	1	1.40	5.00	8.38	8.38	12.96	0.27	28.76	Vu < PhiVc/2	ɔt Reqd 9.6	28.8	0.0	0.0
+1.20D+1.60L	1	1.57	5.00	8.15	8.15	14.41	0.24	28.57	Vu < PhiVc/2	ɔt Reqd 9.6	28.6	0.0	0.0
+1.20D+1.60L	1	1.75	5.00	7.93	7.93	15.81	0.21	28.41	Vu < PhiVc/2	ɔt Reqd 9.6	28.4	0.0	0.0
+1.20D+1.60L	1	1.92	5.00	7.71	7.71	17.18	0.19	28.29	Vu < PhiVc/2	ɔt Reqd 9.6	28.3	0.0	0.0
+1.20D+1.60L	1	2.10	5.00	7.49	7.49	18.51	0.17	28.18	Vu < PhiVc/2	ɔt Reqd 9.6	28.2	0.0	0.0
+1.20D+1.60L	1	2.27	5.00	7.27	7.27	19.80	0.15	28.09	Vu < PhiVc/2	ɔt Reqd 9.6	28.1	0.0	0.0
+1.20D+1.60L	1	2.45	5.00	7.05	7.05	21.05	0.14	28.01	Vu < PhiVc/2	ɔt Reqd 9.6	28.0	0.0	0.0
+1.20D+1.60L	1	2.62	5.00	6.82	6.82	22.26	0.13	27.94	Vu < PhiVc/2	ɔt Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	1	2.80	5.00	6.60	6.60	23.44	0.12	27.88	Vu < PhiVc/2	ɔt Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	1	2.97	5.00	6.38	6.38	24.57	0.11	27.83	Vu < PhiVc/2	ɔt Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	3.15	5.00	6.16	6.16	25.67	0.10	27.78	Vu < PhiVc/2	ɔt Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	3.32	5.00	5.94	5.94	26.73	0.09	27.74	Vu < PhiVc/2	ɔt Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	3.50	5.00	5.71	5.71	27.74	0.09	27.70	Vu < PhiVc/2	ɔt Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	3.67	5.00	5.49	5.49	28.72	0.08	27.67	Vu < PhiVc/2	ɔt Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	3.85	5.00	5.27	5.27	29.66	0.07	27.63	Vu < PhiVc/2	ɔt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	4.02	5.00	5.05	5.05	30.57	0.07	27.60	Vu < PhiVc/2	ɔt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	4.20	5.00	4.83	4.83	31.43	0.06	27.58	Vu < PhiVc/2	ɔt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	4.37	5.00	4.60	4.60	32.25	0.06	27.55	Vu < PhiVc/2	ɔt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	4.55	5.00	4.38	4.38	33.04	0.06	27.53	Vu < PhiVc/2	ɔt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	4.72	5.00	4.16	4.16	33.79	0.05	27.50	Vu < PhiVc/2	ɔt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	4.90	5.00	3.94	3.94	34.50	0.05	27.48	Vu < PhiVc/2	ɔt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	5.07	5.00	3.72	3.72	35.16	0.04	27.46	Vu < PhiVc/2	ɔt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	5.25	5.00	3.49	3.49	35.80	0.04	27.44	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	5.42	5.00	3.27	3.27	36.39	0.04	27.42	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	5.60	5.00	3.05	3.05	36.94	0.03	27.40	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	5.77	5.00	2.83	2.83	37.45	0.03	27.39	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	5.95	5.00	2.61	2.61	37.93	0.03	27.37	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	6.12	5.00	2.39	2.39	38.37	0.03	27.36	Vu < PhiVc/2	ɔt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	6.30	5.00	2.16	2.16	38.76	0.02	27.34	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	6.47	5.00	1.94	1.94	39.12	0.02	27.33	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	6.64	5.00	1.72	1.72	39.44	0.02	27.31	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	6.82	5.00	1.50	1.50	39.72	0.02	27.30	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	6.99	5.00	1.28	1.28	39.97	0.01	27.28	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	7.17	5.00	1.05	1.05	40.17	0.01	27.27	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	7.34	5.00	0.83	0.83	40.34	0.01	27.26	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	7.52	5.00	0.61	0.61	40.46	0.01	27.24	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	7.69	5.00	0.39	0.39	40.55	0.00	27.23	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	7.87	5.00	0.17	0.17	40.60	0.00	27.22	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	8.04	5.00	-0.06	0.06	40.61	0.00	27.21	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	8.22	5.00	-0.28	0.28	40.58	0.00	27.22	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	8.39	5.00	-0.50	0.50	40.51	0.01	27.24	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	8.57	5.00	-0.72	0.72	40.40	0.01	27.25	Vu < PhiVc/2	ɔt Reqd 9.6	27.2	0.0	0.0
+1.20D+1.60L	1	8.74	5.00	-0.94	0.94	40.26	0.01	27.26	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	8.92	5.00	-1.16	1.16	40.07	0.01	27.28	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	9.09	5.00	-1.39	1.39	39.85	0.01	27.29	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	9.27	5.00	-1.61	1.61	39.59	0.02	27.30	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	9.44	5.00	-1.83	1.83	39.29	0.02	27.32	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	9.62	5.00	-2.05	2.05	38.95	0.02	27.33	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0
+1.20D+1.60L	1	9.79	5.00	-2.27	2.27	38.57	0.02	27.35	Vu < PhiVc/2	ɔt Reqd 9.6	27.3	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Stair P.O**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	1	9.97	5.00	-2.50	2.50	38.15	0.03	27.36	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	10.14	5.00	-2.72	2.72	37.70	0.03	27.38	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	10.32	5.00	-2.94	2.94	37.20	0.03	27.40	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	10.49	5.00	-3.16	3.16	36.67	0.04	27.41	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	10.67	5.00	-3.38	3.38	36.10	0.04	27.43	Vu < PhiVc/2	ıt Reqd 9.6	27.4	0.0	0.0
+1.20D+1.60L	1	10.84	5.00	-3.61	3.61	35.48	0.04	27.45	Vu < PhiVc/2	ıt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	11.02	5.00	-3.83	3.83	34.83	0.05	27.47	Vu < PhiVc/2	ıt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	11.19	5.00	-4.05	4.05	34.15	0.05	27.49	Vu < PhiVc/2	ıt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	11.37	5.00	-4.27	4.27	33.42	0.05	27.51	Vu < PhiVc/2	ıt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	11.54	5.00	-4.49	4.49	32.65	0.06	27.54	Vu < PhiVc/2	ıt Reqd 9.6	27.5	0.0	0.0
+1.20D+1.60L	1	11.72	5.00	-4.72	4.72	31.85	0.06	27.56	Vu < PhiVc/2	ıt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	11.89	5.00	-4.94	4.94	31.00	0.07	27.59	Vu < PhiVc/2	ıt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	12.07	5.00	-5.16	5.16	30.12	0.07	27.62	Vu < PhiVc/2	ıt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	12.24	5.00	-5.38	5.38	29.20	0.08	27.65	Vu < PhiVc/2	ıt Reqd 9.6	27.6	0.0	0.0
+1.20D+1.60L	1	12.42	5.00	-5.60	5.60	28.24	0.08	27.68	Vu < PhiVc/2	ıt Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	12.59	5.00	-5.82	5.82	27.24	0.09	27.72	Vu < PhiVc/2	ıt Reqd 9.6	27.7	0.0	0.0
+1.20D+1.60L	1	12.77	5.00	-6.05	6.05	26.20	0.10	27.76	Vu < PhiVc/2	ıt Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	12.94	5.00	-6.27	6.27	25.12	0.10	27.81	Vu < PhiVc/2	ıt Reqd 9.6	27.8	0.0	0.0
+1.20D+1.60L	1	13.11	5.00	-6.49	6.49	24.01	0.11	27.86	Vu < PhiVc/2	ıt Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	1	13.29	5.00	-6.71	6.71	22.85	0.12	27.91	Vu < PhiVc/2	ıt Reqd 9.6	27.9	0.0	0.0
+1.20D+1.60L	1	13.46	5.00	-6.93	6.93	21.66	0.13	27.98	Vu < PhiVc/2	ıt Reqd 9.6	28.0	0.0	0.0
+1.20D+1.60L	1	13.64	5.00	-7.16	7.16	20.43	0.15	28.05	Vu < PhiVc/2	ıt Reqd 9.6	28.0	0.0	0.0
+1.20D+1.60L	1	13.81	5.00	-7.38	7.38	19.16	0.16	28.13	Vu < PhiVc/2	ıt Reqd 9.6	28.1	0.0	0.0
+1.20D+1.60L	1	13.99	5.00	-7.60	7.60	17.85	0.18	28.23	Vu < PhiVc/2	ıt Reqd 9.6	28.2	0.0	0.0
+1.20D+1.60L	1	14.16	5.00	-7.82	7.82	16.50	0.20	28.35	Vu < PhiVc/2	ıt Reqd 9.6	28.3	0.0	0.0
+1.20D+1.60L	1	14.34	5.00	-8.04	8.04	15.11	0.22	28.49	Vu < PhiVc/2	ıt Reqd 9.6	28.5	0.0	0.0
+1.20D+1.60L	1	14.51	5.00	-8.27	8.27	13.69	0.25	28.66	Vu < PhiVc/2	ıt Reqd 9.6	28.7	0.0	0.0
+1.20D+1.60L	1	14.69	5.00	-8.49	8.49	12.22	0.29	28.88	Vu < PhiVc/2	ıt Reqd 9.6	28.9	0.0	0.0
+1.20D+1.60L	1	14.86	5.00	-8.71	8.71	10.72	0.34	29.16	Vu < PhiVc/2	ıt Reqd 9.6	29.2	0.0	0.0
+1.20D+1.60L	1	15.04	5.00	-8.93	8.93	9.18	0.41	29.55	Vu < PhiVc/2	ıt Reqd 9.6	29.5	0.0	0.0
+1.20D+1.60L	1	15.21	5.00	-9.15	9.15	7.60	0.50	30.11	Vu < PhiVc/2	ıt Reqd 9.6	30.1	0.0	0.0
+1.20D+1.60L	1	15.39	5.00	-9.38	9.38	5.98	0.65	30.98	Vu < PhiVc/2	ıt Reqd 9.6	31.0	0.0	0.0
+1.20D+1.60L	1	15.56	5.00	-9.60	9.60	4.32	0.93	32.56	Vu < PhiVc/2	ıt Reqd 9.6	32.6	0.0	0.0
+1.20D+1.60L	1	15.74	5.00	-9.82	9.82	2.62	1.00	32.98	Vu < PhiVc/2	ıt Reqd 9.6	33.0	0.0	0.0
+1.20D+1.60L	1	15.91	5.00	-10.04	10.04	0.88	1.00	32.98	Vu < PhiVc/2	ıt Reqd 9.6	33.0	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	16.000	40.61	63.72	0.64
+1.40D					
Span # 1	1	16.000	20.50	63.72	0.32
+1.20D+1.60L					
Span # 1	1	16.000	40.61	63.72	0.64
+1.20D+0.50L					
Span # 1	1	16.000	24.77	63.72	0.39
+1.20D					
Span # 1	1	16.000	17.57	63.72	0.28
+0.90D					
Span # 1	1	16.000	13.18	63.72	0.21

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	.ocation in Span (ft	Load Combination	Max. "+" Defl (in)	ocation in Span (ft
+D+L	1	0.1804	8.000		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

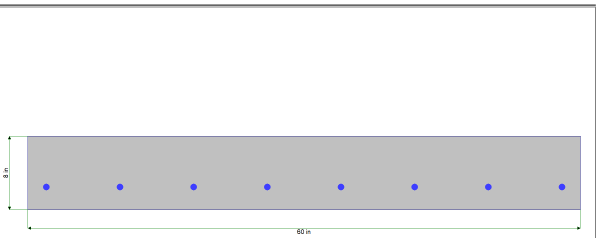
DESCRIPTION: Concrete Stair (Tower)**

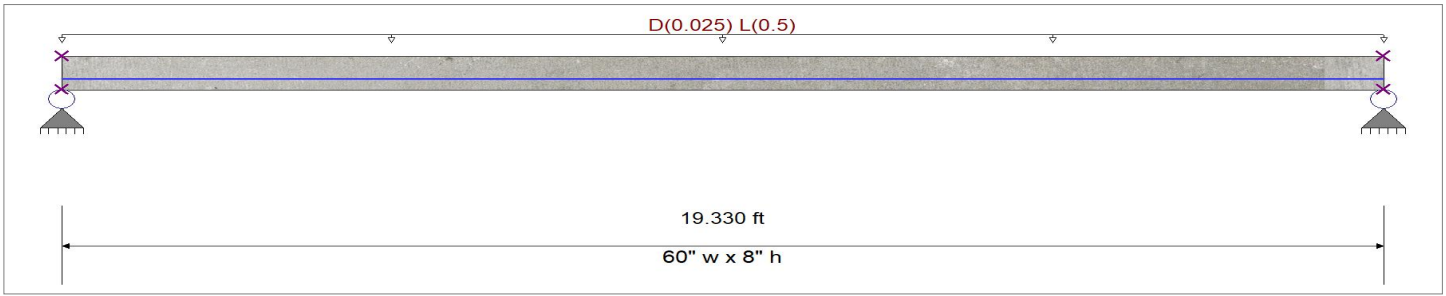
CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

f'c	=	5.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50	=	530.33 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.80
λ LtWt Factor	=	1.0			
Elastic Modulus	=	4,030.51 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2





Cross Section & Reinforcing Details

Rectangular Section, Width = 60.0 in, Height = 8.0 in
Span #1 Reinforcing....
8-#6 at 2.50 in from Bottom, from 0.0 to 19.330 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0050, L = 0.10 ksf, Tributary Width = 5.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.817**	: 1
Section used for this span	**Typical Section**	
Mu : Applied	65.855	k-ft
Mn * Phi : Allowable	80.560	k-ft
Location of maximum on span	9.683	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.152 in	Ratio =	1524	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.862 in	Ratio =	268	>=240.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	9.746	9.746
Overall MINimum	2.948	2.948
D Only	4.913	4.913
+D+L	9.746	9.746
+D+0.750L	8.537	8.537
+0.60D	2.948	2.948
L Only	4.832	4.832

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Stair (Tower)**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L	1	0.00	5.50	13.63	13.63	0.00	1.00	39.85	Vu < PhiVc/2	ɔt Reqd 9.6	39.9	0.0	0.0
+1.20D+1.60L	1	0.21	5.50	13.33	13.33	2.85	1.00	39.85	Vu < PhiVc/2	ɔt Reqd 9.6	39.9	0.0	0.0
+1.20D+1.60L	1	0.42	5.50	13.03	13.03	5.63	1.00	39.85	Vu < PhiVc/2	ɔt Reqd 9.6	39.9	0.0	0.0
+1.20D+1.60L	1	0.63	5.50	12.73	12.73	8.35	0.70	37.86	Vu < PhiVc/2	ɔt Reqd 9.6	37.9	0.0	0.0
+1.20D+1.60L	1	0.85	5.50	12.44	12.44	11.01	0.52	36.67	Vu < PhiVc/2	ɔt Reqd 9.6	36.7	0.0	0.0
+1.20D+1.60L	1	1.06	5.50	12.14	12.14	13.61	0.41	35.95	Vu < PhiVc/2	ɔt Reqd 9.6	35.9	0.0	0.0
+1.20D+1.60L	1	1.27	5.50	11.84	11.84	16.14	0.34	35.47	Vu < PhiVc/2	ɔt Reqd 9.6	35.5	0.0	0.0
+1.20D+1.60L	1	1.48	5.50	11.54	11.54	18.61	0.28	35.13	Vu < PhiVc/2	ɔt Reqd 9.6	35.1	0.0	0.0
+1.20D+1.60L	1	1.69	5.50	11.24	11.24	21.02	0.25	34.87	Vu < PhiVc/2	ɔt Reqd 9.6	34.9	0.0	0.0
+1.20D+1.60L	1	1.90	5.50	10.95	10.95	23.36	0.21	34.67	Vu < PhiVc/2	ɔt Reqd 9.6	34.7	0.0	0.0
+1.20D+1.60L	1	2.11	5.50	10.65	10.65	25.64	0.19	34.51	Vu < PhiVc/2	ɔt Reqd 9.6	34.5	0.0	0.0
+1.20D+1.60L	1	2.32	5.50	10.35	10.35	27.86	0.17	34.38	Vu < PhiVc/2	ɔt Reqd 9.6	34.4	0.0	0.0
+1.20D+1.60L	1	2.54	5.50	10.05	10.05	30.02	0.15	34.26	Vu < PhiVc/2	ɔt Reqd 9.6	34.3	0.0	0.0
+1.20D+1.60L	1	2.75	5.50	9.76	9.76	32.11	0.14	34.17	Vu < PhiVc/2	ɔt Reqd 9.6	34.2	0.0	0.0
+1.20D+1.60L	1	2.96	5.50	9.46	9.46	34.14	0.13	34.09	Vu < PhiVc/2	ɔt Reqd 9.6	34.1	0.0	0.0
+1.20D+1.60L	1	3.17	5.50	9.16	9.16	36.10	0.12	34.02	Vu < PhiVc/2	ɔt Reqd 9.6	34.0	0.0	0.0
+1.20D+1.60L	1	3.38	5.50	8.86	8.86	38.01	0.11	33.96	Vu < PhiVc/2	ɔt Reqd 9.6	34.0	0.0	0.0
+1.20D+1.60L	1	3.59	5.50	8.56	8.56	39.85	0.10	33.90	Vu < PhiVc/2	ɔt Reqd 9.6	33.9	0.0	0.0
+1.20D+1.60L	1	3.80	5.50	8.27	8.27	41.63	0.09	33.85	Vu < PhiVc/2	ɔt Reqd 9.6	33.9	0.0	0.0
+1.20D+1.60L	1	4.01	5.50	7.97	7.97	43.34	0.08	33.81	Vu < PhiVc/2	ɔt Reqd 9.6	33.8	0.0	0.0
+1.20D+1.60L	1	4.23	5.50	7.67	7.67	44.99	0.08	33.77	Vu < PhiVc/2	ɔt Reqd 9.6	33.8	0.0	0.0
+1.20D+1.60L	1	4.44	5.50	7.37	7.37	46.58	0.07	33.73	Vu < PhiVc/2	ɔt Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	4.65	5.50	7.07	7.07	48.11	0.07	33.70	Vu < PhiVc/2	ɔt Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	4.86	5.50	6.78	6.78	49.57	0.06	33.67	Vu < PhiVc/2	ɔt Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	5.07	5.50	6.48	6.48	50.97	0.06	33.64	Vu < PhiVc/2	ɔt Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	5.28	5.50	6.18	6.18	52.31	0.05	33.61	Vu < PhiVc/2	ɔt Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	5.49	5.50	5.88	5.88	53.58	0.05	33.58	Vu < PhiVc/2	ɔt Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	5.70	5.50	5.59	5.59	54.79	0.05	33.56	Vu < PhiVc/2	ɔt Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	5.92	5.50	5.29	5.29	55.94	0.04	33.54	Vu < PhiVc/2	ɔt Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	6.13	5.50	4.99	4.99	57.03	0.04	33.52	Vu < PhiVc/2	ɔt Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	6.34	5.50	4.69	4.69	58.05	0.04	33.50	Vu < PhiVc/2	ɔt Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	6.55	5.50	4.39	4.39	59.01	0.03	33.48	Vu < PhiVc/2	ɔt Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	6.76	5.50	4.10	4.10	59.91	0.03	33.46	Vu < PhiVc/2	ɔt Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	6.97	5.50	3.80	3.80	60.74	0.03	33.44	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	7.18	5.50	3.50	3.50	61.51	0.03	33.42	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	7.39	5.50	3.20	3.20	62.22	0.02	33.41	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	7.61	5.50	2.90	2.90	62.86	0.02	33.39	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	7.82	5.50	2.61	2.61	63.45	0.02	33.38	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	8.03	5.50	2.31	2.31	63.97	0.02	33.36	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	8.24	5.50	2.01	2.01	64.42	0.01	33.35	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	8.45	5.50	1.71	1.71	64.82	0.01	33.33	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	8.66	5.50	1.41	1.41	65.15	0.01	33.32	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	8.87	5.50	1.12	1.12	65.41	0.01	33.30	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	9.08	5.50	0.82	0.82	65.62	0.01	33.29	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	9.30	5.50	0.52	0.52	65.76	0.00	33.28	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	9.51	5.50	0.22	0.22	65.84	0.00	33.26	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	9.72	5.50	-0.07	0.07	65.85	0.00	33.26	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	9.93	5.50	-0.37	0.37	65.81	0.00	33.27	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	10.14	5.50	-0.67	0.67	65.70	0.00	33.28	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	10.35	5.50	-0.97	0.97	65.52	0.01	33.30	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	10.56	5.50	-1.27	1.27	65.29	0.01	33.31	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	10.77	5.50	-1.56	1.56	64.99	0.01	33.32	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	10.99	5.50	-1.86	1.86	64.63	0.01	33.34	Vu < PhiVc/2	ɔt Reqd 9.6	33.3	0.0	0.0
+1.20D+1.60L	1	11.20	5.50	-2.16	2.16	64.20	0.02	33.35	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	11.41	5.50	-2.46	2.46	63.71	0.02	33.37	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	11.62	5.50	-2.76	2.76	63.16	0.02	33.38	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	11.83	5.50	-3.05	3.05	62.55	0.02	33.40	Vu < PhiVc/2	ɔt Reqd 9.6	33.4	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 21 0580 City of key Colony Beach V00.ec6

DESCRIPTION: Concrete Stair (Tower)**

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L	1	12.04	5.50	-3.35	3.35	61.87	0.02	33.42	Vu < PhiVc/2	ot Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	12.25	5.50	-3.65	3.65	61.13	0.03	33.43	Vu < PhiVc/2	ot Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	12.46	5.50	-3.95	3.95	60.33	0.03	33.45	Vu < PhiVc/2	ot Reqd 9.6	33.4	0.0	0.0
+1.20D+1.60L	1	12.68	5.50	-4.24	4.24	59.47	0.03	33.47	Vu < PhiVc/2	ot Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	12.89	5.50	-4.54	4.54	58.54	0.04	33.49	Vu < PhiVc/2	ot Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	13.10	5.50	-4.84	4.84	57.55	0.04	33.51	Vu < PhiVc/2	ot Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	13.31	5.50	-5.14	5.14	56.49	0.04	33.53	Vu < PhiVc/2	ot Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	13.52	5.50	-5.44	5.44	55.38	0.04	33.55	Vu < PhiVc/2	ot Reqd 9.6	33.5	0.0	0.0
+1.20D+1.60L	1	13.73	5.50	-5.73	5.73	54.20	0.05	33.57	Vu < PhiVc/2	ot Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	13.94	5.50	-6.03	6.03	52.95	0.05	33.60	Vu < PhiVc/2	ot Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	14.15	5.50	-6.33	6.33	51.65	0.06	33.62	Vu < PhiVc/2	ot Reqd 9.6	33.6	0.0	0.0
+1.20D+1.60L	1	14.37	5.50	-6.63	6.63	50.28	0.06	33.65	Vu < PhiVc/2	ot Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	14.58	5.50	-6.93	6.93	48.85	0.06	33.68	Vu < PhiVc/2	ot Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	14.79	5.50	-7.22	7.22	47.35	0.07	33.71	Vu < PhiVc/2	ot Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	15.00	5.50	-7.52	7.52	45.80	0.08	33.75	Vu < PhiVc/2	ot Reqd 9.6	33.7	0.0	0.0
+1.20D+1.60L	1	15.21	5.50	-7.82	7.82	44.18	0.08	33.79	Vu < PhiVc/2	ot Reqd 9.6	33.8	0.0	0.0
+1.20D+1.60L	1	15.42	5.50	-8.12	8.12	42.49	0.09	33.83	Vu < PhiVc/2	ot Reqd 9.6	33.8	0.0	0.0
+1.20D+1.60L	1	15.63	5.50	-8.41	8.41	40.75	0.09	33.88	Vu < PhiVc/2	ot Reqd 9.6	33.9	0.0	0.0
+1.20D+1.60L	1	15.84	5.50	-8.71	8.71	38.94	0.10	33.93	Vu < PhiVc/2	ot Reqd 9.6	33.9	0.0	0.0
+1.20D+1.60L	1	16.06	5.50	-9.01	9.01	37.06	0.11	33.99	Vu < PhiVc/2	ot Reqd 9.6	34.0	0.0	0.0
+1.20D+1.60L	1	16.27	5.50	-9.31	9.31	35.13	0.12	34.05	Vu < PhiVc/2	ot Reqd 9.6	34.1	0.0	0.0
+1.20D+1.60L	1	16.48	5.50	-9.61	9.61	33.13	0.13	34.13	Vu < PhiVc/2	ot Reqd 9.6	34.1	0.0	0.0
+1.20D+1.60L	1	16.69	5.50	-9.90	9.90	31.07	0.15	34.22	Vu < PhiVc/2	ot Reqd 9.6	34.2	0.0	0.0
+1.20D+1.60L	1	16.90	5.50	-10.20	10.20	28.95	0.16	34.32	Vu < PhiVc/2	ot Reqd 9.6	34.3	0.0	0.0
+1.20D+1.60L	1	17.11	5.50	-10.50	10.50	26.76	0.18	34.44	Vu < PhiVc/2	ot Reqd 9.6	34.4	0.0	0.0
+1.20D+1.60L	1	17.32	5.50	-10.80	10.80	24.51	0.20	34.58	Vu < PhiVc/2	ot Reqd 9.6	34.6	0.0	0.0
+1.20D+1.60L	1	17.53	5.50	-11.10	11.10	22.20	0.23	34.76	Vu < PhiVc/2	ot Reqd 9.6	34.8	0.0	0.0
+1.20D+1.60L	1	17.75	5.50	-11.39	11.39	19.82	0.26	34.99	Vu < PhiVc/2	ot Reqd 9.6	35.0	0.0	0.0
+1.20D+1.60L	1	17.96	5.50	-11.69	11.69	17.38	0.31	35.29	Vu < PhiVc/2	ot Reqd 9.6	35.3	0.0	0.0
+1.20D+1.60L	1	18.17	5.50	-11.99	11.99	14.88	0.37	35.69	Vu < PhiVc/2	ot Reqd 9.6	35.7	0.0	0.0
+1.20D+1.60L	1	18.38	5.50	-12.29	12.29	12.32	0.46	36.27	Vu < PhiVc/2	ot Reqd 9.6	36.3	0.0	0.0
+1.20D+1.60L	1	18.59	5.50	-12.59	12.59	9.69	0.60	37.18	Vu < PhiVc/2	ot Reqd 9.6	37.2	0.0	0.0
+1.20D+1.60L	1	18.80	5.50	-12.88	12.88	7.00	0.84	38.82	Vu < PhiVc/2	ot Reqd 9.6	38.8	0.0	0.0
+1.20D+1.60L	1	19.01	5.50	-13.18	13.18	4.25	1.00	39.85	Vu < PhiVc/2	ot Reqd 9.6	39.9	0.0	0.0
+1.20D+1.60L	1	19.22	5.50	-13.48	13.48	1.43	1.00	39.85	Vu < PhiVc/2	ot Reqd 9.6	39.9	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	19.330	65.86	80.56	0.82
+1.40D					
Span # 1	1	19.330	33.24	80.56	0.41
+1.20D+1.60L					
Span # 1	1	19.330	65.86	80.56	0.82
+1.20D+0.50L					
Span # 1	1	19.330	40.17	80.56	0.50
+1.20D					
Span # 1	1	19.330	28.49	80.56	0.35
+0.90D					
Span # 1	1	19.330	21.37	80.56	0.27

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
+D+L	1	0.8625	9.665		0.0000	0.000

FOUNDATION DESIGN

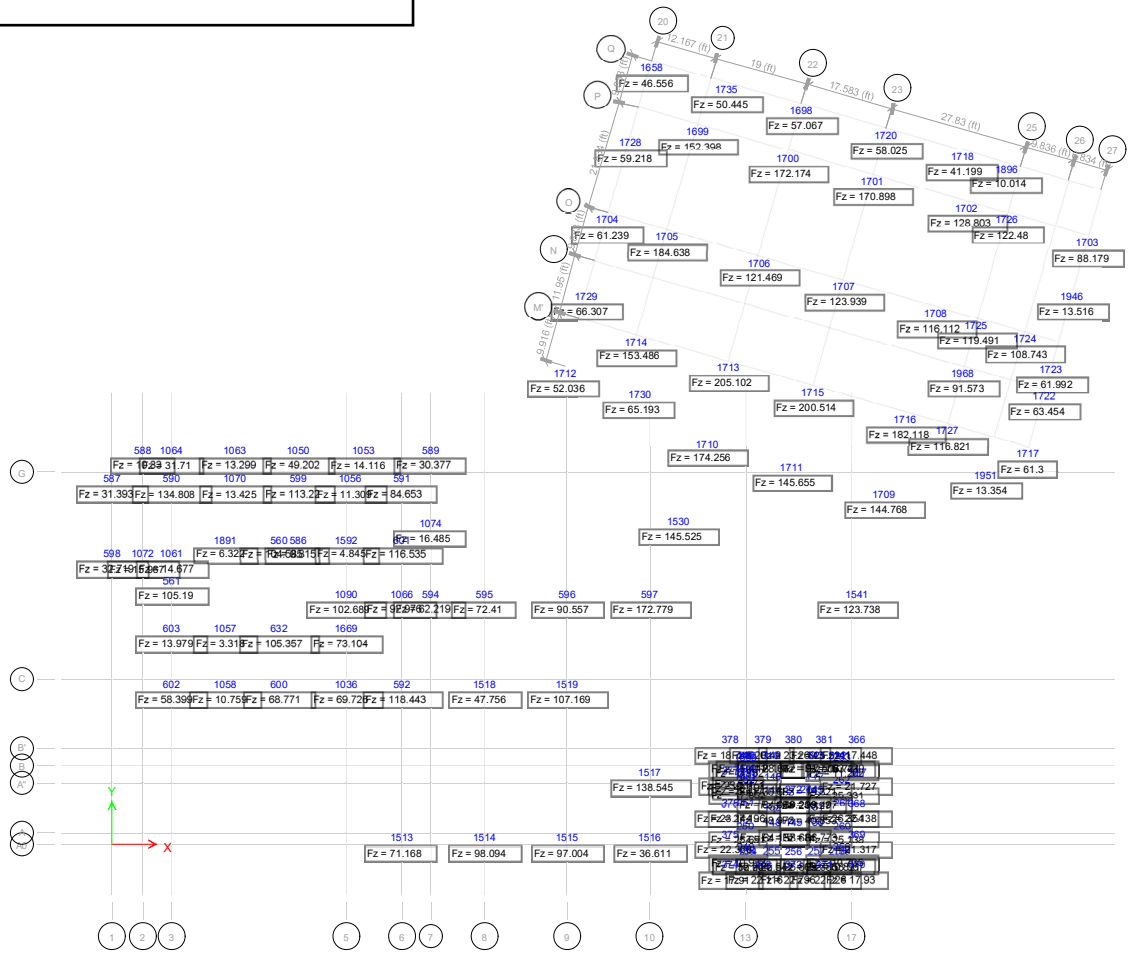


Table: Column Properties 02 - Rectangular

Table: Column Properties 02 - Rectangular

Column	MatProp	SecDim2	SecDim3	AutoRigid	AutoDrop	IncludeCap
		in	in			
C-14x14 (5)	5000 Psi	14.0000	14.0000	No	No	No

Table: Load Cases 06 - Loads Applied

Table: Load Cases 06 - Loads Applied

LoadCase	LoadPat	SF
Dead	Dead	1.000000
Dead	Super Dead	1.000000
Dead	Dead_ABOVE	1.000000
Live	Live	1.000000
Live	Live_ABOVE	1.000000
Roof Live	Roof Live	1.000000
Roof Live	Roof Live_ABOVE	1.000000
Wind(1/12)	Wind(1/12)	1.000000
Wind(1/12)	Wind(1/12)_ABOVE	1.000000
Wind(2/12)	Wind(2/12)	1.000000
Wind(2/12)	Wind(2/12)_ABOVE	1.000000
Wind(3/12)	Wind(3/12)	1.000000
Wind(3/12)	Wind(3/12)_ABOVE	1.000000
Wind(4/12)	Wind(4/12)	1.000000
Wind(4/12)	Wind(4/12)_ABOVE	1.000000
Wind(5/12)	Wind(5/12)	1.000000
Wind(5/12)	Wind(5/12)_ABOVE	1.000000
Wind(6/12)	Wind(6/12)	1.000000
Wind(6/12)	Wind(6/12)_ABOVE	1.000000
Wind(7/12)	Wind(7/12)	1.000000
Wind(7/12)	Wind(7/12)_ABOVE	1.000000
Wind(8/12)	Wind(8/12)	1.000000
Wind(8/12)	Wind(8/12)_ABOVE	1.000000
Wind(9/12)	Wind(9/12)	1.000000
Wind(9/12)	Wind(9/12)_ABOVE	1.000000
Wind(10/12)	Wind(10/12)	1.000000
Wind(10/12)	Wind(10/12)_ABOVE	1.000000
Wind(11/12)	Wind(11/12)	1.000000
Wind(11/12)	Wind(11/12)_ABOVE	1.000000
Wind(12/12)	Wind(12/12)	1.000000
Wind(12/12)	Wind(12/12)_ABOVE	1.000000
Flood	Flood	1.000000
Flood	Flood_ABOVE	1.000000
Reducible Live	Reducible Live	1.000000
Reducible Live	Reducible Live_ABOVE	1.000000

Table: Material Properties 03 - Concrete

Table: Material Properties 03 - Concrete

Material	E	U	A	UnitWt	Fc	LtWtConc	UserModRup
	kip/in2		1/F	lb/ft3	kip/in2		
4000Psi	3604.997	0.200000	5.5000E-06	1.5000E+02	4.000	No	No
5000 Psi	4030.509	0.200000	5.5000E-06	1.5000E+02	5.000	No	No

Table: Slab Properties 02 - Solid Slabs

Table: Slab Properties 02 - Solid Slabs

Slab	Type	MatProp	Thickness	Ortho
			in	
THK=32"	Slab	5000 Psi	32.0000	No

Table: Wall Properties

Table: Wall Properties

Wall	MatProp	Thickness	AutoRigid	OutOfPlane	Color	GUID
		in				
WALL1	4000Psi	12.0000	No	Yes	Magenta	62dbe3bf-e1a5-4ac7-85d1-6d78fab42f2e

2 PILE CAP (Traditional CRSI Approach)

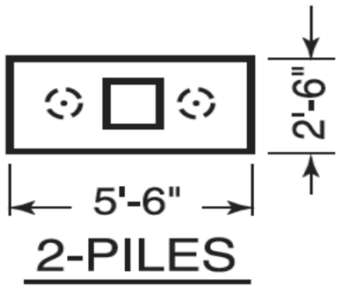
for Vertical Loading

Per ACI 318-11 Building Code

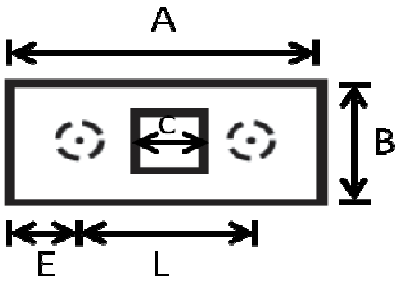
Job Name:		Subject:			
Job Number:		Originator:		Checker:	

Input:

Load Factor =	1.4	
Pile Type =	Concrete	
Pile Shape =	Square	
Concrete Comp. Strength, f'_c=	5	ksi
Steel Reinforcing Yield, f_y=	60	ksi
Accidential Pile Offset =	3	in.
Pile Allowable Load (ASD) =	39	tons
Pile Allowable Load (ASD) =	78	kips
Minimum Pile Embedment =	4	in.
Clear Cover Over Top of Pile=	3	in.
Minimum Pile Dimension d_p=	14	in.
Pile Spacing, L=	4	ft.
Pile Edge Distance, E=	21	in.
Pile Cap $D_{min,\ recommended}$=	22.85	in.
Pile Cap D_{cap}=	32	in.
Pile Cap Dimension A=	7.5	ft.
Pile Cap Dimension B=	3.5	ft.
Short Bars Size (No.) =	6	
Long Bars Size (No.) =	6	
Reinf. Effective $d_{short\ bars}$ =	23.875	in.
Reinf. Effective $d_{long\ bars}$ =	24.625	in.
Reinf. Effective $d_{shear\ checks}$ =	24	in.



Note: Minimum cap dimensions shown above. Actual dimensions provided to the left referencing figure below.



Design Checks:

Short bar size small enough to develop hooks?	OK
Long bar size small enough to develop hooks?	OK
CRSI Limit State 1 Adequate?	OK
CRSI Limit State 2 Adequate?	OK
CRSI Limit State 3 Adequate?	Not applicable to this pilecap configuration
CRSI Limit State 4 Adequate?	Not applicable to this pilecap configuration
CRSI Limit State 5 Adequate?	OK
CRSI Limit State 6 Adequate?	Not applicable to this pilecap configuration

Results:

Column Size Determination

Net Column Capacity P_u=	203.70	kips	(reduced by C6 x pile cap wt., column f'c = 4 ksi)
Min. Column Dimension c=	7.136	in.	
Rounded Dimension c=	10	in.	

(continued)

Required Flexural Reinforcement - Short Bars

M_u=	0	k-in.	Total moment on pile cap with offset
M_u=	0	k-in./ft	1 ft strip design
d=	23.875	in.	
$A_{s,required,structural,per\ ft}$=	-0.007	in^2/ft	
$A_{s,required,structural,total}$=	-0.053	in^2	
$A_{s,min}$=(0.0018 or 0.002)A_g=	5.184	in^2	
$A_{s,required}$=	5.184	in^2	

Increase the calculated area of steel to maintain uniform spacing (ACI 15.4.4)

β=A/B=	2.143		
γ_s=	0.636		% steel concentrated of width B of long side A
$A_{s,required,structural,total,modfied}$=	-0.072	in^2	
$A_{s,required}$=	5.184	in^2	
E'=E-Offset =	18	in.	Available for hook as past pile edge
ψ_e=	1		Use 1.0 for no epoxy coating
ℓ_{dh}=	8.910	in.	OK; sufficient length available to develop hook
Req. number of short bars =	11.73		
Prov. number of short bars =	12		

Required Flexural Reinforcement - Long Bars

M_u=	2527.89	k-in.	Total moment on pile cap with offset
M_u=	722.25	k-in./ft	1 ft strip design
d=	24.625	in.	
$A_{s,required,structural,per\ ft}$=	0.543	in^2/ft	
$A_{s,required,structural,total}$=	1.901	in^2	
$A_{s,min}$=(0.0018 or 0.002)A_g=	2.419	in^2	
$A_{s,required}$=	2.419	in^2	
E'=E-Offset =	18.00	in.	Available for hook as past pile edge
ψ_e=	1		Use 1.0 for no epoxy coating
ℓ_{dh}=	8.910	in.	OK; sufficient length available to develop hook
Req. number of long bars =	5.48		
Prov. number of long bars =	6		

(continued)

Check two way shear at a distance d/2 from column - CRSI LIMIT STATE 1 -

d=	24.000	in.
d/2=	12.000	in.

No. of piles outside d/2 from face of the column = 2

$4(f_c')^{0.5}$=	282.84	psi	
b_0=	84.00	in.	
V_c=	570.21	kips	based on $V_c=4(f_c')^{0.5}b_0d$ acting at d/2 from column face
ϕV_c=	427.66	kips	
V_u=	208.20	kips	reduced by weight of concrete outside of critical section
$V_u/\phi V_c$=	0.487		

Check deep beam (one way shear through short width) at a distance d from column face - CRSI LIMIT STATE 2 -

d=	24.000	in.

No. of piles outside d from face of the column = 0

$2(f_c')^{0.5}$=	141.42	psi	
bd=	1008.00	in^2	
V_c=	142.55	kips	based on $V_c=2(f_c')^{0.5}bd$ acting at d from column face
ϕV_c=	106.91	kips	
V_u=	-2.61	kips	reduced by weight of concrete outside of critical section
$V_u/\phi V_c$=	-0.024		

Check deep beam (one way shear through short width) at face of column (only applies when w/d<1.0) - CRSI LIMIT STATE 5 -

d=	24.625	in.	
w'=	22	in.	
w'/d=	0.893		OK, this limit state should be checked
V_u=	102.67	kips	
M_u=	2271.73	k-in.	
V_ud/M_u=	1.113		
$M_u/(V_ud)$=	0.899		
k=	2.822140424		
ϕV_c=	154.79	kips	
$V_u/\phi V_c$=	0.663		

Conservatively assuming w'/d=1.0,

V_ud/M_u=	1.113	
$M_u/(V_ud)$=	0.899	
k=	2.521	
ϕV_c=	138.29	kips
$V_u/\phi V_c$=	0.742	

(continued)

Quantities of Concrete and Reinforcing Bars

Concrete Summary:

Quantity = 2.59 CY

Short Steel Bar Summary:

12	Total	#6	Bars	of length	3.000	ft (per bar)
24	Total		Hooks	of length	0.785	ft (per bar)

Weight = 82.5 lbs

Long Steel Bar Summary:

6	Total	#6	Bars	of length	7.000	ft (per bar)
12	Total		Hooks	of length	0.785	ft (per bar)

Weight = 77.3 lbs

Total weight of all steel = 159.8 lbs or 0.080 tons

Comments:

3 PILE CAP (Traditional CRSI Approach)

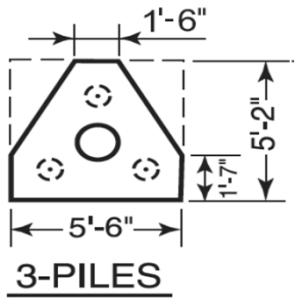
for Vertical Loading

Per ACI 318-11 Building Code

Job Name:		Subject:			
Job Number:		Originator:		Checker:	

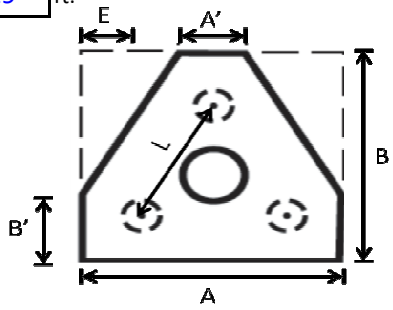
Input:

Load Factor =	1.4	
Pile Type =	Concrete	
Pile Shape =	Square	
Concrete Comp. Strength, f'_c=	5	ksi
Steel Reinforcing Yield, f_y=	60	ksi
Accidential Pile Offset =	3	in.
Pile Allowable Load (ASD) =	39	tons
Pile Allowable Load (ASD) =	78	kips
Minimum Pile Embedment =	4	in.
Clear Cover Over Top of Pile=	3	in.
Minimum Pile Dimension d_p=	14	in.
Pile Spacing, L=	4	ft.
Pile Edge Distance, E=	21	in.
Pile Cap $D_{min,\ recommended}$=	22.85	in.
Pile Cap D_{cap}=	32	in.
Pile Cap Dimension A=	7.5	ft.
Pile Cap Dimension B=	6.964	ft.
Bar Size (No.)=	6	
(All Three Directions)		
Reinf. Effective $d_{short\ bars}$ =	24.625	in.
Reinf. Effective $d_{long\ bars}$ =	25	in.
Reinf. Effective $d_{shear\ checks}$ =	24	in.



Note: Minimum cap dimensions shown above. Actual dimensions provided to the left referencing figure below.

A'=	2.021	ft.
B'=	2.219	ft.



Design Checks:

Short bar size small enough to develop hooks?	OK		
Long bar size small enough to develop hooks?	OK		
CRSI Limit State 1 Adequate?	OK		
CRSI Limit State 2 Adequate?	Not Applicable	CRSI Limit State P1 Adequate?	OK
CRSI Limit State 3 Adequate?	OK	CRSI Limit State P2 Adequate?	OK
CRSI Limit State 4 Adequate?	Not applicable	CRSI Limit State P3 Adequate?	OK
CRSI Limit State 5 Adequate?	Not Applicable	CRSI Limit State P4 Adequate?	OK
CRSI Limit State 6 Adequate?	OK		

Results:

Column Size Determination

Net Column Capacity P_u=	305.63	kips	(reduced by C6 x pile cap wt., column f'c = 4 ksi)
Min. Column Dimension c=	9.863	in.	
Rounded Dimension c=	10	in.	

(continued)

Required Flexural Reinforcement - Three Ways

M_u=	2303.75	k-in.	Total moment on pile cap with offset
M_u=	1038.28	k-in./ft	1 ft strip design
d=	24.625	in.	
$A_{s,required,structural,per\ ft}$=	0.789	in^2/ft	
$A_{s,required,structural,total}$=	1.750	in^2	
$A_{s,min}$=(0.0018 or 0.002)A_g=	1.534	in^2	
$A_{s,required}$=	1.750	in^2	
E'=E-Offset =	18	in.	Available for hook as past pile edge
ψ_e=	1		Use 1.0 for no epoxy coating
ℓ_{dh}=	8.910	in.	OK; sufficient length available to develop hook
Req. number of short bars =	3.96		
Prov. number of short bars =	6		

(continued)

Check two way shear at a distance d/2 from column - CRSI LIMIT STATE 1 -

d=	24	in.	
d/2=	12	in.	
No. of piles outside d/2 from face of the column =	3		
$4(f_c')^{0.5}$=	282.84	psi	
b_0=	106.81	in.	
V_c=	725.06	kips	based on $V_c=4(f_c')^{0.5}b_0d$ acting at d/2 from column face
ϕV_c=	543.79	kips	
V_u=	306.51	kips	reduced by weight of concrete outside of critical section
$V_u/\phi V_c$=	0.564		

Check deep beam (one way shear through long width) at a distance d from column face - CRSI LIMIT STATE 3 -

d=	24.000	in.	
No. of piles outside d from face of the column =	1		
$2(f_c')^{0.5}$=	141.42	psi	
bd=	1128.21	in^2	
V_c=	159.55	kips	based on $V_c=2(f_c')^{0.5}bd$ acting at d from column face
ϕV_c=	119.67	kips	
V_u=	109.20	kips	reduced by weight of concrete outside of critical section
$V_u/\phi V_c$=	0.913		

(continued)

Check two way shear at column face - CRSI LIMIT STATE 4 -

d=	24.000	in.			
d/2=	12.000	in.			
No. of piles outside face of the column =	3				
w_{actual}=	25.714	in.	>	d/2	Limit state not applicable
V_u=	305.94	kips			
$4(f_c')^{0.5}$=	282.84	psi			
$32(f_c')^{0.5}$=	2262.74	psi			
b_0=	106.811	in.			
b_s=	31.415	in.			
k=	6.347		based on k=2(d/w)(1+d/c) acting at column face		
V_c=	338.37	kips	based on $V_c=k(f_c')^{0.5}b_s d$ acting at column face		
ϕV_c=	253.78	kips			
$V_u/\phi V_c$=	1.206				

Check deep beam (one way shear through long width) at face of column (only applies when w/d<1.0) - CRSI LIMIT STATE 6 -

d=	23.875	in.			
w'=	25.696	in.			
w'/d=	1.076		Limit state not applicable		
V_u=	109.20	kips			
M_u=	2806.00	k-in.			
$V_u d/M_u$=	0.929				
$M_u/(V_u d)$=	1.076				
k=	1.499				
ϕV_c=	141.78	kips			
$V_u/\phi V_c$=	0.770	Above	0.200577	Below	**0.770196 Controlling**

(continued)

Quantities of Concrete and Reinforcing Bars

Concrete Summary:

Quantity = 3.87 CY

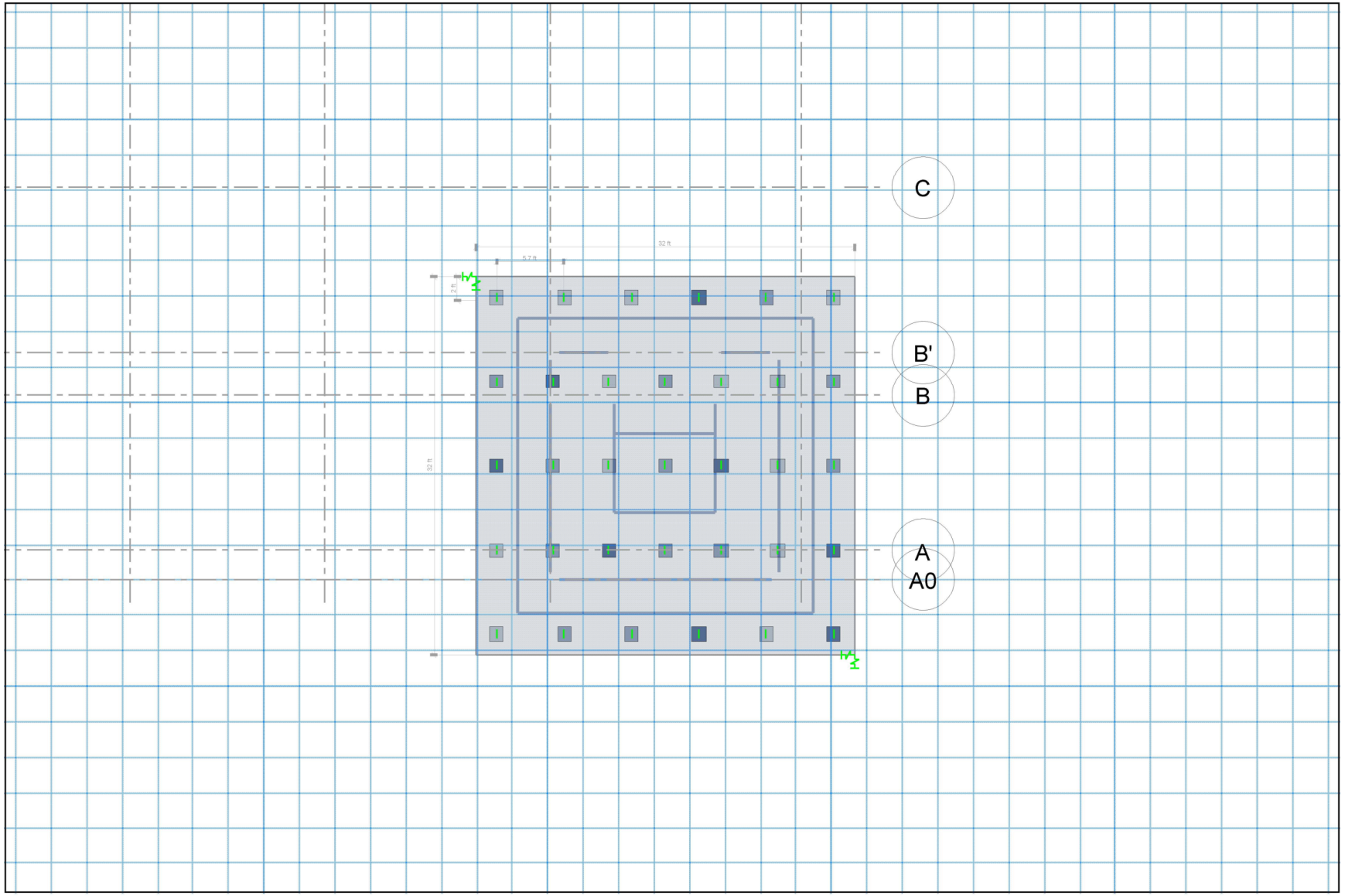
All Steel Bar Summary:

18	Total	#6	Bars	of length	7.000	ft (per bar)
36	Total		Hooks	of length	0.785	ft (per bar)
Weight = 231.9	lbs					

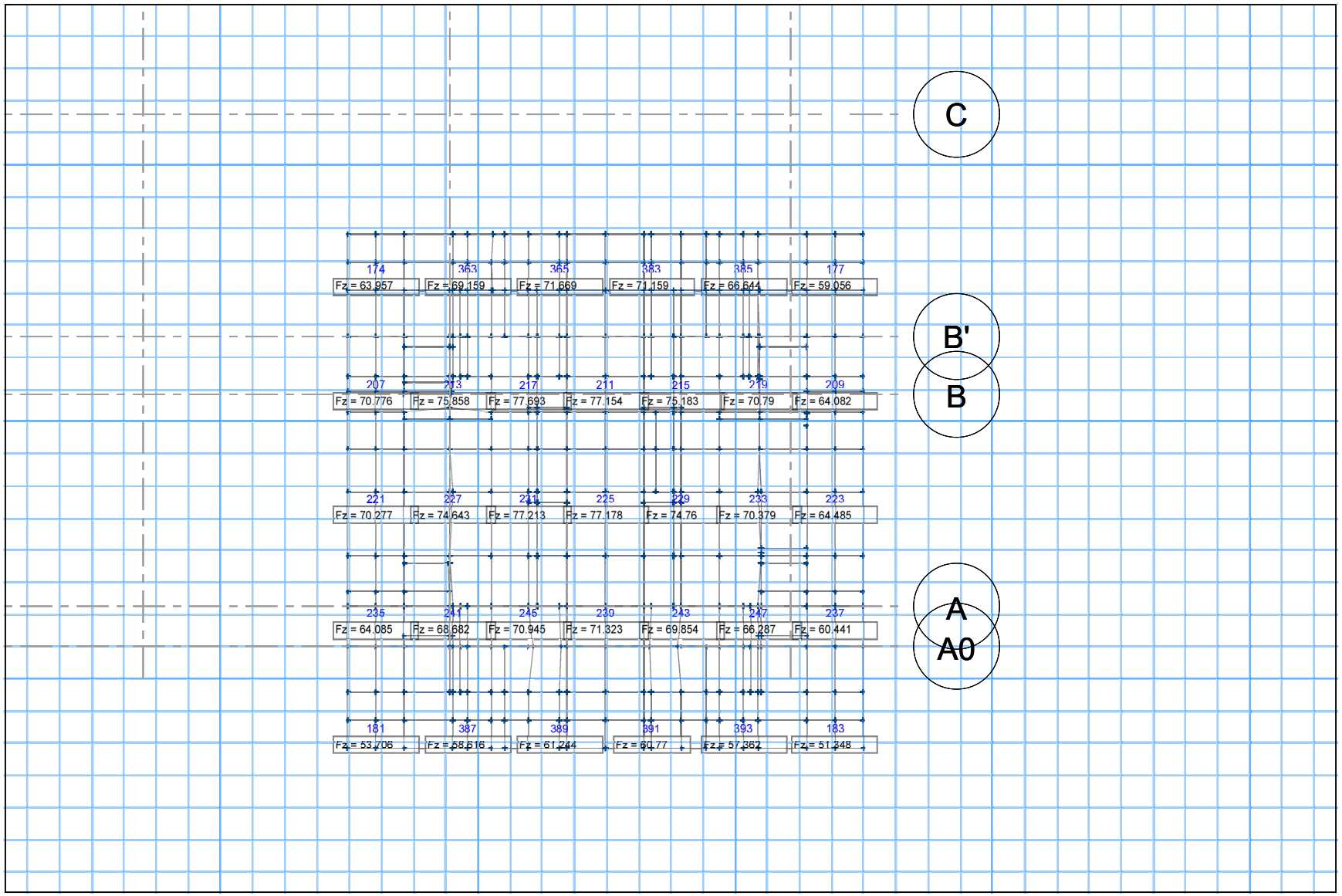
Total weight of all steel = 231.9 lbs or 0.116 tons

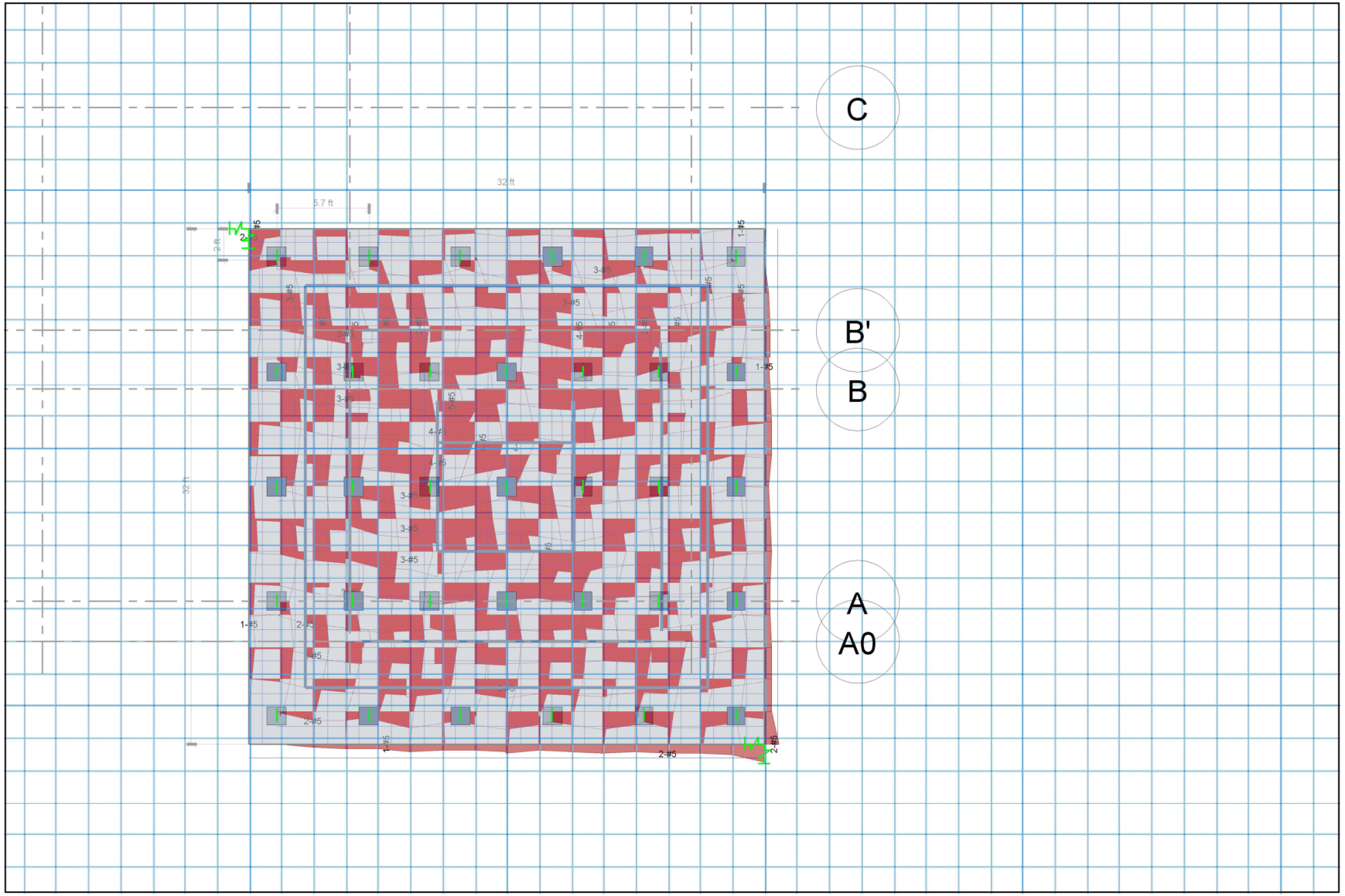
Comments:

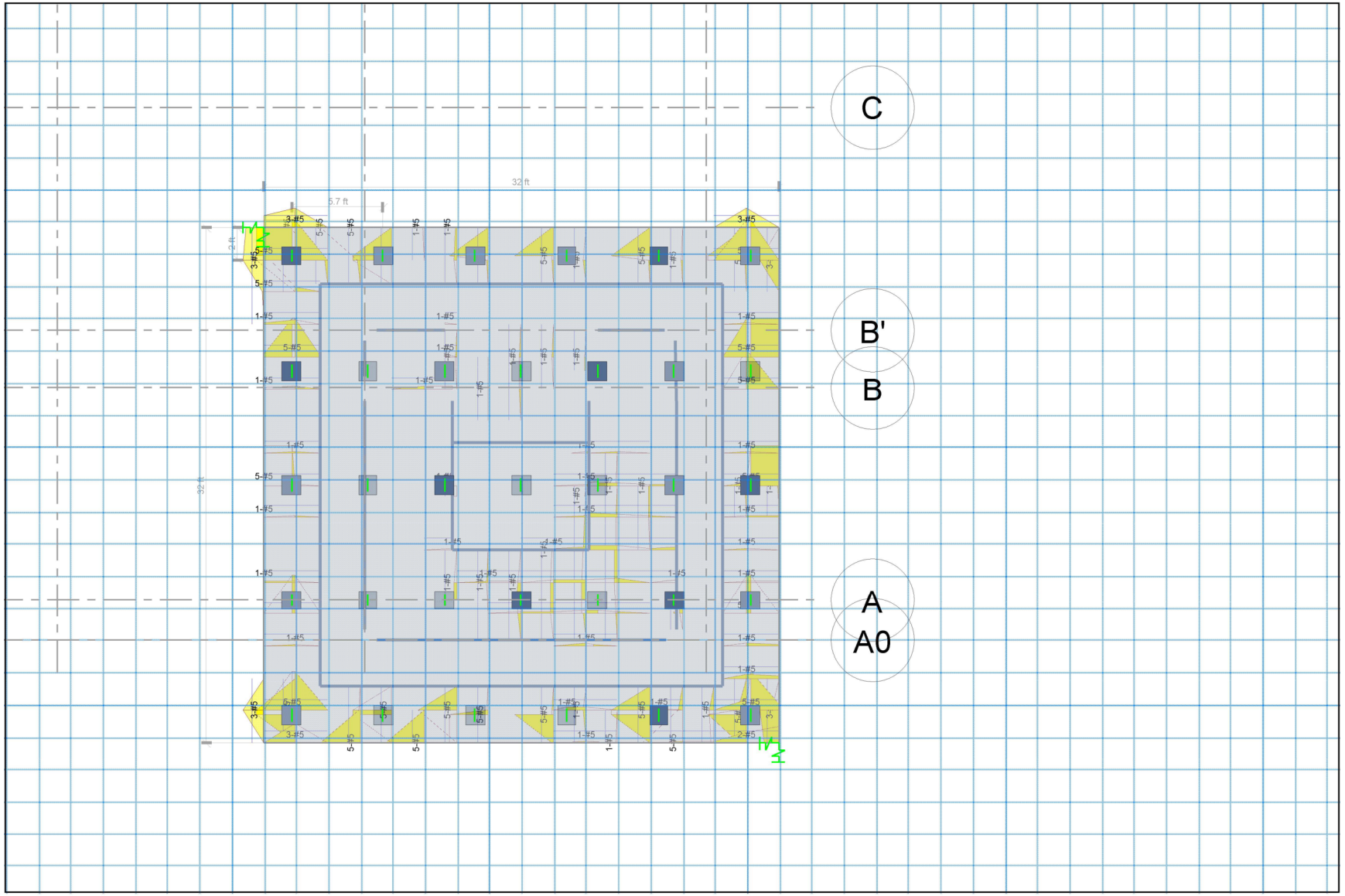
21-0580 Key Colony



SAFE 2016 16.0.1 Plan View kip - ft


C
B'
B
A
A0
174
Fz = 63.957
363
Fz = 69.159
365
Fz = 71.669
383
Fz = 71.159
385
Fz = 66.644
177
Fz = 59.056
207
Fz = 70.776
213
Fz = 75.858
217
Fz = 77.693
211
Fz = 77.154
215
Fz = 75.183
219
Fz = 70.79
209
Fz = 64.082
221
Fz = 70.277
227
Fz = 74.643
231
Fz = 77.213
225
Fz = 77.178
229
Fz = 74.76
233
Fz = 70.379
223
Fz = 64.485
235
Fz = 64.085
241
Fz = 68.682
245
Fz = 70.945
239
Fz = 71.323
243
Fz = 69.854
247
Fz = 66.287
237
Fz = 60.441
181
Fz = 53.706
387
Fz = 58.816
389
Fz = 61.244
391
Fz = 60.77
393
Fz = 57.362
183
Fz = 51.348


C
B'
B
A
A0
32 ft
5.7 ft
32 ft
3-#5
1-#5
2-#5
4-#5


C
B'
B
A
A0
32 ft
5.7 ft
32 ft

Air System Sizing Summary for AHU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**AHU-1-1**		Number of zones	**4**	
Equipment Class	**CW AHU**		Floor Area	**3549.0**	ft²
Air System Type	**VAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Peak zone sensible load**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**16.0**	Tons	Load occurs at	**Jun 1500**	
Total coil load	**192.5**	MBH	OA DB / WB	**89.0 / 79.0**	°F
Sensible coil load	**112.5**	MBH	Entering DB / WB	**79.3 / 68.4**	°F
Coil CFM at Jun 1500	**3972**	CFM	Leaving DB / WB	**53.0 / 52.2**	°F
Max block CFM at Jun 1500	**4096**	CFM	Coil ADP	**50.1**	°F
Sum of peak zone CFM	**4240**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.584**		Resulting RH	**54**	%
CFM/Ton	**247.5**		Design supply temp.	**53.0**	°F
ft²/Ton	**221.2**		Zone T-stat Check	**3 of 4**	OK
BTU/(hr·ft²)	**54.3**		Max zone temperature deviation	**0.6**	°F
Water flow @ 10.0 °F rise	**38.53**	gpm			

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Jun 1500	**4096**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**4093**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.15**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**927**	CFM	CFM/person	**9.87**	CFM/person
CFM/ft²	**0.26**	CFM/ft²			

Zone Sizing Summary for AHU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **AHU-1-1**
Equipment Class ..... **CW AHU**
Air System Type ..... **VAV**

Number of zones **4**
Floor Area ..... **3549.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
VAV-1-1-1	1590	376	1.11	17.0	1.71	0.0	0.00	0
VAV-1-1-2	1780	376	1.25	17.0	1.71	0.0	0.00	0
VAV-1-1-3	679	122	2.15	5.5	0.55	0.0	0.00	0
Zone 16	191	53	0.51	2.4	0.24	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
VAV-1-1-1	37.8	Oct 1500	4.0	1430.0
VAV-1-1-2	42.3	Jun 1500	6.5	1430.0
VAV-1-1-3	16.1	Jul 1400	1.7	315.0
Zone 16	4.5	Jul 1500	0.3	374.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
VAV-1-1-1							
101-S Comm. Center	1	37.8	Oct 1500	1590	4.0	1430.0	1.11
VAV-1-1-2							
101-N Comm. Center	1	42.3	Jun 1500	1780	6.5	1430.0	1.25
VAV-1-1-3							
104 Warming Kitchen	1	13.1	Jul 1000	551	0.8	185.0	2.98
103 Supply Rm.	1	2.7	Jul 1400	114	0.7	103.0	1.11
106 Janitor	1	0.3	Aug 1500	15	0.1	27.0	0.54
Zone 16							
109 Vestibule	1	0.3	Jan 1500	11	0.0	42.0	0.27
110 Mech. Rm. 1st Flr	1	2.4	Jul 1500	100	0.3	40.0	2.49
108 Women;s R.R	1	1.0	Jan 1500	41	0.0	149.0	0.27
113 Men's R.R	1	0.9	Jan 1500	39	0.0	143.0	0.27

Ventilation Sizing Summary for AHU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **ASHRAE Std 62.1-2013**
Design Condition ..... **Minimum flow (heating)**
Occupant Diversity (D) **1.000**
Uncorrected Outdoor Air Intake (Vou) ..... **742** CFM
System Ventilation Efficiency (Ev) **0.800**
Outdoor Air Intake (Vot) ..... **927** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Minimum Supply Air (CFM) (Vpz)	Space Floor Area (ft^2) (Az)	Area Outdoor Air Rate (CFM/ft^2) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
VAV-1-1-1										
101-S Comm. Center	1	376	1430.0	0.06	43.0	5.00	0.8	**376**	*301*	0.800
VAV-1-1-2										
101-N Comm. Center	1	376	1430.0	0.06	43.0	5.00	0.8	**376**	*301*	0.800
VAV-1-1-3										
104 Warming Kitchen	1	65	185.0	0.12	4.0	7.50	0.8	**65**	*52*	0.800
103 Supply Rm.	1	53	103.0	0.12	4.0	7.50	0.8	**53**	*42*	0.800
106 Janitor	1	4	27.0	0.12	0.0	5.00	0.8	**4**	*3*	0.800
Zone 16										
109 Vestibule	1	6	42.0	0.12	0.0	5.00	0.8	**6**	*5*	0.800
110 Mech. Rm. 1st Flr	1	3	40.0	0.06	0.0	5.00	0.8	**3**	*2*	0.800
108 Women;s R.R	1	22	149.0	0.12	0.0	5.00	0.8	**22**	*18*	0.800
113 Men's R.R	1	21	143.0	0.12	0.0	5.00	0.8	**21**	*17*	0.800
Totals (incl. Space Multipliers)		**927**							**742**	**0.800**

Air System Design Load Summary for AHU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 1500 COOLING OA DB / WB 89.0 °F / 79.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	32 ft²	1347	-	32 ft²	-	-
Wall Transmission	1011 ft²	2988	-	1011 ft²	2346	-
Roof Transmission	3188 ft²	10475	-	3188 ft²	3100	-
Window Transmission	32 ft²	236	-	32 ft²	282	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	792 ft²	26077	-	792 ft²	5983	-
Floor Transmission	632 ft²	0	-	632 ft²	734	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	3904 W	11542	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	6699 W	21493	-	0	0	-
People	94	23096	42770	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**97253**	**42770**	**-**	**12446**	**0**
Zone Conditioning	-	100295	42770	-	11580	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	3972 CFM	0	-	927 CFM	0	-
Ventilation Load	899 CFM	12227	37248	210 CFM	3175	0
Supply Fan Load	3972 CFM	0	-	927 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**112523**	**80018**	**-**	**14755**	**0**
Central Cooling Coil	-	112523	80021	-	-12852	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	27608	-
>> Total Conditioning	**-**	**112523**	**80021**	**-**	**14755**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**AHU-1-2**		Number of zones	**4**	
Equipment Class	**CW AHU**		Floor Area	**981.0**	ft²
Air System Type	**VAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**		Zone CFM Sizing	**Peak zone sensible load**	
Sizing Data	**Calculated**		Space CFM Sizing	**Individual peak space loads**	

Central Cooling Coil Sizing Data

Total coil load	**3.1**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**37.1**	MBH	OA DB / WB	**90.0 / 79.0**	°F
Sensible coil load	**23.2**	MBH	Entering DB / WB	**79.5 / 67.4**	°F
Coil CFM at Jul 1500	**796**	CFM	Leaving DB / WB	**52.6 / 51.7**	°F
Max block CFM at Jul 1500	**797**	CFM	Coil ADP	**49.6**	°F
Sum of peak zone CFM	**805**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.625**		Resulting RH	**47**	%
CFM/Ton	**257.5**		Design supply temp.	**53.0**	°F
ft²/Ton	**317.3**		Zone T-stat Check	**3 of 4**	OK
BTU/(hr·ft²)	**37.8**		Max zone temperature deviation	**0.1**	°F
Water flow @ 10.0 °F rise	**7.42**	gpm			

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Jul 1500	**797**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**796**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.81**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**201**	CFM	CFM/person	**11.84**	CFM/person
CFM/ft²	**0.21**	CFM/ft²			

Zone Sizing Summary for AHU-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **AHU-1-2**
Equipment Class ..... **CW AHU**
Air System Type ..... **VAV**

Number of zones **4**
Floor Area ..... **981.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
VAV-1-2-1	272	55	1.20	2.5	0.25	0.0	0.00	0
VAV-1-2-2	325	79	0.84	3.6	0.36	0.0	0.00	0
VAV-1-2-3	127	43	0.44	1.9	0.19	0.0	0.00	0
VAV-1-2-4	65	25	0.79	1.1	0.11	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
VAV-1-2-1	6.5	Jun 1500	0.6	227.0
VAV-1-2-2	7.7	Jul 1400	1.4	386.0
VAV-1-2-3	3.0	Jul 1300	0.3	286.0
VAV-1-2-4	1.5	Jul 1400	0.1	82.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
VAV-1-2-1							
221 Chief of Police	1	2.4	Jul 1300	101	0.1	132.0	0.77
223 Interview Room	1	4.1	Jun 1500	172	0.5	95.0	1.81
VAV-1-2-2							
224 Duty Officers	1	5.5	Jul 1400	231	1.0	300.0	0.77
225 Sargeant	1	2.2	Jul 1500	94	0.5	86.0	1.10
VAV-1-2-3							
226 Women R.R	1	0.8	Jul 1300	35	0.1	80.0	0.44
227 Women Locker	1	0.7	Jul 1300	28	0.1	63.0	0.44
228 Men R.R	1	0.8	Jul 1300	35	0.1	80.0	0.44
229 Men Locker	1	0.7	Jul 1300	28	0.1	63.0	0.44
VAV-1-2-4							
222 Secure Evidence/Weap	1	1.5	Jul 1400	65	0.1	82.0	0.79

Ventilation Sizing Summary for AHU-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **ASHRAE Std 62.1-2013**
Design Condition ..... **Minimum flow (heating)**
Occupant Diversity (D) **1.000**
Uncorrected Outdoor Air Intake (Vou) ..... **161** CFM
System Ventilation Efficiency (Ev) **0.800**
Outdoor Air Intake (Vot) ..... **201** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Minimum Supply Air (CFM) (Vpz)	Space Floor Area (ft^2) (Az)	Area Outdoor Air Rate (CFM/ft^2) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
VAV-1-2-1										
221 Chief of Police	1	29	132.0	0.06	3.0	5.00	0.8	**29**	*23*	0.800
223 Interview Room	1	26	95.0	0.06	3.0	5.00	0.8	**26**	*21*	0.800
VAV-1-2-2										
224 Duty Officers	1	54	300.0	0.06	5.0	5.00	0.8	**54**	*43*	0.800
225 Sargeant	1	25	86.0	0.06	3.0	5.00	0.8	**25**	*20*	0.800
VAV-1-2-3										
226 Women R.R	1	12	80.0	0.12	0.0	5.00	0.8	**12**	*10*	0.800
227 Women Locker	1	9	63.0	0.12	0.0	5.00	0.8	**9**	*8*	0.800
228 Men R.R	1	12	80.0	0.12	0.0	5.00	0.8	**12**	*10*	0.800
229 Men Locker	1	9	63.0	0.12	0.0	5.00	0.8	**9**	*8*	0.800
VAV-1-2-4										
222 Secure Evidence/Weap	1	25	82.0	0.06	3.0	5.00	0.8	**25**	*20*	0.800
Totals (incl. Space Multipliers)		**201**							**161**	**0.800**

Air System Design Load Summary for AHU-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 90.0 °F / 79.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	72 ft²	1903	-	72 ft²	-	-
Wall Transmission	201 ft²	564	-	201 ft²	467	-
Roof Transmission	981 ft²	3282	-	981 ft²	954	-
Window Transmission	72 ft²	573	-	72 ft²	635	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	977 ft²	0	-	977 ft²	365	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1079 W	3190	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1579 W	5067	-	0	0	-
People	17	3965	4590	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**18545**	**4590**	**-**	**2420**	**0**
Zone Conditioning	-	19780	4590	-	2245	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	796 CFM	0	-	205 CFM	0	-
Ventilation Load	201 CFM	3039	9322	201 CFM	2985	0
Supply Fan Load	796 CFM	0	-	205 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	2%	371	-	2%	48	-
>> Total System Loads	**-**	**23191**	**13912**	**-**	**5278**	**0**
Central Cooling Coil	-	23191	13913	-	-455	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	5733	-
>> Total Conditioning	**-**	**23191**	**13913**	**-**	**5278**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**AHU-1-3**		Number of zones	**9**	
Equipment Class	**CW AHU**		Floor Area	**3470.0**	ft²
Air System Type	**VAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**		Zone CFM Sizing	**Peak zone sensible load**	
Sizing Data	**Calculated**		Space CFM Sizing	**Individual peak space loads**	

Central Cooling Coil Sizing Data

Total coil load	**12.0**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**143.6**	MBH	OA DB / WB	**90.0 / 79.0**	°F
Sensible coil load	**92.6**	MBH	Entering DB / WB	**78.9 / 66.7**	°F
Coil CFM at Jul 1500	**3258**	CFM	Leaving DB / WB	**52.6 / 51.6**	°F
Max block CFM at Oct 1400	**3336**	CFM	Coil ADP	**49.6**	°F
Sum of peak zone CFM	**3641**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.645**		Resulting RH	**47**	%
CFM/Ton	**272.3**		Design supply temp.	**53.0**	°F
ft²/Ton	**290.0**		Zone T-stat Check	**8 of 9**	OK
BTU/(hr·ft²)	**41.4**		Max zone temperature deviation	**0.1**	°F
Water flow @ 10.0 °F rise	**28.74**	gpm			

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Oct 1400	**3336**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**3334**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.96**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**701**	CFM	CFM/person	**10.31**	CFM/person
CFM/ft²	**0.20**	CFM/ft²			

Zone Sizing Summary for AHU-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **AHU-1-3**
Equipment Class ..... **CW AHU**
Air System Type ..... **VAV**

Number of zones **9**
Floor Area ..... **3470.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
VAV-1-3-1	580	114	0.84	5.2	0.52	0.0	0.00	0
VAV-1-3-2	411	71	1.47	3.2	0.32	0.0	0.00	0
VAV-1-3-3	353	87	1.38	3.9	0.39	0.0	0.00	0
VAV-1-3-4	254	57	1.03	2.6	0.26	0.0	0.00	0
VAV-1-3-5	740	189	1.72	8.5	0.85	0.0	0.00	0
VAV-1-3-6	315	61	0.43	2.8	0.28	0.0	0.00	0
VAV-1-3-7	387	77	1.08	3.5	0.35	0.0	0.00	0
VAV-1-3-8	252	60	1.16	2.7	0.27	0.0	0.00	0
VAV-1-3-9	276	36	1.10	1.6	0.16	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
VAV-1-3-1	13.8	Jul 1400	2.9	691.0
VAV-1-3-2	9.8	Nov 1400	1.9	280.0
VAV-1-3-3	8.4	Jun 1500	2.3	255.0
VAV-1-3-4	6.0	Jun 1500	1.5	248.0
VAV-1-3-5	17.6	Oct 1500	2.5	430.0
VAV-1-3-6	7.5	Jul 1300	0.7	738.0
VAV-1-3-7	9.2	Nov 1400	1.4	360.0
VAV-1-3-8	6.0	Nov 1400	1.1	217.0
VAV-1-3-9	6.5	Dec 1400	1.0	251.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
VAV-1-3-1							
220 Lobby	1	10.2	Jul 1400	431	1.7	575.0	0.75
230 Corridor B	1	3.5	Jul 1400	149	1.2	116.0	1.29
VAV-1-3-2							
205 Utility Clerk	1	3.0	Jun 1500	128	0.8	110.0	1.17
214 Mech. Rm.	1	5.4	Dec 1400	227	0.8	113.0	2.01
216 Electrical	1	2.5	Jul 1400	106	0.3	57.0	1.86
VAV-1-3-3							
201 Excecutive Asst.	1	4.2	Jun 1500	177	1.4	110.0	1.61
200 City Admin.	1	4.2	Jun 1500	176	1.0	145.0	1.21
VAV-1-3-4							
203 City Clerk	1	3.4	Jun 1500	144	0.8	138.0	1.04
204 Asst. City Clerk	1	2.6	Jun 1400	111	0.7	110.0	1.00
VAV-1-3-5							
West Conference	1	17.6	Oct 1500	740	2.5	430.0	1.72
VAV-1-3-6							
208 Corridor A	1	4.6	Jul 1300	192	0.4	448.0	0.43
210 Secure Storage	1	1.5	Jul 1300	62	0.1	140.0	0.44
211 Plan Storage	1	0.6	Jul 1300	27	0.1	75.0	0.36
208 Copy//File	1	0.8	Jul 1300	33	0.1	75.0	0.44
VAV-1-3-7							
209 Bldg. Department	1	3.5	Jul 1300	146	0.2	230.0	0.63
213 Bldg. Official	1	6.1	Nov 1400	256	1.2	130.0	1.97
VAV-1-3-8							
207 Break Rm.	1	2.8	Aug 1400	118	0.6	117.0	1.01
212 Building Inspect.	1	3.4	Dec 1400	144	0.5	100.0	1.44
VAV-1-3-9							
214 Mech. Rm.	1	5.4	Dec 1400	227	0.8	113.0	2.01
217 Janitor	1	0.3	Jul 1300	13	0.0	30.0	0.43
218 Men's R.R	1	0.6	Jul 1300	23	0.1	54.0	0.43
219 Women's R.R	1	0.6	Jul 1300	23	0.1	54.0	0.43

Ventilation Sizing Summary for AHU-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **ASHRAE Std 62.1-2013**
Design Condition ..... **Minimum flow (heating)**
Occupant Diversity (D) **1.000**
Uncorrected Outdoor Air Intake (Vou) ..... **561** CFM
System Ventilation Efficiency (Ev) **0.800**
Outdoor Air Intake (Vot) ..... **701** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Minimum Supply Air (CFM) (Vpz)	Space Floor Area (ft^2) (Az)	Area Outdoor Air Rate (CFM/ft^2) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
VAV-1-3-1										
220 Lobby	1	106	575.0	0.06	10.0	5.00	0.8	**106**	*85*	0.800
230 Corridor B	1	9	116.0	0.06	0.0	0.00	0.8	**9**	*7*	0.800
VAV-1-3-2										
205 Utility Clerk	1	27	110.0	0.06	3.0	5.00	0.8	**27**	*22*	0.800
214 Mech. Rm.	1	8	113.0	0.06	0.0	5.00	0.8	**8**	*7*	0.800
216 Electrical	1	11	57.0	0.06	1.0	5.00	0.8	**11**	*8*	0.800
VAV-1-3-3										
201 Excecutive Asst.	1	27	110.0	0.06	3.0	5.00	0.8	**27**	*22*	0.800
200 City Admin.	1	42	145.0	0.06	5.0	5.00	0.8	**42**	*34*	0.800
VAV-1-3-4										
203 City Clerk	1	29	138.0	0.06	3.0	5.00	0.8	**29**	*23*	0.800
204 Asst. City Clerk	1	27	110.0	0.06	3.0	5.00	0.8	**27**	*22*	0.800
VAV-1-3-5										
West Conference	1	189	430.0	0.06	25.0	5.00	0.8	**189**	*151*	0.800
VAV-1-3-6										
208 Corridor A	1	34	448.0	0.06	0.0	0.00	0.8	**34**	*27*	0.800
210 Secure Storage	1	11	140.0	0.06	0.0	5.00	0.8	**11**	*8*	0.800
211 Plan Storage	1	11	75.0	0.12	0.0	5.00	0.8	**11**	*9*	0.800
208 Copy//File	1	6	75.0	0.06	0.0	5.00	0.8	**6**	*5*	0.800
VAV-1-3-7										
209 Bldg. Department	1	49	230.0	0.06	5.0	5.00	0.8	**49**	*39*	0.800
213 Bldg. Official	1	29	130.0	0.06	3.0	5.00	0.8	**29**	*23*	0.800
VAV-1-3-8										
207 Break Rm.	1	34	117.0	0.06	4.0	5.00	0.8	**34**	*27*	0.800
212 Building Inspect.	1	26	100.0	0.06	3.0	5.00	0.8	**26**	*21*	0.800
VAV-1-3-9										
214 Mech. Rm.	1	8	113.0	0.06	0.0	5.00	0.8	**8**	*7*	0.800
217 Janitor	1	5	30.0	0.12	0.0	5.00	0.8	**5**	*4*	0.800
218 Men's R.R	1	8	54.0	0.12	0.0	5.00	0.8	**8**	*6*	0.800
219 Women's R.R	1	8	54.0	0.12	0.0	5.00	0.8	**8**	*6*	0.800

Totals (incl. Space Multipliers)		**701**							**561**	**0.800**

Air System Design Load Summary for AHU-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 90.0 °F / 79.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	522 ft²	13277	-	522 ft²	-	-
Wall Transmission	1451 ft²	3989	-	1451 ft²	3369	-
Roof Transmission	3483 ft²	11654	-	3483 ft²	3387	-
Window Transmission	522 ft²	4459	-	522 ft²	4941	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	105 ft²	2955	-	105 ft²	914	-
Floor Transmission	3175 ft²	0	-	3175 ft²	2823	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	3817 W	11285	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	3945 W	12655	-	0	0	-
People	68	15859	18360	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**76132**	**18360**	**-**	**15434**	**0**
Zone Conditioning	-	80365	18360	-	14219	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	3258 CFM	0	-	766 CFM	0	-
Ventilation Load	701 CFM	10713	32644	701 CFM	10217	0
Supply Fan Load	3258 CFM	0	-	766 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	2%	1523	-	2%	309	-
>> Total System Loads	**-**	**92600**	**51004**	**-**	**24744**	**0**
Central Cooling Coil	-	92600	51006	-	-2290	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	27034	-
>> Total Conditioning	**-**	**92600**	**51006**	**-**	**24744**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for AHU-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**AHU-1-4**		Number of zones	**2**	
Equipment Class	**CW AHU**		Floor Area	**1375.0**	ft²
Air System Type	**VAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Peak zone sensible load**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**6.1**	Tons	Load occurs at	**Jun 1500**	
Total coil load	**72.8**	MBH	OA DB / WB	**89.0 / 79.0**	°F
Sensible coil load	**56.4**	MBH	Entering DB / WB	**77.2 / 64.3**	°F
Coil CFM at Jun 1500	**2307**	CFM	Leaving DB / WB	**54.6 / 53.4**	°F
Max block CFM at Jun 1600	**2485**	CFM	Coil ADP	**52.1**	°F
Sum of peak zone CFM	**2485**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.774**		Resulting RH	**46**	%
CFM/Ton	**380.1**		Design supply temp.	**55.0**	°F
ft²/Ton	**226.5**		Zone T-stat Check	**2 of 2**	OK
BTU/(hr·ft²)	**53.0**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**14.58**	gpm			

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM at Jun 1600	**2485**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**2483**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.81**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**228**	CFM	CFM/person	**11.41**	CFM/person
CFM/ft²	**0.17**	CFM/ft²			

Zone Sizing Summary for AHU-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **AHU-1-4**
Equipment Class ..... **CW AHU**
Air System Type ..... **VAV**

Number of zones **2**
Floor Area ..... **1375.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
VAV-1-4-1	1255	242	1.60	10.4	1.05	0.0	0.00	0
VAV-1-4-2	1180	191	2.00	8.2	0.83	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
VAV-1-4-1	27.1	Jun 1600	6.5	785.0
VAV-1-4-2	25.5	Jun 1600	5.2	590.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
VAV-1-4-1							
West BLDG.-west ext	1	27.1	Jun 1600	1255	6.5	785.0	1.60
VAV-1-4-2							
West BLDG.-INTERIOR	1	25.5	Jun 1600	1180	5.2	590.0	2.00

Ventilation Sizing Summary for AHU-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **ASHRAE Std 62.1-2013**
Design Condition ..... **Minimum flow (heating)**
Occupant Diversity (D) **1.000**
Uncorrected Outdoor Air Intake (Vou) ..... **183** CFM
System Ventilation Efficiency (Ev) **0.800**
Outdoor Air Intake (Vot) ..... **228** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Minimum Supply Air (CFM) (Vpz)	Space Floor Area (ft^2) (Az)	Area Outdoor Air Rate (CFM/ft^2) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
VAV-1-4-1										
West BLDG.-west ext	1	121	785.0	0.06	10.0	5.00	0.8	**121**	*97*	0.800
VAV-1-4-2										
West BLDG.-INTERIOR	1	107	590.0	0.06	10.0	5.00	0.8	**107**	*85*	0.800
Totals (incl. Space Multipliers)		**228**							**183**	**0.800**

Air System Design Load Summary for AHU-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 1500 COOLING OA DB / WB 89.0 °F / 79.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	566 ft²	22439	-	566 ft²	-	-
Wall Transmission	1425 ft²	3381	-	1425 ft²	3309	-
Roof Transmission	1375 ft²	4518	-	1375 ft²	1337	-
Window Transmission	566 ft²	4172	-	566 ft²	4992	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	135 ft²	3708	-	135 ft²	860	-
Floor Transmission	1375 ft²	0	-	1375 ft²	1185	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1513 W	4472	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1375 W	4412	-	0	0	-
People	20	4664	5400	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**51765**	**5400**	**-**	**11683**	**0**
Zone Conditioning	-	52118	5400	-	10693	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	2307 CFM	0	-	442 CFM	0	-
Ventilation Load	228 CFM	3219	11065	228 CFM	3291	0
Supply Fan Load	2307 CFM	0	-	442 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	2%	1035	-	2%	234	-
>> Total System Loads	**-**	**56373**	**16465**	**-**	**14218**	**0**
Central Cooling Coil	-	56373	16468	-	-2845	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	17063	-
>> Total Conditioning	**-**	**56373**	**16468**	**-**	**14218**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for DX-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**DX-1-1**		Number of zones	**1**	
Equipment Class	**SPLT AHU**		Floor Area	**50.0**	ft²
Air System Type	**SZCAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Sum of space airflow rates**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**0.2**	Tons	Load occurs at	**Aug 1300**	
Total coil load	**2.9**	MBH	OA DB / WB	**89.1 / 78.8**	°F
Sensible coil load	**2.3**	MBH	Entering DB / WB	**77.3 / 62.9**	°F
Coil CFM at Aug 1300	**86**	CFM	Leaving DB / WB	**52.1 / 50.8**	°F
Max block CFM	**86**	CFM	Coil ADP	**49.3**	°F
Sum of peak zone CFM	**86**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.813**		Resulting RH	**41**	%
CFM/Ton	**358.3**		Design supply temp.	**52.0**	°F
ft²/Ton	**208.6**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**57.5**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**N/A**				

Central Heating Coil Sizing Data

Max coil load	**0.3**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**86**	CFM	BTU/(hr·ft²)	**6.9**	
Max coil CFM	**86**	CFM	Ent. DB / Lvg DB	**68.7 / 72.4**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**86**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**86**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.72**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**8**	CFM	CFM/person	**8.00**	CFM/person
CFM/ft²	**0.16**	CFM/ft²			

Zone Sizing Summary for DX-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **DX-1-1**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **50.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	86	86	1.72	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	2.1	Jul 1400	0.2	50.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
105 Electrical	1	2.1	Jul 1400	86	0.2	50.0	1.72

Ventilation Sizing Summary for DX-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **8** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
105 Electrical	1	50.0	1.0	85.9	5.00	0.06	0.0	0.0	8.0
Totals (incl. Space Multipliers)				**85.9**					**8.0**

Air System Design Load Summary for DX-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1300 COOLING OA DB / WB 89.1 °F / 78.8 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	50 ft²	188	-	50 ft²	49	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	50 ft²	0	-	50 ft²	165	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	55 W	159	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	500 W	1591	-	0	0	-
People	1	187	120	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**2126**	**120**	**-**	**213**	**0**
Zone Conditioning	-	2226	120	-	214	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	86 CFM	0	-	86 CFM	0	-
Ventilation Load	8 CFM	112	418	8 CFM	131	0
Supply Fan Load	86 CFM	0	-	86 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**2338**	**538**	**-**	**345**	**0**
Central Cooling Coil	-	2338	538	-	0	0
Central Heating Coil	-	0	-	-	345	-
>> Total Conditioning	**-**	**2338**	**538**	**-**	**345**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for DX-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**DX-1-2**		Number of zones	**1**	
Equipment Class	**SPLT AHU**		Floor Area	**78.0**	ft²
Air System Type	**SZCAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**		Zone CFM Sizing	**Sum of space airflow rates**	
Sizing Data	**Calculated**		Space CFM Sizing	**Individual peak space loads**	

Central Cooling Coil Sizing Data

Total coil load	**0.4**	Tons	Load occurs at	**Jul 1300**	
Total coil load	**4.4**	MBH	OA DB / WB	**89.1 / 78.8**	°F
Sensible coil load	**3.7**	MBH	Entering DB / WB	**77.0 / 62.6**	°F
Coil CFM at Jul 1300	**136**	CFM	Leaving DB / WB	**52.2 / 50.9**	°F
Max block CFM	**136**	CFM	Coil ADP	**49.4**	°F
Sum of peak zone CFM	**136**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.826**		Resulting RH	**42**	%
CFM/Ton	**369.5**		Design supply temp.	**52.0**	°F
ft²/Ton	**211.7**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**56.7**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**N/A**				

Central Heating Coil Sizing Data

Max coil load	**0.5**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**136**	CFM	BTU/(hr·ft²)	**5.9**	
Max coil CFM	**136**	CFM	Ent. DB / Lvg DB	**69.0 / 72.2**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**136**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**136**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.75**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**10**	CFM	CFM/person	**9.68**	CFM/person
CFM/ft²	**0.12**	CFM/ft²			

Zone Sizing Summary for DX-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **DX-1-2**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **78.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	136	136	1.75	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	3.4	Jul 1400	0.3	78.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
215 IT RM	1	3.4	Jul 1400	136	0.3	78.0	1.75

Ventilation Sizing Summary for DX-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **10** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
215 IT RM	1	78.0	1.0	136.1	5.00	0.06	0.0	0.0	9.7
Totals (incl. Space Multipliers)				**136.1**					**9.7**

Air System Design Load Summary for DX-1-2

Project Name: Key Colony
Prepared by: SGM ENGINEERING

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1300 COOLING OA DB / WB 89.1 °F / 78.8 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	110 ft²	420	-	110 ft²	107	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	64 ft²	0	-	64 ft²	190	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	86 W	249	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	780 W	2482	-	0	0	-
People	1	227	270	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**3379**	**270**	**-**	**297**	**0**
Zone Conditioning	-	3516	270	-	298	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	136 CFM	0	-	136 CFM	0	-
Ventilation Load	10 CFM	136	499	10 CFM	158	0
Supply Fan Load	136 CFM	0	-	136 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**3652**	**769**	**-**	**456**	**0**
Central Cooling Coil	-	3652	770	-	0	0
Central Heating Coil	-	0	-	-	456	-
>> Total Conditioning	**-**	**3652**	**770**	**-**	**456**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for DX-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

Air System Information

Air System Name	**DX-1-3**		Number of zones	**1**	
Equipment Class	**SPLT AHU**		Floor Area	**57.0**	ft²
Air System Type	**SZCAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**		Zone CFM Sizing	**Sum of space airflow rates**	
Sizing Data	**Calculated**		Space CFM Sizing	**Individual peak space loads**	

Central Cooling Coil Sizing Data

Total coil load	**0.3**	Tons	Load occurs at	**Jul 1400**	
Total coil load	**3.4**	MBH	OA DB / WB	**89.8 / 78.9**	°F
Sensible coil load	**2.7**	MBH	Entering DB / WB	**77.3 / 63.2**	°F
Coil CFM at Jul 1400	**101**	CFM	Leaving DB / WB	**52.3 / 51.1**	°F
Max block CFM	**101**	CFM	Coil ADP	**49.5**	°F
Sum of peak zone CFM	**101**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.797**		Resulting RH	**43**	%
CFM/Ton	**354.1**		Design supply temp.	**52.0**	°F
ft²/Ton	**199.5**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**60.2**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**N/A**				

Central Heating Coil Sizing Data

Max coil load	**0.4**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**101**	CFM	BTU/(hr·ft²)	**6.9**	
Max coil CFM	**101**	CFM	Ent. DB / Lvg DB	**68.6 / 72.2**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**101**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**101**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.78**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**8**	CFM	CFM/person	**8.42**	CFM/person
CFM/ft²	**0.15**	CFM/ft²			

Zone Sizing Summary for DX-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **DX-1-3**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **57.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	101	101	1.78	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	2.5	Jul 1400	0.3	57.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
216 Electrical	1	2.5	Jul 1400	101	0.3	57.0	1.78

Ventilation Sizing Summary for DX-1-3

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **8** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft^2)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft^2)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
216 Electrical	1	57.0	1.0	101.2	5.00	0.06	0.0	0.0	8.4
Totals (incl. Space Multipliers)				**101.2**					**8.4**

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1400 COOLING OA DB / WB 89.8 °F / 78.9 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	75 ft²	276	-	75 ft²	73	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	57 ft²	0	-	57 ft²	178	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	63 W	184	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	570 W	1822	-	0	0	-
People	1	230	270	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**2512**	**270**	**-**	**251**	**0**
Zone Conditioning	-	2609	270	-	256	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	101 CFM	0	-	101 CFM	0	-
Ventilation Load	8 CFM	123	426	8 CFM	135	0
Supply Fan Load	101 CFM	0	-	101 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**2732**	**696**	**-**	**391**	**0**
Central Cooling Coil	-	2732	697	-	0	0
Central Heating Coil	-	0	-	-	391	-
>> Total Conditioning	**-**	**2732**	**697**	**-**	**391**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for DX-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**DX-1-4**		Number of zones	**1**	
Equipment Class	**SPLT AHU**		Floor Area	**82.0**	ft²
Air System Type	**SZCAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Sum of space airflow rates**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**0.3**	Tons	Load occurs at	**Jul 1400**	
Total coil load	**3.5**	MBH	OA DB / WB	**89.8 / 78.9**	°F
Sensible coil load	**1.9**	MBH	Entering DB / WB	**80.7 / 70.0**	°F
Coil CFM at Jul 1400	**62**	CFM	Leaving DB / WB	**52.0 / 51.4**	°F
Max block CFM	**62**	CFM	Coil ADP	**48.8**	°F
Sum of peak zone CFM	**62**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.548**		Resulting RH	**55**	%
CFM/Ton	**212.1**		Design supply temp.	**52.0**	°F
ft²/Ton	**279.4**		Zone T-stat Check	**0 of 1**	OK
BTU/(hr·ft²)	**42.9**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**N/A**				

Central Heating Coil Sizing Data

Max coil load	**0.4**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**62**	CFM	BTU/(hr·ft²)	**4.8**	
Max coil CFM	**62**	CFM	Ent. DB / Lvg DB	**65.1 / 71.0**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**62**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**62**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.76**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**20**	CFM	CFM/person	**6.64**	CFM/person
CFM/ft²	**0.24**	CFM/ft²			

Zone Sizing Summary for DX-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **DX-1-4**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **82.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	62	62	0.76	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	1.5	Jul 1400	0.1	82.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
222 Secure Evidence/Weap	1	1.5	Jul 1400	62	0.1	82.0	0.76

Ventilation Sizing Summary for DX-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **20** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
222 Secure Evidence/Weap	1	82.0	3.0	62.3	5.00	0.06	0.0	0.0	19.9
Totals (incl. Space Multipliers)				**62.3**					**19.9**

Air System Design Load Summary for DX-1-4

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1400 COOLING OA DB / WB 89.8 °F / 78.9 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	82 ft²	302	-	82 ft²	80	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	82 ft²	0	-	82 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	90 W	264	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	90 W	288	-	0	0	-
People	3	691	810	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**1545**	**810**	**-**	**80**	**0**
Zone Conditioning	-	1646	810	-	76	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	62 CFM	0	-	62 CFM	0	-
Ventilation Load	20 CFM	285	780	20 CFM	320	0
Supply Fan Load	62 CFM	0	-	62 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**1931**	**1590**	**-**	**396**	**0**
Central Cooling Coil	-	1931	1590	-	0	0
Central Heating Coil	-	0	-	-	396	-
>> Total Conditioning	**-**	**1931**	**1590**	**-**	**396**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for FCU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name	**FCU-1-1**		Number of zones	**1**	
Equipment Class	**CW AHU**		Floor Area	**149.0**	ft²
Air System Type	**SZCAV**		Location	**Key West, Florida**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Sum of space airflow rates**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**0.2**	Tons	Load occurs at	**Jul 1500**	
Total coil load	**2.3**	MBH	OA DB / WB	**90.0 / 79.0**	°F
Sensible coil load	**1.4**	MBH	Entering DB / WB	**82.9 / 69.9**	°F
Coil CFM at Jul 1500	**40**	CFM	Leaving DB / WB	**51.2 / 50.4**	°F
Max block CFM	**40**	CFM	Coil ADP	**47.7**	°F
Sum of peak zone CFM	**40**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.585**		Resulting RH	**38**	%
CFM/Ton	**205.1**		Design supply temp.	**52.0**	°F
ft²/Ton	**772.1**		Zone T-stat Check	**0 of 1**	OK
BTU/(hr·ft²)	**15.5**		Max zone temperature deviation	**1.1**	°F
Water flow @ 10.0 °F rise	**0.46**	gpm			

Central Heating Coil Sizing Data

Max coil load	**0.3**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**40**	CFM	BTU/(hr·ft²)	**1.8**	
Max coil CFM	**40**	CFM	Ent. DB / Lvg DB	**63.2 / 69.7**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**40**	CFM	Fan motor BHP	**0.01**	BHP
Standard CFM	**40**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.27**	CFM/ft²	Fan static	**0.50**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**18**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.12**	CFM/ft²			

Zone Sizing Summary for FCU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

Air System Information

Air System Name **FCU-1-1**
Equipment Class ..... **CW AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **149.0** ft²
Location ..... **Key West, Florida**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	39	39	0.26	0.0	-	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	1.0	Jan 1500	0.0	149.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
108 Women;s R.R	1	1.0	Jan 1500	39	0.0	149.0	0.26

Ventilation Sizing Summary for FCU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

1. Summary

Ventilation Sizing Method ..... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate ..... **18** CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (ft^2)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft^2)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
108 Women;s R.R	1	149.0	0.0	38.8	5.00	0.12	0.0	0.0	17.9
Totals (incl. Space Multipliers)				**38.8**					**17.9**

Air System Design Load Summary for FCU-1-1

Project Name: Key Colony
Prepared by: SGM ENGINEERING

07/23/2021
11:02AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 90.0 °F / 79.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 55.0 °F / 46.1 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	149 ft²	0	-	149 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	164 W	485	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	149 W	478	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**963**	**0**	**-**	**0**	**0**
Zone Conditioning	-	1070	0	-	0	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	40 CFM	0	-	40 CFM	0	-
Ventilation Load	18 CFM	250	962	18 CFM	289	0
Supply Fan Load	40 CFM	15	-	40 CFM	-15	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	2%	19	-	2%	0	-
>> Total System Loads	**-**	**1354**	**962**	**-**	**275**	**0**
Central Cooling Coil	-	1354	962	-	0	0
Central Heating Coil	-	0	-	-	275	-
>> Total Conditioning	**-**	**1354**	**962**	**-**	**275**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

SPECIFICATIONS
TABLE OF CONTENTS

DIVISION 1 GENERAL REQUIREMENTS

DIVISION 2 SITEWORK

DIVISION 16 ELECTRICAL

END OF TABLE OF CONTENTS

01110 SUMMARY OF WORK/CONTRACTOR CONDUCT ON SITE

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Work covers demolition of existing City Hall, preparation and construction new building and associated site requirements for:

1. New City of Key Colony Beach City Hall; *600 W Ocean Drive, Key Colony Beach, FL, 333051*

B. General Conditions of the Contract cover additional requirements of all Parties to the Contract.

1.2 WORK SEQUENCE

A. Coordinate, sequence, and stage new work in accordance with approved Construction Schedules and safety plan.

B. Coordinate access, parking, and egress of all Contractor Personnel prior to commencing construction.

C. Construct Work in stages to provide for public and City's safety at all times including coordination with the local Fire Department for approval of ingress/egress with construction fencing.

D. Working Hours shall be in accordance with the applicable City Ordinances and/or in compliance with the City's directions.

1.3 CONTRACTOR USE OF PREMISES

A. Confine operations at site to areas permitted by Law, Ordinances, Permits, and Contract Documents.

B. Do not encumber site with materials or equipment.

1.4 SITE RESTRICTIONS AND REQUIREMENTS

A. All Contractors, Subcontractors, and other construction employees shall wear identifying clothing with trade or company name.

B. Report all construction site accidents to City of Key Colony Beach City Manager the same day they occur.
1. Provide copies of accident reports and police reports to the City Manager the day they occur.

C. All Contractors, Subcontractors, and other construction employees shall park their vehicles in the designated construction site staging area, as designated by the City.

D. No firearms or other weapons allowed on the site.

E. NO Smoking or tobacco use allowed on this project.

F. No alcohol or drugs allowed on any City of Key Colony Beach property by order of City of Key Colony Beach policy.

1.5 DAILY LOG

A. The Contractor shall maintain a daily log of the construction progress and include the number of workers on site, general activity, inspections performed, visitors, construction site equipment utilized, weather, and other pertinent data. All items shall be summarized each day.

B. Provide one copy to the City Manager daily.

1.6 ITEMS NOT IN CONTRACT

A. Items under this contract include all work indicated on the contract documents, unless specifically noted as "Not in Contract" (N.I.C.).

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01260 CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals

B. Documentation of change in Contract Sum and Contract Time

C. Change procedures

D. Construction Change Directive

E. Stipulated Sum change order

F. Execution of change orders

G. Correlation of Contractor submittals

1.2 SUBMITTALS

A. Submit the name of the individual authorized to receive change documents and who is responsible for informing others in Contractor's employ or Subcontractors of changes to the work.

B. Change Order Forms: Use AIA standard forms.

1.3 CHANGE PROCEDURES

A. The Architect shall advise of minor changes in the work not involving an adjustment to Contract Sum or Contract Time as authorized by issuing supplemental instructions on AIA Form G710 Architect's Supplemental Instructions (ASI).

B. The Architect may issue a Proposal Request detailing the description of a proposed change along with additional or revised drawings/specifications, and with a change in contract time to execute the change with a stipulation of required overtime work and the period the price is valid.

1. Contractor will prepare and submit an estimate within ten working days.

1.4 CONSTRUCTION CHANGE DIRECTIVE

A. Architect may issue a document, signed by the City, instructing the Contractor to proceed with a change in the work, for subsequent inclusion in a change order.

B. The document will describe changes in the work and will designate method of determining any change in Contract Sum or Contract Time.

C. Promptly execute the change in work.

D. At a predetermined time or at the completion of the work, proceed as shown in Item 1.6, below.

1.5 STIPULATED SUM CHANGE ORDER

A. Based on Proposal Request and Contractor's price quotation

1.6 EXECUTION OF CHANGE ORDERS

A. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract, within 15 business days.

1.7 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub schedules to adjust time for other items of work affected by the change and resubmit.

C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01297 PROCEDURES FOR PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Procedures for preparation and submittal of Applications for Payment

1.2 FORMAT

A. AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheets, contractor's electronic media driven form including continuation sheets as approved by City.

1.3 PREPARATION OF APPLICATIONS

A. Present required information on electronic media printout as approved by City.

B. Execute certification by signature of authorized officer.

C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

D. List each authorized Change Order as an extension on AIA G703 - Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.

1.4 SUBMITTAL PROCEDURES

A. Payment period: Submit payment requests no more than once a month.

B. Electronically submit a draft copy (pencil copy) of each Application for Payment to the A/E and other parties as directed by the City.

C. Upon review of the application the City will return the draft copy to the Contractor “Approved” or “Approved as Noted” within five business days.

D. The Contractor shall revise the application, if necessary, and submit the final copies to the Architect, the City, and other parties as directed by the City on the scheduled application date as stipulated by the Agreement.

E. Submit substantiating data, if requested, with the approved or corrected application.

F. Submit an updated construction schedule with each Application for Payment.

G. Submit Contractor’s Release of Liens waivers.

H. Submit Subcontractor and Vendor Partial Release of Lien waivers if requested.

I. Submit Subcontractor and Vendor Final Release of Lien waivers when the line item shown on the Schedule of Values is billed to 100%.

1.5 SUBSTANTIATING DATA

A. When Architect or City requires substantiating information, submit all necessary data justifying the dollar amounts.

B. A meeting at the construction site with the Contractor, Architect, and City will occur to confirm progress of the Work submitted for payment by the Contractor.

C. Include the following with the application.

1. Affidavits attesting to off-site stored products in bonded warehouses.

2. Construction progress schedules revised and correct as specified.

1.6 Retainage

A. A cumulative amount of 10% will be withheld by the City as retainage.

B. When the project billing reaches the 50% level, as shown on the Schedule of Values, retainage may be reduced to 5% on all remaining Applications for Payment.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01310 PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Coordination and project conditions

B. Field engineering

C. Preconstruction meeting

D. Site mobilization meeting

E. Progress meetings

F. Pre-installation meetings

G. Alteration project procedures

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate the scheduling, submittals, and Work to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility company requirements and characteristics of operating equipment are compatible with building utilities.

1. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work as indicated diagrammatically on Drawings.

1. Require coordination drawings from each trade identifying routing of work, openings required in or under structure and possible conflicts.

2. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building.

3. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction.

1. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for City's partial occupancy.

F. After City occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of City's activities.

G. City will not consider change orders for extra work required by the Contractor due to poor coordination by the Contractor.

H. Coordinate scheduling of Contractor Startups, submission of Operations & Maintenance Manuals, Commissioning System Readiness Checklists, Functional Performance Testing, City's Training, and Demonstration with the Commissioning Authority.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Florida and acceptable to the Architect and City.

B. Contractor shall locate and protect survey control and reference points.

C. Control datum for survey is that established by City provided survey.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide field-engineering services.

1. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a copy of site drawing and certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

1.4 PRECONSTRUCTION MEETING

A. City will schedule a conference after Notice to Proceed.

B. Attendance required by the City, Architect, and Contractor.

C. Agenda:

1. Execution of City-Contractor Agreement, if not executed

2. Submission of executed bonds and insurance certificates

3. Distribution of Contract Documents

4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule

5. Designation of personnel representing the parties in Contract, and the Architect

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures

7. Scheduling

8. Scheduling activities of a Geotechnical Engineer

1.5 PROGRESS MEETINGS

A. Architect shall schedule and administer meetings throughout progress of the work at maximum monthly intervals.

1. Arrange for meetings, prepare agenda with copies for participants, and preside at meetings.

B. Attendance Required Job superintendent, major Subcontractors and suppliers if requested, City, Architect, as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings

2. Review of Work progress

3. Field observations, problems, and decisions

4. Identification of problems that impede planned progress

5. Review of submittals schedule and status of submittals

6. Review of off-site fabrication and delivery schedules

7. Maintenance of progress schedule

8. Review updates to As-Built drawings per work accomplished.

9. Corrective measures to regain projected schedules

10. Planned progress during succeeding work period

11. Coordination of projected progress

12. Maintenance of quality and work standards

13. Effect of proposed changes on progress schedule and coordination

14. Other business relating to work

D. Architect and City to record minutes and distribute copies within five business days after meeting to City, participants, and those affected by decisions made.

1.6 PREINSTALLATION MEETING

A. When required in individual specification section, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify City, Commissioning Authority, and Architect five working days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.

2. Review coordination with related work.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

01321 CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. References

B. Quality Assurance

C. Format

D. Schedules

E. Submittals

F. Review and evaluation

G. Updating schedules

H. Distribution

1.2 REFERENCES

A. The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry, Washington, D.C., The Associated General Contractors of America (AGC), Latest edition.

1.3 QUALITY ASSURANCE

A. Scheduler:

1. Contractor's personnel specializing in CPM scheduling with minimum of 5-years of experience in scheduling construction work of a complexity comparable to this Project.

B. Contractor Administrative Personnel: 5-years minimum experience in using and monitoring CPM schedules on comparable projects.

1.4 FORMAT

A. Listings, reading from left to right, in ascending order for each activity.

1. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: 24" high x width required.

C. Scale and Spacing, allowing for notations and revisions

1.5 SCHEDULES

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method, under concepts and methods outlined in AGC's "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

B. Illustrate order and interdependence of activities and sequence of work.

1. How the start of a given activity depends upon completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Illustrate complete sequence of construction by activity, identifying work of separate stages.

1. Provide dates for delivery and return of submittals including those for City furnished items.

2. Provide dates for procurement and delivery of critical products; and dates for installation and provision for testing.

3. Provide allowances for review, correction and re-review by architect, engineer, Commissioning Authority and Building Department as applicable.

4. Provide legend for symbols and abbreviations used.

5. Provide for delivery of a separate report reflecting only shop drawing/product submittals. Include with each analysis submittal.

D. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identifying for each activity:

1. Preceding and following event numbers

2. Activity description

3. Estimated duration of activity, in maximum 15-day intervals

4. Earliest start date

5. Earliest finish date

6. Actual start date

7. Actual finish date

8. Latest start date

9. Latest finish date

10. Total and free float; float time shall accrue to the contractor and to the contractor’s benefit.

11. Monetary value of activity, keyed to Schedule of Values.

12. Percentage of activity completed.

13. Responsibility

E. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, of accepting revised completion dates, and recompilation of all dates and floats.

F. Required Sorts: List activities in sorts or groups:

1. By preceding work item or event number from lowest to highest

2. By amount of float, then in order of early start

3. By responsibility in order of earliest possible start date

4. In order of latest allowable start dates

5. In order of latest allowable finish dates

6. Contractor's periodic payment request sorted by Schedule of Values listings.

7. Listing of basic input data that generates the report

8. Listing of activities on the critical path

9. Provide sub schedules for each state of Work identified in Section 01110.

10. Coordinate contents with Schedule of Values in Section 01330.

1.6 SUBMITTALS FOR REVIEW

A. Within 10 days after date in Notice to Proceed, submit proposed preliminary network diagram defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. Participate in review of preliminary and complete network diagrams jointly with Architect.

C. Within 20 days after joint review of proposed preliminary network diagram, submit draft of proposed complete network diagram for review.

1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete network analysis consisting of network diagrams and mathematical analysis.

E. Submit updated network schedules with each Application for Payment.

F. Submit under transmittal in form of a letter as specified in Section 01330.

1.7 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of network diagrams and analysis with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

1.8 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

1. Update diagrams graphically depicting the status of work.

C. Identify activities modified since previous submittal, major changes in work, and other identifiable changes.

D. Indicate changes required to maintain Date of Substantial Completion.

E. Submit sorts required to support recommended changes.

F. Provide narrative report to define problem areas, anticipated delays, and affect the schedule. Report corrective action taken or proposed and its effect

1.9 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's project site file, to Subcontractors, Suppliers, Architect, the City of Key Colony Beach, Commissioning Authority, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 PRODUCTS

2.1 Not used.

PART 3 EXECUTION

3.1 Not used.

END OF SECTION

01330 SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures

B. Proposed products list

C. Product data

D. Shop drawings

E. Samples

F. Design data

G. Test reports

H. Certificates

I. Manufacturer's instructions

J. Manufacturer's field reports

K. Erection drawings

1.2 REFERENCES

A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry"

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal electronically with Architect accepted form.

B. Sequentially number the transmittal forms.

1. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify project, Contractor, Subcontractor or supplier pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information are in accordance with the requirements of the work and contract documents.

E. Schedule submittals to expedite the project and deliver to Architect and Construction Manager at business email address.

1. Coordinate submission of related items.

F. For each submittal for review, allow at least 7 working days excluding delivery time to and from the Contractor.

G. Identify variations from contract documents and product or system limitations, which may be detrimental to successful performance of the completed work.

H. Provide space for Contractor and Architect review stamps.

I. When submittals are stamped “APPROVED” or “APPROVED AS NOTED”, the Contractor shall proceed according to comments on the submittal. No resubmission is required.

J. When submittals are stamped “REVISE AND RESUBMIT”, the Contractor shall address all comments shown on the submittal, then re-submit a revised submittal for re-evaluation.

K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

1.4 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data for Review:

1. Submit electronically to Architect for review and checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute per the Submittal Procedures article above and for record documents purposes described in Section 01770 - Contract Closeout.

B. Product Data for Information:

1. Submitted for the Architect's knowledge as contract administrator or for the City

C. Product Data for Project Close-out:

1. Submitted for the City's benefit during and after project completion

D. Mark each submittal to identify applicable products, models, options, and other data.

1. Supplement manufacturers' standard data to provide information unique to this project.

E. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

F. After review, distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01 77 00 - Contract Closeout.

1.6 SHOP DRAWINGS

A. Shop Drawings for Review:

1. Submit electronically (PDF format) to Architect for review and checking for conformance with information given and the design concept expressed in the contract documents.

2. Submit electronically to the Building Department after Architect/Engineer approval those items identified in Shop Drawing Requirements and Product Approvals #BD-005 per the outlined procedures.

a. All shop drawings submitted to the Building Department must clearly show the Contractor’s and Architect and/or Engineer’s review stamps and review comments.

3. After review, produce copies and distribute per the Submittal Procedures article above and for record documents purposes described in Section 01770 - Contract Closeout.

4. A/E will not review submittals for items that are considered “means and methods of construction” or intended for temporary, including but not limited to temporary power, shoring, temporary a/c or any other item not specifically included in the drawings or specifications.

5. A/E is under no obligation to provide contractors or their subcontractors with AUTOCAD files for the purpose of preparing shop drawings without compensation. Failure to provide such shop drawings will not constitute a claim for delays on the construction schedule.

B. Shop Drawings for Information:

1. Submitted for the Architect's knowledge as contract administrator or for the City

C. Shop Drawings for Project Close-out:

1. Submitted for the City's benefit during and after project completion

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.7 SAMPLES

A. Samples For Review:

1. Submitted to Architect for review and checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide duplicates and distribute per the Submittal Procedures article above and for record documents purposes described in Section 01770 - Contract Closeout.

B. Samples For Information:

1. Submitted for the Architect's knowledge as contract administrator or for the City

C. Samples For Selection:

1. Submitted to Architect for aesthetic, color, or finish selection.

2. Submit samples of finishes from the full range of manufactures' standard colors, textures, and patterns for Architect selection.

3. After review, provide duplicates and distribute per the Submittal Procedures article above and for record documents purposes described in Section 01770- Contract Closeout.

4. Architect will not accept pdf submittals of color samples.

D. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices.

1. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full project information.

F. Submit the number of samples requested in the specification, one of which the Architect shall retain.

G. Reviewed samples, used in the project for compliance with the specifications.

H. Do not use samples for testing purposes unless specifically stated in the specification.

1.8 DESIGN DATA

A. Submit for the Architect's knowledge as contract administrator or for the City.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.9 TEST REPORTS

A. Submit for the Architect's knowledge as contract administrator or for the City.

B. Submit test reports for information for the purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 CERTIFICATES

A. When specified in specification, submit certification by the manufacturer, installation/application subcontractor, or the contractor to Architect, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements.

1. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect.

1.11 MANUFACTURE'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, and installation, start-up, adjusting, and finishing, to Architect for delivery to City in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Refer to Section 01400 - Quality Control, Manufacturer's Field Services article.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect's benefit as contract administrator or for the City.

B. Submit report within 30 days of observation to Architect for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for the Architect's benefit as contract administrator or for the City.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Data indicating inappropriate or unacceptable work is subject to action by the Architect or City.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01400 QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Quality assurance - control of installation

B. Tolerances

C. References and standards

D. Mock-up

E. Inspecting and testing laboratory services

F. Manufacturers' field services

1.2 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. If manufacturers' instructions conflict with contract documents, request clarification from Architect before proceeding, and document instructions or directions that may invalidate a warranty.

D. Comply with specified standards as a minimum quality for the work.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

H. Contractor shall schedule work to prevent absorbent materials installation and/or concealment of areas until, the building is dried-in, the installation of permanent doors and windows to prevent development of mold, entrapment of mold, moisture inside concealed spaces, or moisture absorption into interior materials.

I. In buildings deemed “dried-in” by the Contractor, the Architect/City of Key Colony Beach may require testing of building areas they suspect may have water damage/mold. If testing indicates water damage or mold growth, Contractor shall remove effected area and replace with new clean material at no additional cost to the City of Key Colony Beach. If no damage/mold is discovered, cost of testing to be paid by the City of Key Colony Beach.

1.3 TOLERANCES:

A. Monitor fabrication and installation tolerance control of products to produce acceptable work; do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES AND STANDARDS:

A. Workmanship shall comply with requirements of the standards specified by an association, trade, or other consensus standards of the specified products, except when applicable code requirements are more stringent.

B. Use current reference standard(s) based on the date of contract documents, except where a code establishes a specific date.

C. Obtain copies of standards where required by product specification sections.

D. The contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Architect shall be altered from the contract documents by mention or inference in any referenced document.

1.5 MOCK-UP:

A. Perform all tests identified in this section and in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining work.

D. Where Architect accepts the mock-up and product specification sections specify removal, remove mock-up and clear area when directed.

E. When feasible, an area of permanent construction may be used as a mock-up.

1.6 TESTING SERVICES:

A. City of Key Colony Beach will appoint and pay for specified services of an independent firm to perform testing.

B. The independent firm will perform tests and other specified services as outlined in individual specification sections and as required by the City of Key Colony Beach.

C. Testing and source quality control may occur on or off the project site.

1. Perform off-site testing as required by the Architect or the City of Key Colony Beach.

D. The independent firm shall submit reports to the City of Key Colony Beach and Architect and Contractor, indicating observations and results of tests and compliance or non-compliance with contract documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify City of Key Colony Beach, Architect and independent firm a minimum of 2-business days prior to expected time for operations requiring services.

2. Make necessary arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing does not relieve Contractor to perform work to contract requirements.

G. The Architect may direct the same independent firm to re-test because of non-conformance to specified requirements.

1. Contractor shall pay for re-testing cost by deducting testing charges from the Contract Price.

1.7 INSPECTION SERVICES:

A. City of Key Colony Beach will appoint, employ, and pay for specified services of an independent firm to perform inspection.

B. The independent firm will perform inspections and other services specified in individual specification sections and as required by the City of Key Colony Beach.

C. Inspecting may occur on or off the project site.

1. Perform off-site inspecting as required by the Architect or the City of Key Colony Beach.

D. The independent firm to the City of Key Colony Beach and Architect and Contractor, indicating inspection observations and indicating compliance or non-compliance with contract documents, will submit reports.

E. Cooperate with independent firm; furnish safe access and assistance for incidental labor as requested.

1. Notify City of Key Colony Beach, Architect, and independent firm a minimum of 2-business days prior to expected time for operations requiring services.

F. Inspecting does not relieve Contractor to perform work to contract requirements.

1.8 MANUFACTURERS' FIELD SERVICES:

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to the Architect 30 days in advance of required observations; the observer is subject to City of Key Colony Beach's approval.

C. Report all observations, site decisions, and instructions given to the applicators or the installers that are supplemental or contrary to the manufacturers' written instructions.

D. Refer to Section 01330 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work, beginning new work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION:

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

01410 REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provision of Contract, including General and Supplementary Conditions apply to work in this section.

1.2 CODE REQUIREMENTS

A. Perform all work on this Project in strict accordance with, but not limited to, applicable requirements and portions of the latest editions of the currently adopted codes, revisions, amendments, and their references.

1. Florida Building Code:

a. Florida Building Code – Building

b. Florida Building Code – Fuel Gas

c. Florida Building Code – Mechanical

d. Florida Building Code – Plumbing

e. Florida Building Code – Accessibility

f. Florida Building Code – Energy Conservation

g. National Electrical Code – FBC Chapter 27

h. FBC Referenced Codes and Standards -- Chapter 35

2. Florida Fire Prevention Code, Ch. 69A-60, Florida Administrative Code, which includes:

a. NFPA 1

b. Referenced Mandatory Codes and Standards listed in 69A-60.005, FAC

c. Referenced Mandatory Codes and Standards listed in NFPA 101

3. American Society of Civil Engineers - Minimum Design Loads for Buildings and Other Structures - ASCE 7

4. State Fire Marshal's rule 69A-58 FAC

5. The Occupational Safety and Health Administration rules and regulations.

1.3 CODE STANDARDS

A. All work shall conform to applicable portions of the adopted, or the latest edition of the standards listed, which shall include, but is not limited to, the following:

1. Aluminum Association (AA)
2. American Concrete Institute (ACI)
3. American Institute of Steel Construction (AISC)
4. American National Standards Institute (ANSI)
5. American Society for Testing and Materials (ASTM)
6. American Society of Mechanical Engineers (ASME)
7. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
8. American Welding Society (AWS)
9. Architectural Woodworking Institute (AWI)
10. Architectural Aluminum Manufacturer's Association (AAMA)
11. Commercial Standards (CS)
12. Federal Specifications and Standards (FSS)
13. National Occupations Safety and Health Administration (OSHA)
14. National Institute for Standards and Technology (NIST)
15. Architectural Sheet Metal Manual (SMACNA)
16. Underwriters Laboratories (UL)
17. U.S. of America Standards Institute (ASI)
18. U.S. Department of Commerce Product Standards (USDCPS)

1.4 CODE DISCREPANCIES

A. In case of discrepancy between the codes, standards, and specifications listed, the code shall govern.

B. In case of a discrepancy between the drawings and specifications, the specifications shall govern.

1.5 COMPLIANCE WITH CODES

A. A permit issued by Building Department will be construed as permission to proceed with construction, and not as authority to violate, cancel, alter, or set aside any of the provisions of any Codes.

B. Permit issuance shall not prevent the Building Official from thereafter requiring a correction of errors in plans, construction, or violations of any Codes.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

01450 TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selection and payment

B. Quality Assurance

C. Laboratory reports

D. Limits on testing laboratory authority

E. Contractor responsibilities

1.2 REFERENCES

A. ASTM D3740 – Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.3 SELECTION AND PAYMENT

A. City will employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.4 QUALITY ASSURANCE

A. Laboratory, authorized to operate in state of Florida.

B. Laboratory maintains a full-time registered Engineer on staff to review services.

C. Testing Equipment, calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards (NBS) Standards or accepted values of natural physical constants.

1.5 LABORATORY REPORTS

A. After each inspection and test, submit the laboratory report electronically to City, Architect, and Contractor.

B. Include:

1. Date issued
2. Project title and number
3. Name of inspector
4. Date and time of sampling or inspection
5. Identification of product
6. Location in the Project
7. Type of inspection or test
8. Date of test
9. Results of tests
10. Pass/fail criteria used to evaluate tests

C. When requested by Architect, provide interpretation of test results.

1.6 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop the Work.

1.7 CONTRACTOR RESPONSIBILITIES

A. Make adequate samples of materials requiring testing available on-site, along with proposed mix designs.

B. Cooperate with laboratory personnel and provide access to the Work and to manufacturer's facilities.

C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain, and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

D. Notify City and laboratory a minimum of 24 hours prior to expected time for operations requiring inspection and testing services.

E. Arrange with laboratory and pay for additional samples and tests required by Contractor beyond specified requirements and pay compensation for Architect's additional services made necessary by failed tests and inspections.

F. Testing and reports by the Contractor shall conform to the requirements of this section and to the requirements of Section 01 91 00 - Commissioning.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01500 TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone, water, and sanitary

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings

1.2 REGULATORY REQUIREMENTS

A. Conform to all applicable codes, standards and requirements

1. Florida Building Code

2. Florida Fire Prevention Code

3. OSHA standards

4. City of Key Colony Beach requirements

5. Other related or referenced codes and standards listed in items 1 thru 5 above

1.3 TEMPORARY ELECTRICITY

A. Cost: By Contractor, provide and pay for power service required from utility source.

B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required.

1. Provide flexible power cords as required to comply with OSHA standards.

C. Provide main service disconnect and over current protection at convenient location.

D. Contractor may use permanent convenience receptacles during construction as long as the use does not trip circuit breakers in the building or otherwise interferes with The City of Key Colony Beach's use of service.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations to achieve a minimum lighting level as required by OSHA.

B. Provide and maintain adequate security lighting to exterior staging and storage areas after dark.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Contractor may use permanent building lighting during construction.

1.5 TEMPORARY HEATING

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations per material manufacturer's or supplier's requirements.

B. Prior to operation of permanent equipment for temporary heating purposes, verify the installation is approved for operation; equipment is lubricated and filters in place.

1. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.6 TEMPORARY COOLING

A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations per material manufacturer's or supplier's requirements.

B. Prior to operation of permanent equipment for temporary cooling purposes, verify the installation has approval for operation, the system controls are functional, equipment properly lubricated, and filters in place.

1. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Unless indicated otherwise in specifications, in areas where construction is in progress, maintain maximum relative humidity of 60%, or as dry as needed to prevent the formation of mold.

1.7 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Utilize existing ventilation equipment.

1. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.8 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service, including long distance available for the City of Key Colony Beach's use, at time of project mobilization and continue until Final Completion.

1.9 TEMPORARY WATER SERVICE

A. Provide, maintain, and pay for suitable quality water service required.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required sanitary facilities and enclosures for start of project mobilization through the end of project. Do not use any existing facilities.

1. Portable sanitary facilities shall be checked, cleaned and serviced weekly by the company that provides the units.

B. At end of construction, return facilities to same or better condition as originally found.

1.11 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for City of Key Colony Beach's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades as required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain.

1. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.12 FENCING

A. Construction: Commercial-grade chain link fence or Solid wood fence as designated on drawings.

B. Provide 6' high fence around construction site; equip with vehicular and pedestrian gates with locks.

1. Provide top rail/support on all temporary fencing.

2. Provide windscreen on temporary chain link fencing.

C. Permanent fencing required in the contract documents may be installed in place of temporary fencing at the Contractor’s option.

1.13 WATER CONTROL

A. Grade site to drain and keep excavations free of water.

1. Provide, operate, and maintain pumping equipment as necessary.

B. Protect site from ponding or running water with water barriers as required to prevent soil erosion.

1.14 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons.

B. Provide access doors with locks.

1.15 PROTECTION OF INSTALLED WORK

A. Protect completed work and provide special protection as specified in other specification sections.

B. Provide temporary and removable protection for installed products.

1. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces.

1. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic in landscaped areas.

1.16 SECURITY

A. Provide security and facilities to protect Work in the area of construction from unauthorized entry, vandalism, or theft.

B. Coordinate with City of Key Colony Beach's security program.

1.17 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate, as required to provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from construction vehicle wheels before entering streets.

E. Only use designated existing on-site roads for construction traffic.

1.18 PARKING

A. Arrange for temporary surface parking areas to accommodate construction personnel.

B. When site space is not adequate, provide additional off-site parking.

C. Do not allow vehicle parking on existing pavement, unless approved by the City of Key Colony Beach.

1.19 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain site in a clean and orderly condition free of waste materials, debris, and rubbish.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and properly dispose off-site.

E. No open free-fall chutes permitted terminate closed chutes into appropriate containers with lids.

1.20 PROJECT IDENTIFICATION

A. Provide 8' w x 4' h project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter or die cut vinyl self-adhesive letters, and self-adhesive, to City of Key Colony Beach's design and colors.

1. The wording on project sign shall include the Project Coordinator's name and telephone contact number.

B. Provide a sign near workers entrance with the following information in addition to other required safety instructions:

1. WARNING: HARD HAT AREA

2. UNAUTHORIZED ENTRY PROHIBITED

3. ALL VISITORS MUST REPORT DIRECTLY TO THE CONSTRUCTION TRAILER OR OFFICE.

4. WORK SITE RULES:

a. BE ALERT, REPORT UNSAFE CONDITIONS IMMEDIATELY TO JOB SUPERINTENDENT OR CITY OF KEY COLONY BEACH REPRESENTATIVE.

b. NO SMOKING, DRUGS, ALCOHOL or LOUD RADIO PLAYING

c. THE FOLLOWING MUST BE WORN AT ALL TIMES:

i) HARD HATS and SAFETY GLASSES

ii) HARD SOLE SHOES (NO SNEAKERS)

iii) SHIRTS AND LONG PANTS

5. YOUR COOPPERATION IS GREATLY APPRECIATED

C. Contractors and Designers identification signs shall be located in such a way as to not distract from traffic site lines at driveways.

D. Provide permanent and temporary freestanding exterior signs that shall comply with Florida Building Code (FBC) Chapter 16.

E. Erect on site at location indicated.

F. All other signs require City of Key Colony Beach's permission except those required by law.

1.21 FIELD OFFICES AND SHEDS

A. Provide weather tight office, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 7 persons.

C. Provide a separate space for City of Key Colony Beach representatives and/or A/E, to use while at the site.

D. Locate offices and sheds a minimum distance of 30' from existing and new structures.

E. Properly anchor any design field offices and/or sheds to resist hurricane force wind loads.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Final Completion inspection.

B. Disconnect and properly cap all temporary utilities prior to Final Completion.

C. Remove underground installations to a minimum depth of 2'; grade site as indicated.

D. Indicate the location and type of all underground temporary utilities on the as-build plans that are to remain.

E. Clean and repair damage caused by installation or use of temporary work.

F. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.23 TEMPORARY LIFE SAFETY CONTROLS

A. When existing fire alarm, fire protection, and emergency lighting systems are present and will be used during construction, those systems are to be tested prior to the start of the project. Defects found at that time to be the responsibility of and corrected by the City of Key Colony Beach.

B. The Contractor shall provide all temporary life safety systems required by statute, rule or code.

1.24 HURRICANE and SEVERE STORM PROTECTION

A. Construction Manager/Contractor shall develop a plan and implementation procedure for preparing the constructions site in the event of a hurricane or severe storm warning.

B. Develop the plan with the City of Key Colony Beach representatives.

C. It shall include as a minimum:

1. Securing construction material from becoming wind borne debris during high winds

2. Securing and protecting partially completed building components during the event

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01560 SECURITY BARRIERS & ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security Program

B. Entry Control

C. Personnel Identification

1.2 SECURITY PROGRAM

A. Protect work, existing premises, and City of Key Colony Beach's operations from theft, vandalism, and unauthorized entry.

B. Initiate program in coordination with City of Key Colony Beach's existing security system at project mobilization.

C. Maintain program throughout construction period until City of Key Colony Beach acceptance precludes the need for Contractor security.

1.3 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to City of Key Colony Beach on request.

D. Coordinate access of City of Key Colony Beach's personnel to site in coordination with City of Key Colony Beach's security forces.

1.4 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. Maintain a list of accredited persons; submit copy to City of Key Colony Beach on request.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01570 TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Controls

1. Dust Control
2. Erosion and Sediment Control
3. Noise Control
4. Pest Control
5. Pollution Control
6. Rodent Control
7. Environmental (temperature, relative humidity) Control

1.2 DUST CONTROL

A. Employ all specified controls required to protect City of Key Colony Beach's existing property and facilities.

B. Execute work by methods to minimize raising dust from construction operations.

C. Provide means to control dust and debris from entering the public streets and rights of way.

1.3 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize amount of bare soil exposed at one time.

C. Provide temporary measures such as berms, dikes, and drains, to control water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Do not allow mud or debris-laden runoff to enter existing storm water system.

G. Comply with Florida DEP National Pollutant Discharge Elimination System requirements.

1.4 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise from and noise produced by construction operations.

B. Contact local government officials to obtain noise control requirements prior to beginning Work.

1.5 PEST CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.6 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.7 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.8 ENVIRONMENTAL CONTROL

A. Maintain temperature in accordance with Section 01 50 00, 1.6 C.

B. Maintain relative humidity in accordance with Section 01 50 00, 1.6 D.

C. Contractor is responsible for environmental control until the City of Key Colony Beach accepts the facility with the Certificate of Occupancy (CO) or the Temporary Certificate of Occupancy (TCO).

a. Contractor is responsible for any damage caused by the formation of mold and mildew or other deterioration of any building materials prior to CO or TCO.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01600 MATERIAL EQUIPMENT AND APPROVED EQUALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products

B. Transportation and handling

C. Storage and protection

D. Product options

E. Substitutions

F. Approved Equals

1.2 PRODUCTS

A. Product means new material, machinery, components, equipment, fixtures, and systems forming the work, it does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the work.

1. This may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

1.3 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact, and legible.

B. Store sensitive products in weather tight, climate-controlled enclosures.

C. For exterior storage of fabricated products, place on sloped supports, above ground.

D. Provide off-site storage and protection when site does not permit on-site storage or protection.

E. Cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

F. Store loose granular materials on solid flat surfaces in a well-drained area avoid mixing with foreign matter.

G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

H. Arrange product storage to permit access for inspection, and periodically inspect for damage and correct storage conditions, if damaged or incorrect storage conditions take corrective action.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description only, means any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers means products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products specified by naming one or more Manufacturers with a provision for substitutions, means submit a request for substitution for any manufacturer not named.

1.6 SUBSTITUTIONS

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions to requirements specified in this section during the bidding period.

B. If a product becomes unavailable through no fault of the Contractor, substitutions may be considered.

C. Document each request with complete data substantiating compliance of the proposed Substitution with the Contract Documents.

D. A request constitutes a representation that the Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Is providing the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other work that may be required for the work to be complete with no additional cost to City of Key Colony Beach.

4. Waives claims for additional costs or time extension, which may become apparent.

5. Will reimburse City of Key Colony Beach for review or redesign services associated with re-approval.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or if acceptance requires revision to the contract documents.

F. The City of Key Colony Beach and A/E shall review the request and either approve or deny the request in writing.

G. Installation of substitutions without the City of Key Colony Beach's approval shall be cause for immediate rejection and removal without extra cost to the City of Key Colony Beach.

H. Substitutions that diminish life safety systems are prohibited.

1.7 APPROVED EQUAL

A. It is not the City's intention to limit open competition of products supplied on the construction of public buildings, but it is the intention to provide products that are cost effective and do not sacrifice the City's needs.

B. If the specifications list a vendor or manufacturer, the contractor may submit a written request for a substitution. This applies if one or more vendors or manufacturers are listed. (May include a statement "or approved equal" or "Engineer and City of Key Colony Beach approved").

C. All requests for "approved equal" shall be in writing on the City form with the proper back-up information:

1. Include the product literature/specifications with warranty information.

2. Product approval or evaluation from Florida Building Code approved agency.

3. List of five local projects and contacts with this product installed.

D. The City of Key Colony Beach and A/E shall review the request and either approve or deny the request in writing.

E. The Contractor shall not use the proposed substitution in the bid unless the City of Key Colony Beach and A/E approve the request in writing.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Contractor shall submit request for substitution of non-listed items to the Architect/Engineer for their review.

3.2 The Architect/Engineer shall review Contractor's information and request, and then make recommendation to the City's Project Coordinator.

3.3 Submit all Architect approved substitutions to the City's Building Department for review and approval to Code and City requirements.

A. Submittals to the Building Department require Architect and City recommendation approvals.

3.4 If Contractor chooses to install substitutions prior to City's approval, they do so at his own risk.

A. Contractor shall be responsible for the cost of changing back to the City's specification.

END OF SECTION

01750 STARTING AND ADJUSTING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems

B. Demonstration and instructions

C. Testing, adjusting, and balancing

1.2 STARTING SYSTEMS

A. Ensure that necessary controls and safeguards are function prior to starting any equipment.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architect, Mechanical Engineer, and City of Key Colony Beach at least two days prior to startup of each item.

D. Verify each piece of equipment or system for proper lubrication, drive rotation, belt tension, control sequence, or other conditions that may cause damage.

E. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify wiring and support components for equipment are complete and tested.

G. Execute startup under supervision of responsible Contractors' personnel in accordance with manufacturers' instructions.

H. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to startup, and to supervise placing equipment or system in operation.

1.3 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to City of Key Colony Beach's personnel within two weeks after the date of Substantial Completion.

B. Demonstrate Project equipment instructed by a qualified manufacturers' representative knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation, perform demonstration for other

season within six months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with City of Key Colony Beachs' personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed upon times, at equipment location.

F. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.4 TESTING, ADJUSTING AND BALANCING

A. The City of Key Colony Beach will appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balancing.

B. The independent firm shall perform the services specified in section 15991.The independent firm shall submit reports to the Architect and Commissioning Authority indicating observations, results of tests and compliance or non-compliance with specified requirements and with the requirements of the contract documents.

C. The independent firm shall coordinate scheduling of Testing, Adjusting, and Balancing activities with the Construction Manager.

1. Testing, Adjusting and Balancing must be completed prior to scheduling equipment and system Functional Performance Testing.

PART 2 PRODUCTS

1.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01770 CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures

B. Final cleaning

C. Adjusting

D. Project record documents

E. As-built survey

F. Operation and maintenance data

G. Spare parts and maintenance Products

H. Warranties and bonds

I. Maintenance service

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that contract documents were reviewed, work inspected, and that work is complete in accordance with contract documents and ready for City of Key Colony Beach and Architect review.

1. Electronically provide the following documents to the City of Key Colony Beach City Manager and Building Official

a. Copy of release from the Monroe County Health Department for the potable water system.

b. Copy of the State Elevator Inspection Certificate.

c. Copy of the Temporary Certificate of Occupancy and/or Certificate of Occupancy issued by the Building Department.

d. Copies of all product submittals as outlined in Section 01330, paragraph 1.5.C.

B. Provide submittals to Architect and City of Key Colony Beach that are required by governing or other authorities.

C. City of Key Colony Beach will have the option to occupy all or portions of the facility.

1.3 FINAL CLEANING

A. Execute final cleaning concurrent with final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate for the surface and material.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

H. Clean and sanitize water fountains (coolers).

I. Clean all ledges countertops and shelves with all-purpose non-abrasive cleaner leaving no residue.

1.4 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.5 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the work:

1. Drawings/specifications, RFIs and addenda

2. Change orders and other modifications to the contract

3. Reviewed, approved and accepted shop drawings, product data, and samples

4. Manufacturer's instruction for assembly, installation, and adjusting

B. Ensure entries are complete and accurate, enabling future reference by City of Key Colony Beach.

C. Store record documents separate from documents used for construction.

D. Record information related to changes of approved construction documents concurrent with construction progress.

E. Specifications - legibly mark and record at each product section a description of the products installed.

1. Manufacturer's name, product name and model number

2. Product substitutions or alternates utilized

3. Changes made by addenda and modifications

F. As-Built Drawings and shop drawings - legibly mark each item to record actual construction.

1. Measured depths of foundations in relation to finish first floor datum

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.

4. Field changes of dimension and detail.

5. Provide any additional details not on original contract drawings.

G. As-built survey/Flood Certification Form:

1. Upon completion of site construction improvements, provide Architect and City of Key Colony Beach with a complete and accurate field survey prepared, signed and sealed by a Florida registered surveyor.

a. Exact horizontal and vertical location relative to property lines and NGVD of buildings, concrete and asphalt surfaces and all drainage features including lakes, detention areas, berms, embankments and swales.

b. Show the actual grades of the spot elevations shown on the paving and drainage plans.

c. Provide sufficient information indicating a true representation of constructed grade conditions for areas where grading between two elevation points is not constructed at a uniform slope.

d. Survey shall include cross sections elevations at 50' stations of swales, lakes, and drainage retention areas including banks, berms, bottoms, and transitions constructed or improved.

e. Elevations shown shall be accurate to the nearest tenth of a foot.

2. Upon completion of site construction improvements, provide Architect, Building Department, and City of Key Colony Beach with a complete and accurate FEMA Flood Certification form (FEMA 81-31) prepared, signed and sealed by a Florida registered surveyor.

H. Submit documents, AutoCAD (minimum 2020) files, and PDF files on a CD to Architect and City of Key Colony Beach, prior to claim for final Application for Payment.

1.6 OPERATION AND MAINTENANCE DATA

A. See section 01782 for requirements.

1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products in quantities specified in specification.

B. Provide copies of all itemized receipts/transmittals listing the extra materials or parts with their physical location indicated prior to final payment.

1.8 WARRANTIES AND BONDS

A. Contractor shall fill out all warranty cards, certificates, and letters to manufacturers in the name of the City of Key Colony Beach. All products shall be registered with the Contractor carrying the product warranty for the time period that the City is entitled to.

B. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in D-side 3-ring binder with durable plastic cover.

D. Provide one paper copy and two CD's or DVD copies.

E. Submit prior to final application for payment.

F. For items of work delayed beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections for one-year from date of substantial completion.

B. Examine, clean, adjust, and lubricate system components as required for reliable operation.

C. Include systematic examination, adjustment, and lubrication of components repairing or replacing parts as required with parts produced by the manufacturer of the original component.

D. City of Key Colony Beach shall approve in writing of any transfers or reassignments of maintenance service tasks prior to one year from the date of substantial completion with exception to items referred to in Section 1.8.F, above.

PART 2 PRODUCTS

2.1 APPROVED PRODUCTS

PART 3 EXECUTION

3.1 Documentation

A. Provide copies of all letters of maintenance transfers in the project warranty manual.

END OF SECTION

01782 OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Format and content of manuals

B. Instruction of City of Key Colony Beach's personnel

C. Schedule of submittals

1.2 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3 FORMAT

A. Prepare data in the form of an instructional manual.

B. Prepare data in electronic format and submit on CD or DVD.

1. Submit four (4) copies of the CD or DVD

2. When multiple disks are used, correlate data into related consistent groupings

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of project; identify subject matter of contents.

D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

E. Provide manufacturer's printed data, or typewritten data.

F. Drawings: Provide with reinforced punched binder tab; fold larger drawings to size of text pages.

G. Prepare a table of contents for each volume, with each product or system description identified, in three parts as follows:

1. Part 1: Directory listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section for each category, identify names, addresses, and telephone numbers of subcontractors and suppliers.

a. Significant design criteria

b. List of equipment and parts list for each component

c. Operating instructions

d. Maintenance instructions for equipment and systems

e. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

a. Shop drawings and product data

b. Product submittals as outlined in Section 01330, Paragraph 1.5.

c. Certificates and originals of warranties and bonds

1.4 CONTENTS, EACH VOLUME

A. Provide a table of contents with title of project; names, addresses, and telephone numbers of Architect, Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For each product or system list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product data - mark each document sheet to identify specific products and component parts, and data applicable to installation, delete inapplicable information.

D. Drawings - supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Typed text as required supplementing product data, providing logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 40 00.

F. Warranties - bind in a copy of each as specified in Section 01783.

G. Bonds - bind in photocopy and original of each.

1.5 MANUAL FOR MATERIALS AND FINISHES

A. Building products, applied materials, and finishes - include product data, with catalog number, size, composition, and color and texture designations.

1. Provide information for reordering custom manufactured products.

2. Provide complete itemized paint color list stating manufacturer, color name, interior or exterior, and finish for each color used.

B. Instructions for care and maintenance - include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products - include product data listing applicable reference standards, chemical composition, and details of installation.

1. Provide recommendations for inspections, maintenance, and repair.

D. Additional requirements as specified in individual product specification sections.

1.6 MANUAL FOR EQUIPMENT AND SYSTEMS

A. For each item of equipment and each system, include the description of the unit or system, and component parts identifying function, normal operating characteristics, and limiting conditions.

1. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

B. Panel board circuit directories - provide electrical service characteristics, controls, and communications by label machine.

1. Include color-coded wiring diagrams as installed.

C. Operating procedures include:

1. Startup, break-in, and routine normal operating instructions and sequences

2. Regulation, control, stopping, shut down, and emergency instructions

3. Summer, winter, and any special operating instructions

D. Maintenance Requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

J. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

1.7 INSTRUCTION OF CITY OF KEY COLONY BEACH PERSONNEL

A. Before final inspection, instruct the City of Key Colony Beach's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. List all equipment requiring seasonal operation performance instructions for other seasons within six months.

C. Use operation and maintenance manuals as basis for instruction.

1.8 SUBMITTALS

A. Submit two sets of Final Operations and Maintenance Manuals, within ten days after final inspection at least fifteen days prior to substantial completion.

B. The Final Operations and Maintenance Manuals will incorporate review comments from the City of Key Colony Beach, Commissioning Authority, and Architect/Engineer.

C. The Final Operations and Maintenance Manuals shall incorporate any changes in the Systems Sequences of Operations identified during Functional Performance Testing.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

01783 WARRANTIES

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Preparation and submittal of warranties

B. Time and schedule of submittals

C. Transfer of Maintenance responsibility

1.2 FORM OF SUBMITTALS

A. Provide two copies of all warranty information in an electronic format on a compact disk (CD).

B. Provide CD's labeled WARRANTIES, with project number and title, name of responsible company principal, address, and telephone number of Contractor and equipment supplier.

C. Prepare table of contents in the same sequence as the Project Manual, section 01782; identify each item with the number and title of the correct specification section, and the product name.

D. Separate each warranty with index tab sheets keyed to the table of contents listing.

E. Provide full information on CD as necessary listing subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible company principal.

1.3 PREPARATION OF SUBMITTALS

A. Provide the responsible subcontractors, suppliers, and manufacturers' warranties in duplicate, prior to claim for final Application for Payment.

1. Warranty shall be on the company's' original forms signed by authorized agent only.

2. Except for items put into use with City of Key Colony Beach’s permission, identify the start date of warranty period after the Date of Substantial Completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties until time specified for submittal.

E. All of the above shall be in electronic format included on the CD or DVD, provide 2 copies.

1.4 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with City of Key Colony Beach's permission, submit documents within ten days after being put into service.

B. Submit other warranties prior to final Application for Payment.

C. For warranty items delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

1.5 Transfer of Maintenance Responsibility

A. Provide a separate tabbed section in the warranty documents for all letters of maintenance responsibility transference.

B. Provide separate letter for each transfer, which shall include the mutually agreed time and date of the transfer of responsibility.

PART 2 PRODUCTS

2.1 Warranty Certificates

A. The installation contractor shall complete all warranty certificates, registering the product with the manufacturer.

B. Use the date of substantial completion as the installation date.

C. List the product model and serial number on each certificate.

D. Provide copy of the original certificate in warranty manual if the original goes to manufacturer.

PART 3 EXECUTION

3.1 The installing contractor shall fill out all product warranty forms during the manufacture's required time limit.

A. Failure to do so may result in the City of Key Colony Beach's loss of standard product coverage in which the installing contractor shall become liable for the same coverage and time limit forfeited due to their omission.

B. The installing contractor shall notify the City of Key Colony Beach, at least 30 days prior to Substantial Completion, of all optional extended warranties provided by the manufacturer and make available to the City of Key Colony Beach the opportunity to issue a Contract Modification prior to the application for final payment to facilitate the purchase of the extended warranty.

C. The installing contractor shall insure that all warranty documents, including copies of completed registration forms, are submitted to the General Contractor for inclusion into their closeout documents as required by section 01770 of these specifications.

3.2 Warranty pre-expiration equipment review

3.3 The Commissioning Authority shall conduct an on-site review of equipment and systems covered by warranties.

A. This review will be scheduled approximately 2-months prior to expiration of the Warranty.

B. The Contractor, City of Key Colony Beach's Representative, and City of Key Colony Beach's Operations & Maintenance representative shall accompany the Commissioning Authority during this review.

C. The purpose of the review will be to evaluate the condition of the equipment and systems to determine if Warranty repairs of claims are necessary.

D. The Contractor shall cooperate to notify the issuer of the Warranty and to schedule necessary repairs or corrective actions prior to expiration of the Warranty.

END OF SECTION

02011 SOIL BORING DATA

Both reports listed below are part of the Project Manual. *(Refer to pages 3 - 32.)*

A. Report of Subsurface Exploration & Geotechnical Engineering Evaluation of Subsurface Conditions prepared by Wingerter Laboratories, Inc. in June 2021.

B. Addendum to Report of Subsurface Exploration & Geotechnical Engineering Evaluation of Subsurface Conditions prepared by Wingerter Laboratories, Inc. on October 18, 2021.

END OF SECTION

02060 BUILDING DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Removal of structures by demolition and disposition of debris legally off-site.

1.2 SUBMITTALS

A. Demolition Schedule: Include detailed schedule showing start and completion dates for each area of demolition and for completion of demolition work. Submit method of demolition and plan of removing work.

B. Certification: Submit copy of demolition firm's current license to operate in Monroe County, Florida.

1.3 QUALITY ASSURANCE

A. Organize and perform demolition work to avoid damage to construction intended to remain.

B. Demolition and transportation of debris shall comply with applicable codes and regulations governing these operations. Fees shall be paid by the Contractor.

C. Demolition and removal operations shall be conducted in an expedient manner, with precautions taken to prevent demolition site from being an "attractive nuisance".

D. Notify CITY OF KEY COLONY BEACH and A/E of any conditions capable of affecting the safety of occupants of adjacent buildings, the normal use of these facilities, or the physical condition of the structures.

1. In case of accidental disruption of utilities or the discovery of previously unknown utilities, stop work immediately and notify CITY OF KEY COLONY BEACH and A/E.
2. Do not continue work until CITY OF KEY COLONY BEACH, A/E, and Contractor agree on a plan to correct the situation or identify utility service line.

1.4 SEQUENCING AND SCHEDULING

A. Scheduling: Areas next to demolition and removal work may be occupied and their activities cannot be interrupted or disturbed during normal working hours. Demolition schedule shall be according to drawings and as accepted by CITY OF KEY COLONY BEACH and A/E.

B. Coordinate with applicable utility companies and CITY OF KEY COLONY BEACH for utility line removal, capping, and utility shutdowns required by removal work.

1.5 PROJECT CONDITIONS

A. Existing work not specified for removal that is temporarily removed, damaged, exposed, or in any way disturbed or altered by removal work shall be repaired, patched, or replaced to CITY OF KEY COLONY BEACH and A/E's satisfaction at no additional cost to CITY OF KEY COLONY BEACH.

B. Provide barriers and warning devices to protect the public and users of adjacent facilities.

C. Environmental Protection:

1. Control amount of dust resulting from construction or demolition to prevent spread of dust to other buildings and to avoid creation of a nuisance in surrounding areas. Use of water to control dust will not be allowed when it will result in flooding or other objectionable or hazardous or conditions.
2. Use of explosives is not allowed.
3. Disposition of demolished materials by burning is not allowed.

D. Traffic Maintenance:

1. Conduct removal operations to maintain traffic along existing streets and walks.
2. Keep paved streets and walkways free of debris.
3. Remove material and other matter tracked or fallen onto traffic surfaces.

E. Disposition of Materials:

1. Title and responsibility to materials and equipment to be removed, excepting salvageable equipment to be retained by CITY OF KEY COLONY BEACH, is vested in the Contractor upon receipt of Notice to Proceed.
2. CITY OF KEY COLONY BEACH will not be responsible for the condition, loss, or damage to such materials and equipment after the Notice to Proceed.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DEMOLITION

A. Structures:

1. Demolish existing indicated structures according to accepted schedule.
2. Indicated buildings shall be demolished completely, including any grade beams and/or piles which may be in conflict of new foundation system.

B. Perform removal and demolition according to Demolition Schedule and take necessary precautions to protect existing adjacent buildings, furnishings, and equipments.

C. Existing Utilities: Perform utility related work according to these specifications for the type of utility service involved.

D. Removal:

1. Remove demolished construction materials and related debris from the site on a regular basis.
2. Accumulation of debris on the site will not be allowed.
3. Selling of salvageable building materials or equipment or furnishings is not allowed at the site.

3.2 CLEAN UP

A. Remove materials, including debris and dust, and dispose of legally off site. Use methods approved by A/E before beginning cleanup operations. Use of blowers to distribute dust is not allowed.

END OF SECTION

02200 EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Earthwork for buildings and other grassed or landscaped areas as indicated on Drawings and specified in this section.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 02511 - Asphaltic Concrete Paving.
3. 02900 - Landscaping.
4. 02935 - Sodding.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. D422 Test Method for Particle-Size Analysis of Soils.
3. D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
4. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5. D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
6. D2487 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7. D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. D2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Materials.
9. D 4972 Test Method for pH of Soils.

B. Monroe County Design & Construction Division Design Standards.

C. Florida Statute, Chapter 556, Underground Facility Damage Prevention and Safety.

D. Consumer Products Safety Commission (CPSC): A Handbook for Public Playground Safety.

1.3 QUALITY ASSURANCE

A. Trench Safety Act:

1. Comply with the Trench Safety Act, sections 553.60 through 553.64 Florida Statutes.

1.4 DEFINITIONS

A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW and SP properly worked by Contractor to obtain optimum moisture and compaction.

1. For Grassed or Landscaped Areas:

a. Within 1.5 feet of the surface of the indicated grade, limit rock size to 3 inches.
b. Below 1.5 feet of the surface of indicated grade, limit rock size to 12 inches.
c. Deeper than 6 feet limit rock size to 24 inches.

2. For Buildings:

a. Within 2 feet of the surface of indicated grade, limit rock size to 2 inches.
b. Below 2 feet of the surface of indicated grade limit rock size to 6 inches.

B. "Unsatisfactory Materials" include materials other than "Satisfactory Fill Materials". Materials of any classification determined by testing laboratory as too wet or too soft for providing a stable foundation for structure, paving, and walks will be classified as "unsatisfactory".

C. Degree of Compaction: Required compaction is expressed as a percentage of maximum density obtained by test procedures of ASTM D1557.

D. Building Area: The area bounded by lines not less than 4 feet beyond the outside line of the building perimeter footings.

1. Increase the 4-foot dimension by 1 foot for each foot of excavation depth required exceeding 4 feet.

1.5 SUBMITTALS

A. Submit the following before starting work:

1. Compaction Machinery Specifications.
2. Compaction Tests (by the City of Key Colony Beach).
3. Soil Classification Tests using ASTM classification for subgrade materials and USDA classifications for topsoil materials.
4. Stabilized Subgrade Composition and Density.
5. Testing Laboratory (by the City of Key Colony Beach).

1.6 SITE CONDITIONS

A. Determine location and nature of work, character of equipment, and facilities needed for performance of work, general, and local conditions prevailing at site, and other matters affecting work under this contract according to Instructions to Bidders and General Conditions.

B. Subsurface data, including soil borings, ground water elevations, or conditions, if shown on the drawings or attached to these specifications, are presented only as information available indicating conditions found and limited to exact locations and shall not be interpreted as an indication of conditions that may actually develop during construction.

1. Make deductions of subsurface conditions that may affect methods or cost of construction and agree that no claim for damages or other compensation shall be made, except as are provided for in the agreement, should conditions be found during construction different from those as calculated or anticipated by the Contractor.
2. Neither the City of Key Colony Beach nor the A/E will be held responsible for variations found to exist between the subsurface data referred to above and actual field conditions that may develop during construction.

C. Where existing grades, utility lines, or substructures are shown on drawings, Contractor, the City of Key Colony Beach, and A/E assume no responsibility for correctness of existing conditions indicated.

1. Contractor shall locate indicated existing utility lines or substructures that may be affected by this Project and shall be responsible for any damage or injury they may sustain as a result from working on or near these existing utilities or substructures not specified to be removed or demolished.

D. Benchmarks and Monuments:

1. Maintain existing benchmarks, monuments, and other reference points, and if disturbed or destroyed, replace as directed by A/E.

1.7 JOB CONDITIONS

A. Condition of Premises: Accept site as found and excavate, fill, compact, and backfill site as indicated on drawings and specified in this section.

B. Protection:

1. Adjacent Structures and Property:

a. Take precautions to guard against movement, settlement, injury, or loss to existing structures or to equipment and furnishings housed therein arising directly or indirectly in connection with this contract according to Instructions to Bidders and General Conditions.
b. Provide and place bracing or shoring as necessary or proper according to Instructions to Bidders and General Conditions.
c. Be responsible for the safety and support of such structures and facilities and be liable for any movement or settlement, damage, or injury caused by or resulting therefrom.

1) If, at any time, the safety of any adjacent structures or facilities appears to be in doubt, cease operations and take immediate precautions to support such structures and facilities and notify A/E at once.
2) Resume operations only after permission has been granted by A/E.

2. Adjacent Sidewalks and Streets:

a. Take precautions to guard against movement, settlement, or collapse of any sidewalks, curbs, or street passages on adjoining sites and be liable for any such

movement, settlement, or collapse according to Instructions to Bidders and General Conditions.

1) Repair such damage promptly when so ordered at no cost to the City of Key Colony Beach.
2) Install necessary shoring, including sheet piling as may be required, to protect banks, adjacent paving, structures, and utilities during excavations.
3) Be responsible for any damage to existing structures, equipment, and furnishings due directly or indirectly to construction operations. Except where removal is needed by site grading or location of new buildings, use every possible precaution to prevent injuries to landscaping, drives, curbs, and walks on or next to site of the work and replace, at no expense to the City of Key Colony Beach, any of the above destroyed.

3. Existing Landscaping, Drives, Curbs, and Walks: Except where removal is required by site grading or location of new buildings, take every possible precaution to prevent injuries or loss to individual trees, groups of trees, and other existing landscaping, drives, curbs and walks on or next to the site of the work according to Instructions to Bidders and General Conditions, and replace any such damaged or destroyed at no cost to the City of Key Colony Beach.

PART 2 EXECUTION

2.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

2.2 GENERAL

A. Public Safety: Accomplish work in a manner providing for the safety of the public and workers and the protection of property.

B. Construction: Do not close, obstruct, or store material or equipment in streets, sidewalks, alleys, or passageways without a permit according to local ordinances, regulations, codes, and the City of Key Colony Beach's approval.

C. Interference: Conduct operations with minimum interference with roads and other facilities.

D. Removal:

1. Unless otherwise noted or specified to be relocated or stored, materials removed become property of Contractor and shall be removed completely away from site.
2. Do not store or allow debris to accumulate on site.
3. If Contractor fails to remove excess debris promptly, the City of Key Colony Beach reserves the right to remove the debris at Contractor's expense.

E. Temporary Structures: Remove temporary structures when no longer required.

F. Repair:

1. Clean up, repair, or replace, at no cost to the City of Key Colony Beach, property damage arising in connection with this Contract.
2. Patch and repair work shall match existing and be performed in a neat and professional manner by workers skilled in the trade involved.
3. This applies to damage to the newly graded areas within the building area limits and damage to adjacent properties by eroded materials.

G. Erosion Repair:

1. Take every precaution and temporary measure to prevent damage from erosion of freshly graded areas.

    a. Repair and reestablish grades to required elevations and slopes where settlement or washing occurs before acceptance of work at no cost to the City of Key Colony Beach.
    b. This applies to damage to the newly graded areas within the building area limits and damage to adjacent properties by eroded materials

2.3 LOCATIONS AND ELEVATIONS

A. Be responsible for surveys, measurements, and layouts required for proper execution of the work.

1. Lay out lines and grades from existing survey control system and as shown on drawings.

B. Locate by stake and mark locations and elevations of following:

1. Elevations of existing earth cut and fill.
2. Final grades for landscape contours.
3. Other items as required to execute work as specified.

2.4 CLEARING AND GRUBBING

A. Within limits of areas designated for building area, grading and site construction work, remove trees, brush, stumps, wood debris, and other deleterious materials not required to remain as part of finished work.

B. Remove grass, plants, vegetation, and organic material from same area.

C. Burning of materials is not allowed on the site.

D. Remove accumulated material daily or as necessary to prevent fire hazard condition.

2.5 STRIPPING

A. Strip turf, organic material, surface litter, rubble, and overburden for entire depth of root system of grass or other vegetation within areas indicated on Site Plan.

B. Stockpile topsoil on site where directed.

C. For building area, remove muck or organic material above the limestone layer. Clean potholes, larger than 6 inches in any horizontal direction, in rock filled with muck or organic material.

2.6 EXCAVATION

A. Begin excavation after stripping, clearing, and grubbing has been completed.

B. Excavate to grades required to accommodate the proposed construction.

C. Dewater as specified.

D. Excavations for structures shall conform to dimensions and elevations indicated for each building.

1. Extend excavations a sufficient distance from walls and footings to allow for placing and removal of forms and installation of services, except where the concrete for walls and footing is authorized to be deposited directly against excavation surfaces.
2. Excavation below general machine excavation for footings and foundations shall be hand worked.
3. Bottoms of footings shall be on level planes.

E. Excavate in such a manner that quick and efficient drainage of storm water will occur.

F. Remove "unsatisfactory materials" encountered from the building areas.

G. Classify excavated materials and stockpile separately suitable soils for use as backfill materials. If sufficient quantities of excavated materials meeting requirements for backfill are not available on site, provide materials meeting these requirements.

H. Stockpile excavated material suitable for use as fill and backfill where directed by A/E.

2.7 FILLING, BACKFILLING, AND COMPACTION

A. Compaction:

1. Compact existing earth surfaces (exclude rock) after excavation, backfilling, and compaction of said areas to levels required with "Suitable Backfill Materials".

a. Compact with equipment suited for soil compaction.
b. Moisten or aerate material, as necessary, to provide moisture content to facilitate obtaining specified compaction with equipment being used.
c. Compact each layer to not less than percentage of maximum density specified below, determined according to ASTM D1557, Method D.
d. Insure compaction of previously prepared fill areas has been maintained before placing new layers.

Location	Percent
1) Under structures and building slabs, except footings, each layer.	95
2) Under footings, top 1 foot in cut, each layer of fill.	95

3)	Under pavements and sidewalk areas, top 12 inches, each layer.	95
4)	Under pavements and sidewalk areas, below 12 inches, each layer.	90
5)	Under landscaped areas, each layer	80-85

B. Filling and Backfilling:

1. Materials: "Satisfactory Fill Materials" shall be used in fills and backfills.
2. Place "Satisfactory Fill Material" in horizontal layers not exceeding 12 inches in loose depth.

    a. Compact as specified in this section.
    b. Do not place materials on muddy surfaces.

C. Reconditioning of Subgrade:

1. Where approved compacted subgrades are disturbed by the Contractor's subsequent operations or adverse weather, scarify and compact the subgrade as specified to required density before further construction occurs.
2. Use power driven hand tampers for recompaction over underground utilities

D. Backfilling:

1. Do not begin backfilling until:

    a. Construction below finished grade has been accepted.
    b. Underground utilities systems have been inspected, tested, and accepted.
    c. Forms have been removed.
    d. Excavation cleaned of trash and debris.

2. Bring backfill to indicated finished grades.
3. Backfill materials and compaction shall be as specified.
4. Do not place backfill in wet areas.
5. Do not operate heavy equipment for spreading and compacting backfill closer to foundation or retaining walls than a distance equal to height of backfill above top of footing.
6. Compact the area remaining by power-driven hand tampers suitable for material being compacted.
7. Place backfill carefully around pipes to avoid damage to the pipes.

E. Protection: Settlement or washing occurring in backfilled areas before acceptance of work shall be repaired and grades reestablished to required elevation and slope.

2.8 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Excess "Satisfactory Fill Materials" and "Unsatisfactory Materials" shall become the property of the Contractor.

1. Remove from site.

2.9 DEWATERING

A. Dewater excavations for inspection and for construction. Concrete or fill shall not be placed in water and concrete less than 8 hours of age shall not be subjected to ground water pressure.

1. Keep excavations free of water while backfilling or construction takes place.
2. Dispose of water resulting from dewatering operations according to city, county, state, and federal regulations.
3. Conduct operations to insure storm water runoff sediment is not discharged to the adjacent lakes, waterways, sewers, streets, and adjacent properties.

2.10 TESTING

A. The City of Key Colony Beach will provide services of a Testing Laboratory to perform specified tests, inspections, instrumentation and inspection of work.

1. Notify, through A/E, the City of Key Colony Beach contracted Testing Laboratory to perform specified tests at the City of Key Colony Beach's expense.

B. Tests of Materials:

1. Soil Classification:

a. One test from each type of material encountered or proposed to be used.

2. Laboratory Tests for Moisture-Content and Density According to ASTM D1557:

a. One test for each material encountered or proposed to be used.

3. Field Tests for Moisture-Content and Density:

a. According to ASTM D1556 or ASTM D2922, one test per layer of fill per 10,000 square feet of area, plus one test per 10,000 square feet of subgrade in cut.

C. Fill and topsoil mixture may be inspected at any stage of operation to determine compaction characteristics, densities and freedom from organic and plastic materials.

D. Notification:

1. Give sufficient notification of placing of orders for fill and topsoil with supplier to allow full inspection including testing for compaction characteristics at source of supply.
2. Obtain approval from A/E before placing topsoil mixture at project site, without exception.

END OF SECTION

02221 EXCAVATING, BACKFILLING AND COMPACTION FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02660 - Water Systems.
3. 02720 - Storm Drainage System.
4. 02731 - Sanitary Sewer System.
5. 15047 - Identification.
6. Division 15 - Mechanical Work.
7. Division 16 - Electrical Work.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
3. D2487 Practice of Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. Occupational Safety and Health Administration (OSHA): Trench Safety Act.

1.3 DEFINITIONS

A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW, and SP properly worked by Contractor to obtain optimum moisture and compaction. Maximum size of rock limited to 6 inches. Use 2-inch maximum size for the top 2 feet below the finish indicated grade.

1.4 SUBMITTALS

A. Submit copies of tests and records performed as specified to A/E for review before starting work.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with OSHA, Trench Safety Act, Standard 29 C.F.R.s., Chapter XVII, Subpart P (para. 1926.650 thru 1926.653).

1.6 PROJECT CONDITIONS

A. Excavation, filling, and backfilling for utilities complete for underground utility lines and structures as specified and as shown on the drawings.

B. Sidewalks and Streets:

1. Take precautions to guard against movements, settlement, or collapse of sidewalks or street passages on site or on adjoining property.
2. Be liable for any such movement, settlement, or collapse.
3. Repair promptly such damage.
4. Install shoring, including sheet piling, as may be required during excavation to protect trench banks, adjacent paving, structure, and utilities.

C. Existing Utilities:

1. Protect existing utilities from movement, settlement, or other damages according to Instructions to Bidders and General Conditions.

D. Trench Safety Act: Provide trench safety systems at all trench excavations where workers may be exposed to moving ground or cave-ins regardless of depth of trench. All trenches more than 5 feet in depth shall comply with OSHA "Trench Safety Act".

PART 2 PRODUCTS

2.1 MATERIALS

A. Trench Backfill Materials: Either satisfactory excavated material or fill materials as specified.

B. Pipe Bedding Material: Bedding material shall be selected or satisfactory backfill material and free of any rocks or stones larger than 2 inches in diameter for cast iron and PVC pipe. Limerock screenings or sand shall be used for copper tubing. (Underground copper lines are 3-inch diameter or less.)

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 EXCAVATION

A. General:

1. Perform excavating of every description and of whatever substance encountered to depths indicated or specified.
2. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins.
3. Keep surface drainage of adjoining areas unobstructed.
4. Remove excavated materials not required nor suitable for backfill from site.
5. Remove water by pumping or other acceptable method and discharge at a safe distance from excavation. Continue dewatering until deemed proper or desirable for the installation of utility lines.
6. Comply with the applicable standards and regulations of City of Key Colony Beach where building is located.

7. Sheeting and shoring shall be done as is necessary for protection of work and for safety of personnel. Excavating shall be by open cut.

B. Trench Excavations:

1. Make trench of necessary width and depth for proper laying of pipe, with bank as vertical as practical.
2. Coordinate trench excavation to avoid open trenches for prolonged periods.
3. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along their entire length, except portions of pipe sections where it is necessary to excavate for couplings and for proper making of pipe joints or where unsatisfactory materials incapable of properly supporting pipe and utility structures are encountered at bottom of trench.
4. Dig holes and depressions for joints after trench bottom has been graded of length, depth, and width required for properly making the particular type of joint.
5. When unsatisfactory soil, incapable of properly supporting pipe, is encountered at the bottom of the trench, remove such soil to a minimum depth of 12 inches, or 1/4 of the pipe diameter, whichever is greater, below the bottom of pipe and backfill material specified.
6. Over-depths in unstable soil excavation and unauthorized over-depths shall be at the expense of Contractor.

C. Special requirements relating to specific utilities are as follows:

1. Storm Drains and Sanitary Sewers:

a. Where shown on drawings, make width of trench at and below top of pipe adequate to allow space for workers to place and properly joint pipe.
b. Clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe.
c. Width of the trench above the level may be as wide as necessary for sheeting and bracing and proper performance of the work.
d. For plastic pipe, where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of 2-1/2" or less pipe and a minimum of 36 inches of cover over the top of 3 inch or larger pipe from finished grade unless otherwise indicated or required by local utility. Install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.
e. Round the bottom of the trench so at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil or select bedding for as nearly the full length of the barrel as proper joining operations will allow.
f. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.
g. Perform this part of the excavation manually a few feet ahead of the pipe laying operation by workers skilled in this type of work.

2. Water Lines, Force Mains, and Gas Lines:

a. Where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of the pipe from finished grade unless otherwise indicated or required by local utility.

b. For plastic pipe, install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.
c. Avoid interference of water lines with other utilities, grade water lines to avoid air pockets.
d. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.

3. Electrical Conduit or Cables:

a. Trenches for plastic conduits shall be a depth providing not less than 24 inches of cover from finished grade or 12 inches or greater of cover from underside of slabs to accommodate bending radii, unless otherwise indicated. Install warning tape 8 inches below finish grade or underside of slab. See Section 15047 - Identification.
b. Trenches for plastic conduit and cables shall be cut to an over-depth of not less than 3 inches and a cushion of rock free soil or coarse sand used for not less than 3 inches bedding and 3 inches backfill over the plastic conduit and cable.

4. Excavating for Appurtenances:

a. Excavations for structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or shoring used.
b. Whenever unstable soil is incapable of properly supporting the structure is encountered in the bottom of the excavation, such soil shall be removed, and excavation backfilled as specified herein in paragraph "Trench Excavation".
c. Unauthorized over-depths or under-depths in wet or otherwise unstable soil shall be filled with selected backfill material or concrete, as directed, at the expense of the Contractor.

3.3 EXCAVATION OF UNCLASSIFIED MATERIAL

A. Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, or other similar materials.

1. No adjustment will be made in the Contract Price because of the presence (or absence) of rock, concrete, masonry, or other similar materials.

3.4 PROTECTION OR REMOVAL OF UTILITY LINES

A. Protection:

1. Protect existing utility lines indicated on drawings (or the locations of which are made known to Contractor before excavating and trenching) specified to remain, including utility lines constructed during trenching operations, from damage during trenching, backfilling, and compacting operations.

a. If such new or existing utility lines are damaged during trenching, backfilling, and compacting operations, repair or replace at no cost to A/E.

2. When utility lines specified to be removed or replaced are encountered within the area of operations, issue notices in ample time for measures to be taken to coordinate necessary interruption of services.

B. Repair of Damage to Unknown Existing Utility Lines:

1. Existing utility lines not shown on drawings (or the location of which is not known to Contractor in time to avoid damage) damaged during trenching operations shall be repaired by Contractor and an adjustment to the Contract Price will be made according to Instructions to Bidders and General Conditions.

3.5 BACKFILLING

A. General:

1. Coordinate backfilling with testing of utilities. Leave sheeting in place where damage is likely to result from withdrawal.
2. Carefully backfill trenches with satisfactory specified materials.
3. Bring backfill up evenly in 9-inch maximum layers, loose depth, and thoroughly and carefully compact with mechanical or hand tampers until pipe has a minimum cover of one foot. Take care not to damage the pipe.
4. Deposit remainder on the satisfactory backfill material in the trench in one-foot layers and compact by mechanical means to percentages as specified.

a. Trenches and excavation pits improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, refilled and compacted, with the surface restored to the specified grade and compaction.

1) Keep excavations free of ground and surface water until backfilling operation is complete.

B. Appurtenances:

1. At structures, remove forms and trash before backfilling:

a. Place satisfactory backfill materials symmetrically on all sides in 9-inch maximum loose depth layers.
b. Moisten each layer, if necessary, and compact with mechanical or hand tamper, taking care not to injure the structure by excessive tamping.

2. Materials and density shall be as previously specified for trenches depending upon location of the structure.

C. Compaction:
1. Material may be compacted by a hand tamper, a powered hand tamper, a vibrating tamper, or mechanized power tamper provided such compaction percentages meet the required density as specified below.
2. Backfilling and compacting by means of hydraulic methods will not be allowed except as may be approved by A/E.

a. Compact each layer to not less than the percentage of maximum density specified below, determined according to ASTM D1557, Method D:

FILLS AND BACKFILL	COHESIONLESS SOIL
Under slabs and pavement	95%
Under walk areas, top 12 inches	95%
Under walk areas, below top 12 inches	90%
Under landscape areas	85%
Under other areas noted on Site Plan	85%

3.6 TESTING

A. Notify, through A/E, the City contracted Testing Laboratory to perform specified tests at the City's expense.

B. Tests of Materials shall be as follows:

1. Laboratory Tests for Moisture Content and Density:

a. According to ASTM D1557, one test for each material encountered or proposed to be used.

2. Field Tests for Moisture Content and density:

a. According to ASTM D1556, one test per layer per 100 linear feet of ditch.

END OF SECTION

02280 SOIL TREATMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Termiticide application to soil under new buildings as indicated on drawings and specified in this section.

B. Use of chlordane, heptachlor, aldrin, dieldrin and chlorpyrifos class of chemicals are not allowed.

C. Related Sections:

1. 02200 - Earthwork.
2. 03300 - Cast-In-Place Concrete.
3. 07262 - Vapor and Radon Retarder.

1.2 SUBMITTALS

A. Submit the following for review before starting work:

1. Product data, including manufacturer’s specifications, chemical analysis, with recommended dilution, application directions, and safety precautions.
2. Sample copy of applicator's warranty for review.
3. Applicator's experience evidence with copies of current local and state licenses and current Certified Operator-in-Charge certificate.

1.3 QUALITY ASSURANCE

A. Work shall be done by a bonded Contractor whose principal business is pest control and termite treatment and can show evidence of at least 5 years of successful operation in this field.

B. Field Samples:

1. Test samples of the mixture of the concentrate and water will be taken by the City contracted Testing Laboratory.
2. If sample solution indicates noncompliance with the manufacturer's application requirements, the Contractor shall pay for the initial test performed by the City, any subsequent retesting required by the City, and reapplication of soil treatment solution.

1.4 PROTECTION

A. To avoid surface flow or overspray of toxicant from application site, do not apply soil poisons when soil or fill is excessively wet or after heavy rains.

B. Unless treated areas are to be immediately covered, take precautions to prevent disturbance of treatment by human or animal contact.

C. Comply with applicable laws, codes, ordinances of Federal, State, and local regulatory agencies having jurisdiction over use of soil poisons.

D. Provide warning signs and instruct workers to use protective measures for their safety.

1.5 WARRANTY

A. Upon completion of soil treatment and as a condition of substantial completion, furnish the City with a written warranty, from the applicator, which shall provide that:

1. Application was made at concentration, rates, and methods complying with these specifications.
2. Effectiveness of treatment is warranted for not less than 5 years without additional cost to the City, by means of a 5-year repair and replacement bond.
3. Upon evidence of subterranean termite activity, retreat area at no additional charge to the City. Additional treatment shall be sufficient to prevent termites from attacking building or its contents.
4. Upon occurrence of damage to building or to its contents within warranty period, retreat soil and replace damage at no cost to the City.
5. Warranty bond shall be drawn in favor of the City, successor, or assigns and shall be non-cancelable by all parties to the contract except the City.

PART 2 PRODUCTS

2.1 MATERIALS

A. Florida Registered Soil Termiticides:

1. Biflex, bifenthrin, FMC Corporation.
2. Talstar, bifenthrin, FMC Corporation.
3. Demon TC, cypermethrin, Zeneca.
4. Prevail, cypermethrin, FMC Corporation.
5. Termidor, fipronil, Aventis Environmental Science.
6. Premise, imidicloprid, Bayer Corporation.
7. Dragnet SFR, permethrin, FMC Corporation.
8. Prelude, permethrin, Zeneca.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 APPLICATION

A. Before mixing concentrate and water as recommended by the manufacturer for specific application and conditions, contact the City 48 hours in advance.

B. Apply termiticide mixture to the following:

1. Soil and earth that will be covered by or lie next to buildings.
2. Masonry foundations.
3. Areas around pipes and conduits penetrating slabs on fill to provide a lethal barrier to subterranean termites.

C. Apply termiticide mixture after subgrade has been made ready for placement of any floor slab vapor barrier, and as soon as practical before placement of concrete slabs and caps on masonry piers. Piling, pile caps, grade beams, foundation walls, and below grade waterproofing shall have been completed.

D. Apply at least 12 hours before placement of concrete slabs and during normal working hours to be subject to inspection. Notify applicator at least 24 hours before application of termiticide mixtures will be completed.

E. Soil Conditions: Apply termiticide mixtures when moisture content soil is sufficiently low to allow uniform distribution of chemical throughout specified areas.

F. Application Under Slabs on Fill:

1. Apply termiticide mixtures uniformly to all areas beneath concrete slabs-on-grade, including beneath walkways and entrance platforms and beneath sidewalks within 5 feet of buildings.
2. A minimum of 1 gallon of termiticide mixtures shall be uniformly applied to each 10 square feet of area to be treated.
3. Ground areas beneath concrete slabs-on-grade and paving abutting building slabs shall be similarly treated for a distance not less than 3 feet from building.

G. Application Along Foundation Walls, Pipes, and Conduits:

1. Treat critical areas along both sides of exterior and interior foundation walls, columns, and around utility pipes, conduits, ducts, and other similar items extending through soil beneath, and next to new construction, to a depth of 1 foot in a strip 6 inches wide, at a rate of 4 gallons of termiticide mixture to each 10 linear feet.
2. Mix chemical with soil as it is placed against walls and utility lines.
3. Apply at least 1 gallon of termiticide mixture around each pipe.

H. Application to Masonry Foundation Walls: Treat voids of unit masonry foundation walls, top of course occurring at or just above grade level, with additional treatment of not less than 2 gallons of chemical for each 5 linear feet.

I. Retreatment of Disturbed Soil: Retreat soil surfaces disturbed after treatment and before placement of slabs and covering structures.

3.3 CLEAN UP

A. Improper disposal of pesticide, spray mixture, or rinsate is a violation of federal law. Comply with manufacturer’s instructions for disposal of these materials and empty containers. Do not allow supplies of chemicals to remain on site unattended.

END OF SECTION

02511 ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02529 - Concrete Sidewalk, Straight Curbs, Curbs, Gutters, and Wheel Stops.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO) Standard:

1. T-180 Moisture-Density Relations of Soils Using a 10 lb. Rammer and an 18-inch drop.
2. T-181 In-Place Density of Compacted Base Course Containing Large Sizes of Coarse Aggregates.

B. Florida Department of Transportation (FDOT) - Standard Specifications for Road and Bridge Construction, latest edition.

C. Monroe County Design & Construction Division Design Standards.

1.3 SUBMITTALS

A. Submit the following for review before starting work.

1. Laboratory and field tests of limerock base course for moisture and density.
2. Asphaltic concrete design mix.
3. Asphaltic concrete stability and mix analysis:

a. If required by A/E, submit results of stability and mix analysis according to requirements of Section 332 of the FDOT Specifications or Monroe County Standards.

1.4 QUALITY ASSURANCE

A. Perform tests according to standards as specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subgrade: Stabilized subgrade according to requirements of Earthwork - Section 02200. For work on Public Right of Way, comply with Monroe County Standards.

B. Limerock Base Courses: According to the requirements of Section 51, "Limerock Base", Monroe County Standards, minimum 6-inch thickness.

C. Prime and Tack Coats for Base Courses: RC-1, MC-O or MC-1 according to Monroe County Standards.

D. Asphaltic Concrete: Type S-I asphaltic concrete, according to requirements of Monroe County Standards. Thickness as indicated on drawings.

E. Seal Coat:

1. Star-Seal Supreme by Star Technology and Research.
2. Accepted equivalent.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Milling:

1. Perform milling as shown according to FDOT Standard Specification for Road and Bridge Construction and Monroe County requirements.
2. Milled areas deeper than 1 inch shall have an asphalt wedge where the milled surface meets existing asphalt grade.
3. Complete resurfacing of milled areas within 3 calendar days of the milling operation.

B. Asphaltic Concrete: Provide mix design according to requirements of Monroe County.

C. Lay asphaltic concrete pavement with stabilized subgrade, base course, and asphaltic concrete surface course in the hardcourt areas and in asphaltic concrete paved areas according to specified Monroe County Standards.

1. Prime Coat: Apply prime coat at rate of not less than 0.10 gallons per square yard.
2. Tack Coat: Apply tack coat at rate of 0.05 to 0.15 gallons per square yard if required by A/E at no additional cost to the City of Key Colony Beach.

D. Provide seal coat per manufacturer's recommendations.

3.3 TESTING

A. The following laboratory and field tests will be performed by the City of Key Colony Beach contracted Testing Laboratory:

1. Limerock: Provide 1 test from each source of limerock, showing compliance with Monroe County specifications.
2. Limerock Base:

a. Provide 1 laboratory maximum density and optimum moisture test for each source of material used according to AASHTO-T-180.

b. Provide 2 field density tests per 7,500 square feet or fraction thereof on each course for each day of final compaction operations.
c. Test according to AASHTO-T-181.

3. Tests as required by Monroe County and Section 520 of FDOT.

END OF SECTION

02513 PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02511 - Asphaltic Concrete Paving.
4. 02529 - Concrete Sidewalk, Straight Curb, Curbs, Gutters, and Wheel Stops.
5. 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute (ACI)-318, latest edition.

B. American Association of State Highway and Transportation Officials (AASHTO) Standard.

1. T-180 Moisture-Density Relations of Soils Using a 10 lb. Rammer and an 18-inch Drop.
2. T-181 In-Place Density of Compacted Base Courses Containing Large Sizes of Coarse Aggregates.

C. American Society for Testing and Materials (ASTM), latest edition:

1. C78 - Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
2. C192 - Practice for Making and Curing Concrete Test Specimens in the Laboratory.
3. D1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.3 SUBMITTALS

A. Submit the following for review before starting work:

1. Concrete design mix and proving flexural strength (modulus of rupture) tests.
2. Expansion joint filler data.
3. Joint sealer data.
4. Proposed finish procedure and technique for placing the concrete.
5. Results of concrete tests as specified.
6. Results of field tests of compaction of base course.

1.4 QUALITY ASSURANCE

A. Comply with ACI 318 - Recommended Practices for Construction of Concrete Pavements and Concrete Bases, and applicable requirements of Section 03300-Cast-In-Place Concrete, except as specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Base Course: Provide 12-inch stabilized subgrade compacted to a maximum density of 95 percent as determined by AASHTO T-180.

B. Concrete for concrete pavement shall have a 28-day modulus or rupture of 650 psi as determined by the requirements as specified.

1. Minimum compressive strength shall be 3,000 psi at 28 days.

C. Joint sealing: Comply with Fed. Spec. SS-S1401 or SS-S-200d (cold applied).

D. Premolded expansion joint filler: Comply with ASTM D1751.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 PREPARATION

A. Surface Requirements:

1. The finished test standard pavement surface in both transverse and longitudinal directions shall have a maximum deviation from the specified plane of ± 1/8".
2. Corrections shall be by grinding with the ground finish to match the specified finish.
3. Exterior paving shall have a maximum deviation from the specified grade of 1/8" in 10 feet.

3.3 APPLICATION

A. The surface finish, a medium broom finish after troweling, requires acceptance by the A/E.

B. Joints:

1. Contraction Joints:

a. Place as indicated and to be perpendicular to the finish grade of the concrete.
b. Joints shall be cut to a depth of 1/4 of the slab thickness by cutting with an edging tool having a 1/4" radius or by sawing with a blade producing a cut not less than 1/8" in width.
c. Saw joints within 24 hours of concrete placement.

2. Expansion Joints:

a. Place where indicated on the drawings, using 1/2" thick preformed expansion joint material.

b. Anchor with accepted devices to prevent displacement during pouring and finishing.
c. Edges shall be rounded with an edging tool.
d. Joints shall be full depth of concrete except that top edges shall be 1/2" below the finish concrete surface.
e. Seal expansion joints by filling with joint sealing compound. Joints shall be clean and dry before sealing compound is put in place.

3. Construction joints are to be used at indicated locations to stop concrete pours.

C. Curing: Methods of curing shall be accepted by the A/E.

3.4 TESTING

A. Laboratory and field testing shall be made by the City of Key Colony Beach contracted testing laboratory.

B. Testing requirements for concrete as specified shall be according to the requirements of Cast-In-Place Concrete - Section 03300 of these specifications, and as specified.

C. Design mixes and testing requirements for the concrete pavement shall be flexural strength tests of concrete as basis for design.

D. Where the flexural strength of the concrete is specified, make 1 strength test and one flexural test following (ASTM C192 and ASTM C78) for each 100 cubic yards or fraction thereof placed per day. Number of cylinders shall be 3 for strength test and 3 for flexural test. Test one at 3 days, one at 7 days and one at 28 days.

E. Base Course: Provide 1 field density test at each location of the concrete paving according to Section 02200 - Earthwork.

END OF SECTION

02580 PAVEMENT MARKING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02511 - Asphaltic Concrete Paving.

1.2 REFERENCE

A. Florida Department of Transportation (FDOT) - Standard Specifications for Road and Bridge Construction (latest edition), except basis of payment and other pay measurement requirements.

B. Manual on Uniform Traffic Control Devices for Streets and Highways (latest edition), published by the U.S. Department of Transportation, Federal Highway Administration.

C. Monroe County Engineering Services.

D. Florida Building Code (FBC) for accessibility requirements.

1.3 SUBMITTALS

A. Submit for review before starting work, paint tests, as specified in Section 971 of FDOT Specifications and as applicable to specified material.

1.4 QUALITY ASSURANCE

A. Perform work in a neat and accurate manner.

B. All equipment shall be of a type and design that will readily obtain the required uniformity of application of the pavement markings both as to thickness of coating and alignment.

1.5 MAINTENANCE

A. Spare Paint: Provide the City of Key Colony Beach with a minimum of 5 gallons of traffic paint from the same batch used in application of pavement markings. Also provide paint specifications and the manufacturer's identification number of the paint used.

PART 2 PRODUCTS

2.1 MATERIALS

A. Traffic Paint: According to requirements as specified in Section 971-12 of the FDOT Specifications and colors indicated on Drawings.

B. Court Paint: By Caribbean Paint Co. Inc. or other A/E accepted equivalent.

1. #260-0307 Yellow.

2. #260-0315 White.

PART 3 EXECUTION

A. INSPECTION

1. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 APPLICATION

A. Time of Application: Painting shall be done only during daylight hours and, as far as practical, shall be terminated in time to allow sufficient drying by sunset.

B. Weather Limitations: No paint shall be applied when any moisture is present on the surface to be painted or when the air temperature is below 40 degrees F. Painting shall not be done when winds are sufficient to cause spray dust.

C. Preparation of Surface to be Painted: The surface to be painted shall be cleaned by compressed air or other effective means immediately before the start of painting. Surface shall be clean and dry when the paint is applied. Any vegetation or loose soil shall be removed from the pavement before striping is begun.

D. Mixing Paint: The paint shall be thoroughly mixed before it is poured into the painting machine and no thinning of the paint in the machine will be allowed. Before the start of each day's work the paint container, the connections and the spray nozzles on the machine shall be thoroughly cleaned with a suitable cleaner.

E. Paint Application: The traffic markings shall be of the specified dimensions with clean, true edges and without sharp breaks in the alignment. A uniform coating of paint shall be obtained, and the finished markings shall contain no light spots or paint skips. Any stripes not having a uniform, satisfactory appearance, both day and night, shall be corrected.

F. Rate of Paint Application: The minimum rate of application for paint shall be as follows:

1. Four-inch solid parking stall strips: 18.5 gallons per mile.
2. Any other width stripe or markings: A direct proportion of the above.

G. Required Film Thickness: The minimum wet film thickness for all painted areas shall be 15 mils.

H. Alignment of Strips: Where a stripe deviates from the correct alignment, as indicated by the string line, by more than one inch in any 20-foot length, it shall be obliterated, and the stripe corrected as specified in paragraph "Corrective Measures".

3.3 PROTECTION

A. Protection of Stripes: All newly painted stripes, or other markings, shall be protected until the paint is sufficiently dry to allow vehicles to cross the marking without damage from the tires.

B. Repair of Damaged Areas: Any portions of the stripes damaged by passing traffic or from and other cause shall be repainted at the Contractor's expense.

3.4 DIMENSION AND ALIGNMENT TOLERANCE

A. Dimensions: No marking shall be less than the specified width. No markings shall exceed the specified width by more than 1/2". Alignment tolerances shall be as specified in this document.

B. Correction Rates: Any corrections of variation in the width of in the alignment of stripes shall not be made abruptly but the stripes shall be returned to the design width at the rate of at least 10 feet for each 1/2" of correction.

3.5 CORRECTIVE MEASURES

A. Painted markings failing to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred, damaged by traffic, or from other causes, shall be corrected at the Contractor's expense. Drip and spattered paint shall be removed. Whenever it is necessary to remove paint, it shall be done by means that will not damage the underlying surface of the pavement. When necessary to correct a deviation that exceeds the permissible tolerance in alignment, that portion of the stripe affected shall be removed and repainted according to these specifications.

B. Corrective Devices: Misalignment, defective surfaces, etc., shall be corrected by chemical agents, or by any other type of mechanical device that will effectively remove the paint without damage to the pavement surface, or prevent the reapplication of markings.

END OF SECTION

02660 WATER SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. A complete underground domestic/fire water supply system, with all necessary accessories indicated on drawings or specified in this section.
2. System shall start from an existing water main located either inside or outside the property line, having sufficient capacity, and extended to within 5 feet from the new building services or as indicated in the drawings and connection to lines furnished under other sections of specifications.
3. The system's total installation cost shall include the costs imposed by the utility, municipality, and federal agencies having jurisdiction. System's costs include, but are not limited to:

    a. Furnishing and installing the water meters.
    b. Tapping to the existing lines as shown on the drawings and the services extension to the point of use.
    c. Installation and permit fee.
    d. Meter and tapping fees.
    e. Reduced pressure backflow preventers for domestic water, full sized, aboveground, complete with concrete pad and fencing.
    f. Fire line, full sized, aboveground, double check valve backflow preventer, complete with OS&Y valves, concrete pad, chains, and tamper switches, with installation and applicable items Underwriters Laboratories (UL) listed and Factory Mutual (FM) approved.
    g. Piping, pipe coatings, valves, backflow preventers, valve boxes, meter box or vault, and any other item or accessory required for a complete water supply system installation from the point of connection to the point of use shall be either provided by the Contractor directly or paid for by the Contractor.
    h. Site restoration inside and outside the property line including road restoration.

4. The City of Key Colony Beach will only pay the meter deposits.

B. Related Sections:

1. 02221 - Excavating, Backfilling and Compacting for Utilities.
2. 03300 - Cast-In-Place Concrete.
3. 09900 - Painting of Unpainted Surfaces.
4. Division 15 - Mechanical Work.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:
1. A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. B88 Specification for Seamless Copper Water Tube.
3. D2241 Specification for Poly(Vinyl Chloride)(PVC) Pressure-Rated Pipe.

4. D1785 Specification for Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120.
5. D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

B. American National Standards Institute (ANSI), latest edition:

1. A21.4 Cement-mortar Lining for Cast-iron and Ductile Iron Pipe and Fittings for Water.
2. A21.6 Cast-iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids.
3. A21.8 Cast-iron Pipe Centrifugally Cast in Sand-lined Molds, for Water or Other Liquids.
4. A21.11 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.
5. A21.51 Ductile-iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids.
6. B16.22 Wrought Copper and Bronze Solder Joint Pressure Fittings for Piping under 3 Inches in Diameter.
7. B16.3 Malleable Iron Threaded Fittings, 150 and 300 Lbs.

C. American Water Works Association (AWWA), latest edition:

1. B300 Hypochlorites.
2. B301 Liquid Chlorine.
3. C203.66 Coal Tar Enamel Protective Coating for Steel Water Pipe.
4. C5OO Gate Valves - 3" through 48" for Water and Other Liquids.
5. C601 Disinfecting Water Mains.
6. C800 Threads for Underground Service Line Fittings.
7. C900 Polyvinyl Chloride Pressure Pipe.

1.3 SUBMITTALS

A. Submit manufacturer's literature on the following items before starting work.

1. Pipe and fittings, complete with gaskets and lubricants.
2. Valves.
3. Solder and flux.
4. Chemical solvents.
5. Sterilizing chemicals.
6. Test reports and certificates.
7. Backflow preventers.
8. Fire hydrants.
9. Detector check valve.

B. Certification: Submit certification that solder used for copper tubing joints is lead free and complies with specifications.

1.4 QUALITY ASSURANCE

A. Provide manufacturer's certificate of compliance or certified analysis with each shipment of materials used.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cast Iron Pipe:

1. ANSI S21.6 or A21.8, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply with ANSI A21.4.
3. For all water and fire mains inside the property line, for sizes 3 inches and above.

B. Ductile Iron Pipe:

1. ANSI A21.51, cement mortar lined, working pressure minimum 150 psi.
2. Standard thickness cement mortar lining shall comply with ANSI A21.4.
3. For all water and fire mains inside and outside the property line, for sizes 3 inches and above.

C. Polyvinyl Chloride Pipe:

1. AWWA C-900, DR 18, 150 psi minimum working pressure.
2. For all water and fire mains inside and outside the property line, for sizes 4 inches and above.

D. Polyvinyl Chloride Pipe:

1. ASTM D2241, SDR 26, 160 psi minimum working pressure.
2. For non-fireline use inside the property line, sized 3 inches and above.

E. PVC Pipe:

1. ASTM D1785, Schedules 40, and 80.
2. For sizes below 3 inches.

F. Copper Tubing:

1. ASTM B88, Type "K" or "L".
2. For sizes below 3 inches.

G. Galvanized Steel Pipe:

1. ASTM A120.
2. For sizes below 3 inches.
3. Allowed only where mandated by Monroe County for use in backflow preventer installations.

H. Joints:

1. ASTM D3139, PVC push-on joints.

    a. For 3 inches diameter and above:
    b. Rubber gaskets and lubricants: ASTM D3139.

2. Schedule 40 PVC piping below 3 inches diameter:

    a. Solvent welded according to manufacturer's written recommendations.
    b. Do not thread schedule 40 pipe.

3. Copper Water Tubing Joints:

    a. Sweat solder joints using tin-antimony solder and flux according to manufacturer's recommendations without using lead compounds.

4. Cast Iron and Ductile Iron Pipe:

    a. Push-on Joints: ANSI A21.11
    b. Rubber Gaskets and Lubricants: Applicable requirements of ANSI A21.11.

5. Galvanized Steel Pipe:

    a. AWWA C800.
    b. Joints shall be threaded.

6. Dissimilar Metal Joints: Consist of a sandwich-type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts (for installation between non-threaded ferrous and non-ferrous metallic pipe).

    a. Make gaskets full faced with outside diameter equal to the flange outside diameter.
    b. Provide full length bolt insulating sleeves.
    c. Make units of a shape to prevent metal-to-metal contact between dissimilar metallic piping elements.

l. Fittings and Special Items:

1. For PVC Piping:

    a. Fittings: ASTM D2466 and D3139.
    b. Solvent welding: Comply with manufacturers written recommendations.

2. For Copper Tubing:

    a. Sweat solder type red bronze or wrought copper complying with ANSI B16.22.
    b. Solder: 95-5 tin-antimony solder. Solder containing lead is not acceptable.

3. For Cast Iron and Ductile Iron Pipe:

    a. Suitable for 150 psi pressure rating.
    b. Pipe, fittings, and special items shall have standard thickness cement mortar lining complying with ANSI A21.4.
    c. Fittings and Special Items for Use with Push-on Joints Pipe: ANSI/AWWA C110 and A21.1 1.

4. For Galvanized Steel Piping less than 3 inches.

    a. Steel fittings shall be galvanized malleable iron.

b. Screwed fittings: ANSI BI 6.3.
c. Dresser-type fittings shall not be used.

J. Gate Valves Not in Fire Service.

1. Design gate valves for a WOG working pressure of 150 psi minimum.

a. Connect valves as required for the piping in which they are installed.
b. Valves smaller than 3 inches shall be rising stem.
c. Provide a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counterclockwise.

2. Valves Smaller Than 3 Inches:

a. Nibco Scott T-143.
b. Crane 431-UB.
c. Milwaukee 1150.
d. Other A/E accepted equivalent.

3. Valves 3 Inches and Larger:

a. Iron body, bronze mounted, AWWA C500.
b. Crane 461/462, Nibco Scott F-619, Milwaukee F-2882 or other A/E accepted equivalent.

K. Fire Service Valves.

1. Design valves for a WOG working pressure of 175 psi minimum. Valves shall be UL listed and FM approved.

a. Connect valves as required for the piping in which they are installed.
b. Provide gate valves with a clear waterway equal to the full nominal diameter of the valve. Valve shall open by turning counterclockwise.

2. Underground Gate Valves:

a. Crane 4621/2.
b. Other A/E accepted equivalent.

3. Check Valves:

a. Crane 375.
b. Nibco Scott F-908-B
c. Other A/E accepted equivalent.

L. Domestic Water Reduced Pressure Backflow Preventer.

1. Reduced Pressure Backflow Preventer: Full pipe sized and designed for a pressure drop not to exceed 13 psig at full flow, provided adequate water pressure may be maintained at the most remote water closet fixture while flushing plus a 5 psig safety margin.

2. Mount at heights complying with Monroe County Standards.

3. 2 Inches and Smaller:

    a. Watts Model FAE-909S, with bronze strainer and flanged adapter ends.
    b. Provide drain line with Watts Model 909 AG Series air gap, as directed by A/E.

4. 3 Inches and Larger:

    a. Watts Model 909-S-QT-FDA, or accepted equivalent with FDA approved epoxy coated strainer and quarter turn FDA epoxy coated ball valve shut-offs.
    b. Provide drain line with Watts Model 909 AG Series air gap as directed. Provide intermediate support as required.

5. Provide fenced enclosure complete with top cover and lockable access door, either on side or top of fence, as required.

M. Fire Service Double Check Valve Detector Assembly.

1. Double Check Valve Detector Assembly: Full pipe sized, designed for fire protection system use, UL listed, and FM approved.
2. Provide chains with locks and tamper switches. Installation of locks and tamper switches shall comply with NFPA 26 requirements and specifically Par. 21 (b), 2-3, and 2-6.2.3.
3. 3 Inches and Larger:

    a. Watts Model 709-DCDA or accepted equivalent, with AWWA epoxy coated UL listed and FM approved, OS&Y gate valves, CFM 5/8" x 3/4" meter and ball test cocks. Provide intermediate support as required.

4. Install according to manufacturer's published recommendations and Monroe County standard details.
5. Aboveground pipe and fittings shall be painted red.

N. Valve Boxes:

1. Cast Iron:

    a. Traffic type for use at all asphalted locations. Valve box shall be extension type with slide-type adjustment and flared base. Minimum metal thickness 3/16". Provide concrete minimum 8 inches deep and 8 inches around base of valve box.
    b. Cover shall have the work "Water".
    c. Provide ductile iron riser pipe of sufficient diameter to surround valve's bolted bonnet and sufficient length to enter 6 inches into valve box proper.
    d. Cast iron valve boxes may be used at non-traffic locations when approved by A/E.

2. Pre-Cast Concrete:

    a. Shall be used in non-asphalted areas, have the word "Water" embossed or permanently affixed on the cover.

b. Valve boxes shall be Brooks Products Inc. 36, 37, 38 or 66 series having either cover or lid weighting not less than 16 pounds. Size of valve box shall be adjusted to the size of the valve.
c. Provide extensions as required so depth of box reaches bottom of valve.

3. Precast Polymer Concrete:

a. Quazite by Strongwell, Lenoir City, TN or accepted equivalent.
b. The word "Water" shall be permanently embossed on the cover.
c. Provide standard colors as selected by A/E.
d. Not to used where exposed to vehicular traffic.

O. Meters and Vaults: Water meters and vaults shall comply with the utility company having jurisdiction in the area.

P. Thrust Blocks, Tie Rods, and Socket Clamps:

1. Provide concrete for thrust blocks according to Section 03300 Cast-in Place Concrete. Provide thrust blocks for all push-on type joint water piping, at each pipe junction, dead ends, and change in direction.
2. Provide tie rods and socket clamps underground near each building entrance and elsewhere as required to prevent piping from joint disassembly or blow-out.
3. Transitions to aboveground piping shall be done sufficiently underground to minimize requirements for aboveground tie rods and socket clamps.

Q. Miscellaneous Items:

1. Disinfection:

a. Chlorinating materials complying with the following:

1) Chlorine, Liquid: AWWA B301.
2) Hypochlorite, Calcium, and Sodium: AWWA B300.

R. Piping Materials:

1. Domestic Water Piping:

a. Exterior Aboveground: Copper Type "L", except at aboveground backflow preventers where steel piping shall be used according to Monroe County Standards.
b. Exterior Underground: PVC, cast iron, ductile iron, "K" or "L" copper tubing.

2. Fire Water Distribution Piping Underground: PVC, cast iron or ductile iron.
3. Fire Water Distribution Piping Exterior Aboveground: Ductile iron.
4. Transition of underground to aboveground material shall be at the valve box designated for the building. Aboveground PVC piping is not allowed.

S. Post Indicator Valves:

1. Iron body bronze mounted flanged non-rising stem, solid wedge disc with vertical indicator post, Kennedy Fig.701 with valve with Fig.541 indicator or Mueller valve A2052-6 with A20800 indicator. Install at least 40 feet from the building being served.
2. The post indicator shall be approved by the fire department having jurisdiction in the area.

T. Fire Hydrant: Comply with WWA C502 and Monroe County Standards. Install in the vicinity of siamese fire department connection.

1. Pipe and Joint Coating: Coal tar enamel complying with AWWA C203.
2. Disinfection:

a. Chlorinating materials complying with the following:

1) Chlorine, Liquid: AWWA B301.
2) Hypochlorite, Calcium, and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install main according to the requirements of authorities having jurisdiction and AWWA Standard C600.

3.3 HANDLING

A. Handle pipe and accessories to insure delivery to the trench in sound, undamaged condition.

1. Take care not to injure pipe coating.
2. Repair damaged coating or lining, if any, of any pipe or fitting in a satisfactory manner at no cost to the City of Key Colony Beach.
3. Do not place pipe or materials of any kind inside a pipe or fitting after coating has been applied.
4. Carry pipe into position. Do not drag it.
5. Pinch bars or tongs for aligning or turning pipe may be used only on bare ends of pipe.
6. Clean interior of pipe and accessories of foreign matter before lowering into trench.
7. Keep pipe clean during laying operations by plugging or other accepted method.
8. Inspect pipe for defects before installation.
9. Replace material found defective before or after laying with sound material without cost to the City of Key Colony Beach.
10. Store rubber gaskets not immediately installed in a cool, dark place.

3.4 PIPE CUTTING

A. Cut pipe in a neat and professional manner without damage to the pipe.

1. Cut with an accepted type of mechanical cutter unless otherwise recommended by manufacturer and authorized by A/E.

    a. Use a wheel cutter when practical.

3.5 LOCATING

A. Outside property Line:

1. Do not lay pipe closer horizontally than 10 feet from the edge of a sewer line except where bottom of water pipe will be at least 18 inches above the top of the sewer pipe.
2. For further requirements comply with Monroe County Standards.

B. Inside property Line:

1. Do not lay pipe closer horizontally than 5 feet from the edge of a sewer line except where bottom of water pipe will be a least 12 inches above the top of the sewer pipe.
2. Comply with Florida Building Code (FBC) - Plumbing, paragraphs 608.3 and 608.4.
3. Where water lines do not meet the above conditions, encase sewer line in concrete, minimum 4 inches thick, for a distance of at least 5'-1" each side of the crossing, or sewer lines shall be made of cast iron pipe with no joint located within 5'-1" horizontally of crossing. The water line may also be sleeved, with the edges of the sleeve being caulked, for a distance of 5'-1" horizontally from the edge of the sewer line.
4. Water lines shall cross above sewage force mains a minimum of 2 feet above force main.

C. Do not lay water lines in same trench with sewer, gas, or fuel lines or electrical conduit.

D. Maintain a minimum vertical separation of 12 inches between pipes where non-ferrous metallic pipe (copper) crosses any ferrous piping material.

3.6 PLACING AND LAYING

A. Carefully lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other authorized equipment.

1. Do not drop or dump any water line materials into trench.
2. Avoid abrasion to pipe coating.
3. Lay pipe, except where necessary to make connections with other lines, with bells facing direction of laying.
4. Rest full length of each section of pipe solidly upon pipe bed, with recesses excavated to accommodate bells, coupling and joints.
5. Take up pipe that has had grade or joint disturbed after laying.
6. Do not lay pipe in water or when trench conditions are unsuitable for the work.
7. Securely close open end of pipe, fittings and valves when work is not in progress.
8. Keep water out of trench until jointing work is complete.
9. Repair damage to existing piping, or to new piping coating or lining in a satisfactory manner without cost to the City of Key Colony Beach.
10. Valve, plug, or cap and anchor pipe ends left for future connections.

11. Place a metallic location tape above all plastic lines, Seton 37220 or 37222 as required.
12. Provide clean sand minimum 6 inches all around plastic lines.

3.7 JOINTING

A. Cast Iron Pipe: Install push-on type joints according to AWWA C600.

B. Galvanized Steel Pipe: screw joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an acceptable graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

C. Copper Tubing: Sweat solder fittings using solder and flux. Connections made with solder containing lead are not allowed. Joints with lead shall be disassembled, solder remaining removed, and reconnected using the specified solder, at no additional cost to the City of Key Colony Beach.

D. Insulating Joints: Install according to manufacturer's requirements.

E. Connections between different type of pipe and accessories shall be made with transition fittings accepted by A/E.

3.8 SETTING OF VALVES AND BOXES

A. Install where shown or specified and set plumb at finished grade.

B. Valve boxes shall be centered on the valves.

1. Boxes shall be installed over each outside gate valve unless otherwise shown.
2. Where feasible, valves shall be located outside the area of roads and parking.
3. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

3.9 METER, BACKFLOW PREVENTER, DETECTOR CHECK VALVE, AND VAULTS

A. Install according to local utility company standards, as specified, and as indicated on drawings.

3.10 FIRE HYDRANTS

A. Hydrants shall be installed according to the fire department having jurisdiction in the area.

3.11 THRUST BLOCKS

A. Plugs, caps, tees, and bends deflecting 22.5 degrees or more, either vertically or horizontally, on water lines 6 lines in diameter or larger, shall be provided with thrust blocking, or metal tie rods and clamps, or lugs.

B. Thrust blocking shall be concrete of a mix not leaner than 1 cement: 2-1/2 sand: 5 gravel and having a compressive strength of not less than 2,500 psi after 28 days.

C. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored.

D. Unless otherwise indicated the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth.

E. The sides of thrust blocks not subject to thrust may be poured against forms.

F. The area of bearing shall be as shown.

G. Blocking shall be placed so that the fitting joints will be accessible for repair.

H. Steel rods and clamps shall be protected by galvanizing or by coating with coal tar enamel coating.

3.12 HYDROSTATIC PRESSURE TEST

A. Test:

1. After pipe is laid, joints completed, and trench partially backfilled, leaving joints exposed for examination, subject newly laid water piping or any valved section of water piping to a one hour, 150 psi hydrostatic pressure test, unless otherwise specified.
2. Open and close each valve several times during test.
3. Carefully examine exposed pipe, joints, fittings and valves during the partially open trench test.
4. Replace or remake joints showing visible leakage as necessary.
5. Remove and replace cracked or defective pipe, joints, fittings, or valves discovered after this pressure test with sound material.
6. Repeat test until results are satisfactory.
7. Replace, repair and retest as required at no cost to the City of Key Colony Beach -
8. Test shall be according to and accepted by the local utility company.
9. Test shall be also accepted by the A/E.

B. Time for Making Test:

1. Except joint material setting or where concrete reaction backing requires a 5-day delay, pipelines or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage any time after partial completion of backfill.
2. Cement mortar lined pipe may be filled with water as recommended by manufacturer before being subjected to pressure test.

C. Concurrent Hydrostatic Test and Disinfection:

1. Despite sequence of tests employed, results of pressure tests and disinfection shall be satisfactory as specified.

   a. Replace, repair, or retest as required at no cost to the City of Key Colony Beach.

2. Pressure test and disinfection may be conducted separately, or hydrostatic tests and disinfection may be conducted concurrently, using water tested for disinfection to accomplish hydrostatic test.
3. If water is lost when treated for disinfection and air is admitted to piping unit being tested, or if any repair procedure results in contamination of piping unit, repeat disinfection procedures until satisfactory results are obtained.

3.13 DISINFECTION

A. Before acceptance of potable water operation, disinfect each unit of completed water piping as prescribed by AWWA C601.

3.14 CLEANUP

A. Upon completion of installation of water lines and appurtenances, remove debris and surplus materials resulting from work.

3.15 TESTS

A. Cost of tests by Contractor.

END OF SECTION

02720 STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-in-place Concrete.

1.2 REFERENCES

A. The American Society for testing and Materials (ASTM), latest edition:

1.	A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2.	A74	Specification for Cast Iron Soil Pipe and Fittings.
3.	C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
4.	C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
5.	C564	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6.	D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. The American Association of the State Highway Transportation Officials (AASHTO).

C. Florida Department of Transportation (FDOT), latest edition, Standard Specifications for Road and Bridge Construction.

1. Delete the basis of payment and other pay measurement requirements from FDOT specifications.
2. Payment for work specified in this section will be included as part of lump sum bid for entire project according to Construction Documents.

D. Monroe County Environmental Resource Protection Codes - Drainage Wells.

E. County Health Department - Drainage Wells.

F. Cast Iron Soil Pipe Institute.

1.3 SUBMITTALS

A. Submit properly identified shop drawings and manufacturer's catalog cuts, technical data, and certificates on the following for review before starting work.

1. Precast concrete structures.
2. Frames and grates.
3. Pipe.
4. Test reports.
5. Plastic filter fabric.

B. Include manufacturer's certificates of compliance or certified analysis according to applicable standards with each shipment of material.

1.4 QUALITY ASSURANCE

A. Work shall be performed according to plans and specifications in a neat and accurate manner.

B. Wells shall be installed by a qualified well driller, licensed by the State of Florida, actively engaged in well drilling work and with a minimum of 5 years experience in installing wells.

C. Contractor shall be totally responsible for the design, construction, installation, development, and testing of disposal wells to provide the City of Key Colony Beach with completed wells adequate for the performance required of the wells as indicated on the drawings and as specified.

1.5 STORAGE

A. Keep materials, structures, equipment, and appurtenances stored on the site clean and free of foreign materials.

B. Replace damaged items at no cost to the City of Key Colony Beach.

1.6 PROJECT CONDITIONS

A. Comply with Standards and Regulations of Florida State and Monroe County Environmental Resource Protection Codes for drainage well and detention tanks.

PART 2 PRODUCTS

2.1 MATERIALS

A. High Density Polyethylene Storm Drainage Pipe:

1. Advance Drainage Systems, Inc.
2. Hancor, Inc.

B. Corrugated Metal Pipes:

1. Helically corrugated aluminum alloy-round pipe shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.
2. Helical corrugated aluminum-alloy pipe perforated shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.

    a. Perforated pipe shall have perforations of 1/4" to 3/8" diameter holes at ± 2-3/4" o.c., with a minimum of 114 holes per linear foot.

3. Helically corrugated steel pipe shall comply with AASHTO M36. Pipe shall be fully bituminous coated according to the requirements of AASHTO M190, for Type A. Thickness: 16-gage unless otherwise indicated on the drawings.

4. Joint: Locking bands with a rubber or neoprene gasket for a flexible watertight joint. Locking band shall comply with AASHTO M36 and gasket shall comply with ASTM C443.

C. PVC Sewer Pipe and Fittings: ASTM D3034 for SDR 35.

1. Joints: Bell spigot type, elastomeric gasket joints.

D. Cast Iron Soil Pipe: Comply with ASTM A74 for Cast Iron Soil Pipe and Fittings.

1. Joints: Provide with roll-on joints complying with ASTM C564 and Cast-Iron Soil Pipe Institute recommendations for compression joints.

E. Black Steel Pipe: Comply with ASTM A53 for schedule 40 Pipe and Fittings.

F. Well Casing: Black steel pipe with a minimum wall thickness of 5/16", diameter as indicated on drawings, complying with ASTM A53.

1. Casing cover as specified on drawings.

G. Detention Tank and Well Manhole: Cast-in-place concrete or precast concrete with hinged covers and frames as specified on drawings.

H. Catch Basins and Storm Manholes: Cast-in-place concrete or precast concrete, with cast iron frames and hinged grates as indicated on drawings and specified in Section 425 of FDOT Specification.

I. Ballast Rock: Ballast rock shall be obtained from fresh water local sources. When subjected to ASTM C131 tests, the loss shall not exceed 40 percent. Ballast rock designated as 2 inches shall fall within the 3/4" to 2-1/2" range.

J. Plastic Filter Fabric: Plastic filter fabric shall comply with Section 985 of the FDOT "Plastic Filter Fabric" for the piping trench.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Excavation and Backfilling for Trenches and Manholes: As specified in Section 02221-Excavating, Backfilling, and Compaction for Utilities.

B. Placing Pipe:

1. Carefully examine each pipe before laying. Do not use defective or damaged pipe.
2. Lay pipelines to grades and alignment indicated.
3. Provide proper facilities for lowering sections of pipe into trenches.

4. Inspect pipe in place before backfilling and remove and replace those damaged during placement at no cost to the City of Key Colony Beach.
5. Storm Sewer Pipe:

    a. Shape bottom of trench by hand to give uniform circumferential support to lower one fourth of each pipe.
    b. Where applicable, lay pipe upgrade with tongue or spigot ends pointing in direction of flow.
    c. Lay each pipe true to line and grade indicated on drawings and in such a manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
    d. Keep interior of storm sewer free of dirt and superfluous materials as work progresses.
    e. Keep a suitable swab or drag in pipe where cleaning after laying is difficult due to small pipe size and pull forward past each joint immediately after each jointing has been completed.
    f. If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.
    g. Keep trenches for sections of sewer free from water until pipe-jointing material has set and trench backfilled.
    h. Do not lay pipe when condition of trench or weather is unsuitable for such work.
    i. Keep open ends of pipes and fittings securely closed at times when work is not in progress.
    j. If pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase pipe in concrete or support it on a concrete cradle.

C. Seepage Trenches:

1. Excavate trench to depth indicated.
2. Place filter fabric and ballast rock to the level of the proposed pipe.
3. After pipe has been laid and approved, place ballast rock carefully so as not to displace pipe and tamp carefully.
4. Fill the trench to level indicated with ballast rock of the size or sizes indicated.
5. Install filter fabric as indicated on plans. Backfill and compact according to Section 02221.
6. Provide concrete slab cover and specified in "Concrete Work", Division 3, and as indicated in drawings.

D. Concrete Structure:

1. Concrete structures shall be constructed according to plans and as specified on Concrete Work - Division 03300, excavation and backfill as specified in Section 02221 - Excavating, Backfilling, and Compaction for Utilities, Monroe County, and as indicated on the drawings.
2. Leveling courses at structures for manholes and catch basins shall be 3 to 12 inches and according to Monroe County.

E. Detention Tank: Detention tank shall be constructed as indicated on drawings.

F. Catch Basins and Manholes: Frames and Inlet Grates or Solid Covers: Set the cast iron frames and grates in a bed or mortar and carefully adjust to elevations shown on the drawings.

G. Disposal Well:

1. Construction:

a. Drill and construct as indicated on drawings.
b. Provided casing with drive shoe and other necessary accessories.

2. Required Discharge: Provide sufficient length to discharge a minimum of _____ gpm in a saline ground water table with 3,000 ppm chloride or more.

a. Drive well casing to a seat in rock before developing well capacity. The entire cost of the above-described disposal wells shall be included in the Contractor's lump sum price bid. No additional payment will be made.

3. Well manhole shall be constructed as indicated on drawings and as specified in Section 02221 - Excavation, Backfilling and Compacting for Utilities.

3.3 CLEAN UP

A. If drainage well has been used for disposal of water from dewatering operation, upon completion of dewatering clean out the detention tank and perform capacity tests as specified to insure that the disposal well is capable of disposing of storm water as indicated on drawings and specified in this Section.

3.4 FIELD QUALITY CONTROL

A. Test according to the following:

1. Pumping from well, for a minimum of 2 hours duration to demonstrate, to the satisfaction of the A/E, that the well has the capacity to absorb the amount of disposal indicated on drawings and specified in this Section. Test shall be paid by the Contractor.

END OF SECTION

02731 SANITARY SEWER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Sanitary sewer system including necessary accessories indicated on drawings and specified in this section. Contractor shall include in his bid price any amount imposed by the utility company having jurisdiction to connect into the existing sanitary system.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-in-Place Concrete.
3. Division 15 - Mechanical Work.

1.2 REFERENCES

A. American Society for testing and Materials (ASTM), latest edition:

1. A74 Specification for Cast Iron Soil Pipe and Fittings.
2. C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
3. D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
4. D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
5. D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
6. F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. Cast Iron Soil Pipe Institute.

C. Florida Building Code (FBC) - Plumbing.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature including data on pipe before starting work.

B. Submit test reports and certificates for approval.

1. Certificate: Submit manufacturer's certificate of compliance or certified analysis according to applicable standards for each shipment of materials.

1.4 PRODUCT STORAGE

A. Store materials on site and keep clean and free of foreign materials. Any damaged items shall be replaced at no additional cost to the City of Key Colony Beach.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings:

1. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings:

a. Comply with ASTM D3034 for SDR35 and except where indicated otherwise on the drawings. Use bell and spigot type pipe.
b. The pipe shall be colored with a different color from water pressure pipe and force main for in ground identification as sewer pipe.

2. Cast Iron Soil Pipe and Fittings: Comply with ASTM A74 for cast iron soil pipe and fittings.

B. Pipe Joints:

1. PVC Sewer Pipe: Elastomeric gasket joints providing a watertight seal.
2. Cast Iron Soil Pipe and Fittings: Furnish with roll-on joints complying with ASTM C564 and Cast-Iron Pipe Institute Recommendations for Compression Joints.

C. Manholes: Cast in place concrete or precast concrete with cast iron frames and hinged covers as indicated on drawings and as specified in Section 03300 - Cast-in-Place Concrete.

D. Cleanouts: Commercially manufactured wye branches and as indicated on drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 LOCATION

A. Where location of sewer is not clearly defined, do not locate sewer closer horizontally than 10 feet to a water supply main or service line, except that where bottom of water pipe will be at least 18 inches above top of sewer pipe.

1. Where gravity-flow sewers cross above waterlines, fully encase sewer pipe for a distance of 10 feet on each side of crossing in concrete or provide acceptable pressure pipe with no joint closer horizontally than 3 feet to crossing.
2. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

B. Excavation and backfilling for trenches and manholes shall be as specified in Section 02221 - Excavating, Backfilling, and Compacting for Utilities.

3.3 INSTALLATION

A. Placing Pipe:

1. Shape bottom of trench by hand to give uniform circumferential support to the lower fourth of each pipe.
2. Where applicable, pipe laying shall proceed upgrade with tongue or spigot ends pointing in direction of flow.
3. Lay each pipe true to line and grade indicated on drawings and in such manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
4. As work progresses, clean interior of sewer of dirt and superfluous materials.

    a. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after joint has been completed.
    b. If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.

5. Keep trenches for all sections of sewer free from water until the pipe-jointing has set and trench backfilled.

    a. Do not lay pipe when condition of trench or weather is unsuitable for such work.

6. At time is not in progress, keep open end of pipes and fittings securely closed.

    a. When conditions prevent pipe from being adequately supported on undisturbed earth or tamped backfill, encase the pipe in concrete or support it on a concrete cradle.
    b. Pipe and fittings shall be installed according to ASTM D2321.

B. Pipe Joints:

1. Polyvinylchloride (PVC) Pipe: Install joints according to ASTM D3212 and approved manufacturer's installation procedures.
2. Cast Iron Soil Pipe: Install roll-on joints according to Cast Iron Soil Pipe Institute for compression joints.

C. Manholes:

1. Construction: As indicated on drawings and as specified in Section 02221 - Excavating, Backfilling and Compacting for Utilities.

    a. Frames and Covers: Set the cast iron frames and covers in a bed of mortar and carefully adjust to elevations shown on drawings.

D. Cleanouts: Install commercially manufactured wye branches where indicated on the drawings. Cutting into pipe for connection will not be allowed except in special cases when accepted by the A/E.

E. Pipe Connections to Existing Structures: Make finished work to comply as nearly as practicable to essential applicable requirements for new structures, including all necessary

concrete work, cutting, and shaping. Coordinate work with utility company having jurisdiction.

3.4 TESTING AND INSPECTION

A. Inspect sewer lines by checking each section for alignment.

1. A full circle of light shall be seen by looking through the pipe at a light held at opposite end of the section of sewer line being inspected.
2. Make any corrections required in line or grade.

B. Leakage Tests:

1. Test lines for leakage by either infiltration tests or exfiltration tests, as appropriate.
2. Backfill trench before testing for leakage, up to at least the lower half of pipe.
3. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving joints uncovered to allow inspection.
4. Correct visible leaks encountered regardless of leakage test results.
5. Measure infiltration when water table is two feet or more above top of pipe at upper end of pipeline section to be tested, using a suitable weir or other acceptable device.
6. When infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both water table and top of pipe at the upper end of pipe to be tested.
7. Allow filled line to stand until pipe has reached its maximum absorption, but not less than 4 hours. After absorption, reestablish the head.
8. The amount of water required to maintain this water level during a 2-hour test or exfiltration test shall not exceed 0.4 gallons/inch diameter per 100 feet of pipeline per hour.
9. When leakage exceeds maximum amount specified, satisfactory correction shall be made, and retesting accomplished.
10. Testing, correction and retesting shall be made at no additional cost to the City of Key Colony Beach.

END OF SECTION

02735 WASTEWATER DRAINAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-in-Place Concrete.
3. 15175 - Tanks

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
2. D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
3. D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
4. D2855 Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
5. D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

B. American Association of State Highway and Transportation Officials (AASHTO) Publications, latest edition:

1. M-196 Corrugated Aluminum Alloy Culverts and Under Drains.
2. M-190 Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.

C. Monroe County Standards.

D. Florida Department of Transportation (FDOT) Specification, latest Edition.

1.3 SUBMITTALS

A. Submit properly identified shop drawings and manufacturer's catalog cuts, technical data, and certificates on the following before starting work:

1. Precast concrete structures or fiberglass or plastic structures.
2. Frames and covers.
3. Pipe.
4. Floor drains (vandal proof).
5. Plastic filter fabric.
6. Test reports.

B. Include manufacturer's certificates of compliance or certified analysis according to applicable standards with each shipment of material.

1.4 PRODUCT STORAGE

A. Keep materials, structures, equipment, and appurtenances stored on the site clean and free of foreign materials.

1. Replace damaged items at no cost to the City of Key Colony Beach.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Pipe: Helical Corrugated Aluminum Alloy Pipe:

1. Non-Perforated: Comply with AASHTO M-196.
2. Perforated:

a. Comply with AASHTO M-196.
b. Perforations: 1/4" to 3/8" diameter holes at ± 2-3/4" o.c. with a minimum of 114 holes per linear foot.

3. Polyvinylchloride (PVC) Drainage Pipe and Fittings:

a. Comply with ASTM D3034 for SDR35 except where indicated. Use bell and spigot type pipe.
b. Pipe Identification: Pipe shall be a different color from water pressure pipe and force main for in-ground identification as sewer pipe.

B. Joints:

1. For Corrugated Pipe: Band couplers as indicated.
2. For PVC Drainage Pipe and Fittings: Elastomeric gasket joints complying with the requirements of ASTM D3212 providing a watertight seal or solvent-cemented joints complying with ASTM D2855 providing a watertight seal.

C. Manhole: 24-inch diameter, helical corrugated aluminum alloy pipe or precast concrete with cast iron frame and hinged cover as indicated.

D. Concrete Slab: Provide as indicated, using 3000 psi concrete.

E. French Drain Trench:

1. Ballast Rock:

a. Obtain from local fresh water sources.
b. When subjected to ASTM C131 tests, loss shall not exceed 40 percent.
c. Ballast rock designated as 2 inches shall fall within the 3/4" to 2-1/2" range.

2. Plastic Filter Fabric:

a. Poly Filter "X" by Carthage Mills.
b. Mirafi 140N by TenCate Geosynthetics Americas .
c. Typar Style 3401 by Dupont.
d. Propex 4545 by Amoco.

F. Floor Drain: Josam or Zurn as indicated. Floor drain shall be vandalproof.

G. Grease Interceptor Tanks: Shall comply with Master Specifications section 15175 - Tanks

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Trenches:

1. Excavation and backfilling for trenches, manholes, and grease trap shall be as specified in Section 02221-Excavation, Backfilling, and Compaction for Utilities.

B. Grease Trap: Install as indicated and according to manufacturer's recommendations.

C. Placing Pipe:

1. Carefully examine each pipe before laying; do not use defective or damaged pipe.

a. Lay pipelines to grades and alignment indicated.
b. Provide proper facilities for lowering sections of pipe into trenches.
c. Inspect pipe in place before backfilling and remove and replace those damaged during placement at no cost to the City of Key Colony Beach.

2. Corrugated Pipe: Laying shall proceed with separate sections joined firmly together, with outside lap of circumferential joints pointing upstream and with longitudinal laps on sides.
3. Wastewater Drainage Pipe:

a. Shape bottom of trench by hand to give substantially uniform circumferential support to lower 1/4 of each pipe.
b. Where applicable, pipe laying shall proceed upgrade with tongue or spigot ends pointing in direction of flow.
c. Lay each pipe true to line and grade indicated on drawings and in such a manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
d. As work progresses, clean interior of storm sewer of dirt and superfluous materials.

1) Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after joint has been completed.

2) If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.

e. Keep trenches for sections of sewer free from water until pipe-jointing material has set and trench backfilled.

1) Do not lay pipe when condition of trench or weather is unsuitable for such work.

f. Keep open end of pipes and fittings securely closed at times when work is not in progress.

1) When other conditions are such that pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase pipe in concrete or support it on a concrete cradle.
2) Pipe and fittings shall be installed according to ASTM D2321.

4. Pipe Joints:

a. Polyvinylchloride (PVC) Pipe: Install joints according to ASTM D3212 and manufacturer's installation recommendations.
b. Helical Corrugated Aluminum Pipe: Install band couplers according to manufacturer's recommendations.

D. Manhole:

1. Construction: As indicated on the drawings.
2. Frames and Covers: Set the cast iron frames and covers in a bed of mortar and carefully adjust to elevations indicated.

E. French Drain Trench:

1. Excavate trench to depth indicated.
2. Place filter fabric and ballast rock to the level of the proposed perforated aluminum pipe.
3. After pipe has been laid and accepted, continue placing ballast rock carefully to avoid displacement of pipe, and tamp carefully.
4. Continue installation of filter fabric as indicated.
5. Fill trench to level indicated with ballast rock of size or sizes indicated.
6. Backfill and compact according to requirements of Section 02221 - Trenching, Backfilling, and Compaction for Utilities.
7. Finish construction of trench as indicated.

F. Grease Interceptor Tanks: Install in accordance with Plans and manufacturer’s recommendations, whichever is most stringent. Excavate hole for grease interceptor tanks according to Section 02221 - Trenching, Backfilling, and Compaction for Utilities, except as noted in the following.

1. Perform excavating of every description and of whatever satisfactory or unsatisfactory material encountered to accommodate grease interceptor tanks at depths indicated on plans.

2. Pile materials suitable for backfilling a sufficient distance from banks of excavation to prevent slides or cave-ins.
3. Keep surface drainage of adjoining areas unobstructed.
4. Remove excavated materials not required nor suitable for backfill from site.
5. Remove water by pumping or other acceptable method and discharge at a safe distance from excavation.
6. Make hole of necessary width and depth for proper laying of grease interceptor tanks, with bank nearly vertical as practical.
7. Grade bottom of excavation accurately to provide uniform bearing and support for each section of grease trap according to plans and manufacturer's recommendations.
8. When unsatisfactory soil, incapable of properly supporting the grease trap, is encountered at the bottom of the excavation, remove such soil to a minimum depth of 12 inches and substitute this unsuitable material by a minimum of 12 inches of compacted ballast rock at no cost to the City of Key Colony Beach.
9. Over-depths in unstable soil excavation and unauthorized over-depths shall be at the expense of the Contractor.

G. Excavation of Unclassified Material: Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, debris, garbage, silt, rubble, or other materials.

    1. No adjustment will be made in the Contract Price because of the presence (or absence) of these or other materials.

H. Protection or Removal of Utility Lines:

    1. Protect existing utility lines indicated on drawings (or the locations of which are made known to Contractor before excavating and trenching) specified to remain, including utility lines constructed during excavation operations, from damage during excavation, backfilling, and compacting operations.

        a. If such new or existing utility lines are damaged during excavation, backfilling, and compacting operations, repair or replace at no cost to the City of Key Colony Beach.

    2. When utility lines specified to be removed or replaced are encountered within the area of operations, issue notices in ample time for measures to be taken to coordinate necessary interruption of services.
    3. Location of existing underground utilities shown are approximate. Excavations shall be done using extreme care to avoid damage to any existing underground utilities. Any damage occurring shall be repaired immediately at the Contractor's expense to the complete satisfaction of the A/E.
    4. Repair of Damage to Unknown Existing Utility Lines: Existing utility lines not shown on drawings and are damaged during excavation operations shall be repaired by Contractor and an adjustment to the Contract Price will be made according to Instructions to Bidders and General Conditions.

I. Backfilling:

    1. General:

        a. Coordinate backfilling with testing of utilities.

b. Leave sheeting in place where damage is likely to result from withdrawal.
c. Carefully backfill excavation with satisfactory materials specified.
d. Bring backfill up evenly in all sides in 9-inch maximum layers, loose depth, and thoroughly and carefully compact with mechanical or hand tampers.
e. Take care not to damage the grease trap or manhole by excessive tamping.
f. Excavation pits improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, refilled and compacted, with the surface restored to the specified grade and compaction at the Contractor's expense.
g. Materials and density shall be as previously specified for trenches depending upon location of the structure.

2. Compaction:

a. Material may be compacted by a hand tamper, a powered hand tamper, or mechanized power tamper provided such compaction meets the required density as specified.
b. Backfilling and compacting by means of hydraulic methods will not be allowed except as accepted by A/E.

1) Compact each layer to not less than the percentage of maximum density specified below, determined according to ASTM D1557, Method D:

Fill and Backfill	Cohesionless Soil
Under grass areas	85%
Under pavements	95%

3.3 TESTING

A. See Section 02221, paragraph related to Testing, two tests minimum at location chosen by A/E.

B. Abrasion tests for each size and type of ballast rock. Material will be rejected if not in compliance with requirements.

END OF SECTION

02840 TRAFFIC SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02511 - Asphaltic Concrete Paving.

1.2 REFERENCES

A. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration.

B. Florida Department of Transportation (FDOT) Specifications for Road and Bridge Construction.

C. Monroe County Standards.

D. Florida Building Code (FBC) for accessibility requirements.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data before starting work.

1. Shop Drawings: Submit shop drawings for review, indicating construction details, sizes, elevations, installation requirements, gauges, thickness of materials, colors, and other information necessary to show compliance with the requirements of this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sign Panels:

1. Galvanized steel according to the applicable requirements of FDOT Section 700.
2. Size, shape, and color as indicated on the drawings or as specified.

B. Sign Support Posts:

1. Galvanized steel according to the applicable requirements of FDOT Section 700.
2. Size, shape, and color of posts and mountings as indicated on drawings.

C. Aluminum components are not allowed.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Sign Panels and Supports:

1. Install according to applicable requirements of the following:

a. FDOT Section 700 "Highway Signing".
b. Standard Road Details of Monroe County.
c. Manual on Uniform Traffic Control Devices.
d. Accepted shop drawings and as indicated on drawings.

END OF SECTION

03100 CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03200 - Concrete Reinforcement
2. 03300 - Cast-in-Place Concrete
3. 04221 - Concrete Unit Masonry

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1.	D994	Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
2.	E154)	Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1.	ACI 117/117R	Tolerances Compatibility for Concrete Construction.
2.	ACI 301	Specifications for Structural Concrete.
3.	ACI 318	Building Code Requirements for Structural Concrete.
4.	ACI 347R	Guide to Formwork for Concrete.

B. Qualifications:

1. Formwork Engineer: Professional engineer, with Florida registration and experience in design of formwork and related items.
2. Formwork Contractor: Florida licensed contracting firm having 5 years successful experience in fabrication and erection of formwork systems of similar scope and complexity as required for this project. Contractor shall have sufficient capacity to produce formwork without causing delay in work.

1.4 FORMWORK AND RESHORING DESIGN

A. Formwork:

1. Comply with Chapter 4 of ACI 301.
2. Formwork engineer shall perform or oversee design, drawings, erection, and removal.
3. Design according to ACI 117 and ACI 347, including provisions for construction loads and placing equipment to be used on project.
4. Verify strength and stiffness of in-place building elements to resist required loads and restrict deformations to specified tolerances.

5. Earth cuts shall not be used as forms for vertical surfaces. Natural rock formations maintaining a stable vertical cut may be used as side forms. Comply with OSHA's "Trench Safety Act".
6. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.
7. Removal Strength:

    a. Wall forms and column forms may be removed 12 hours after pouring.
    b. Slabs supported by precast joists may have forms removed as follows:

        1) Joist spacing 4'-6" or less, 24 hrs.
        2) Joist spacing between 4'-6" and 6'-8", 48 hrs.
        3) Joist spacing between 6'-8" and 8'-8", 72 hrs.

    c. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength. Beams shall be reshored immediately upon removal of forms.
    d. In addition to the above, flat slab forms and stair slab forms shall not be removed for 5 days. Upon removal of forms, reshores shall be placed and remain in place until concrete is 14 days old.

B. Reshoring:

1. Design reshoring to resist active loads.
2. Space shoring so no lower floor or member will be excessively loaded from design live loads or will induce tensile stress in concrete members where no reinforcing steel is provided.
3. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
4. Consider special loading requirements to support load of special elements where elements of similar size and capacity do not exist in supporting structure below.

1.5 FORMWORK SUBMITTALS

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items.

B. Formwork:

1. Submit shop drawings, signed, and sealed by formwork engineer, for fabrication and erection of specific finished concrete surfaces as indicated. Show construction of forms as required.
2. A/E’s review is for general applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility and will not be reviewed.

C. Reshoring:

1. Submit shop drawings, signed, and sealed by formwork engineer, for reshoring system showing:

    a. Arrangement and sequencing of reshores required.
    b. Specific areas where reshores do not align vertically.

c. Required installation procedures.
d. Removal criteria.

2. Submit calculations showing:

a. Loading diagrams for each floor or differently loaded area showing maximum imposed loads at each critical sequence.
b. Ratio of total load to strength at actual age.
c. Verification of member strength where shores do not align vertically.
d. Verification of structure to resist required lateral loads.

D. Foundations for Formwork and Reshoring:

1. Submit shop drawings, signed, and sealed by formwork engineer, or include with formwork and reshoring shop drawings, showing:

a. Subgrade preparation required including compaction and moisture control.
b. Size and description of sill assemblies.

E. Formwork Removal:

1. Authorization for Removal: Formwork engineer shall furnish a signed and sealed report establishing the criteria for removal of formwork, shoring, and reshoring. Deviation from established criteria is not allowed.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete:

1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, or other acceptable panel-type materials. Provide continuous, straight, smooth, exposed surfaces.
2. Furnish in largest practicable sizes to minimize number of joints and to comply with joint system shown on drawings.
3. Provide form material with sufficient thickness to withstand pressure of newly placed concrete, restricting bow and deflection to specified tolerances.
4. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
5. Where concrete is scheduled to have Smooth Rubbed Finish (Sm Rb-Fn), use plywood complying with U.S. Product Standard PS-1 "B-B (Medium Density Overlaid Concrete Form", Class I, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces to be concealed in finished structure with plywood, lumber, metal, or other material.

C. Forms for Textured Finish Concrete:

1. Form textured finish concrete surfaces with units of face design, arrangement, and configuration as shown on drawings or as required to match A/E’s control sample.

2. Provide form supports to ensure stability of textured form liners.

D. Cylindrical Columns and Supports:

1. Form round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection.
2. Prefabricated fiberglass or steel forms may be used.
3. Provide units with sufficient wall thickness to resist loads imposed by wet concrete and restrict deformation to specified tolerances.

E. Form Ties: Ties that leave plastic tube lined holes through members are not allowed.

F. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

G. Forming Accessories: CRD-C572-74 polyvinyl chloride (PVC).

1. Waterstops: Flat dumbbell type at construction joints and center bulb type at building expansion joints.
2. Chamfers: 1/2" radius on outside corners of exposed-to-view concrete unless drawings show other size or shape.
3. Drips: 3/8" wide x 1/2" high drip groove placed 3/4" back from edge in cast-in-place exterior soffits.

H. Premolded Expansion Joint: ASTM D994, 1/2" thick.

I. Vapor Retarder:

1. Provide moisture retarder cover over prepared base material where indicated.
2. Use polyethylene sheet not less than 6 mils thick or other materials resistant to decay when tested according to ASTM E154.

PART 3 EXECUTION

3.1 FORMS

A. Erect, support, brace, and maintain formwork to support applied vertical and lateral loads until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown to obtain accurate alignment, location, grades, and level and plumb work in finished structures.

1. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
2. Use selected materials to obtain required finishes.

3. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

1. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
2. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary opening where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete.

1. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.
2. Locate temporary openings on forms at inconspicuous locations.

F. At chamfers exposed to view, provide corners and edges with 1/2" radius PVC accessories to produce uniform smooth lines and tight edge joints, unless otherwise indicated or accepted by A/E.

G. Form Ties:

1. Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
2. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1- 1/2" inside concrete.
3. Unless otherwise shown, provide form ties that will not leave holes larger than 1 inch diameter in concrete surface.

H. Provisions for Other Trades:

1. Provide openings in concrete formwork to accommodate work of other trades.
2. Determine size and location of opening, recesses, and chases from trades providing such items.
3. Accurately place and securely support items built into forms.

I. Cleaning and Tightening:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.
2. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

3.2 JOINTS

A. Construction Joints: Locate and install construction joints not shown on drawings to not impair strength and appearance of the structure, as acceptable to A/E.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Waterstops:

1. Provide waterstops in construction joints as indicated.
2. Install waterstops to form continuous diaphragm in each joint.
3. Make provisions to support and protect exposed waterstops during progress of work.
4. Fabricate field joints in waterstops according to manufacturer's printed instructions.

E. Isolation Joints in Slabs-on-Ground:

1. Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
2. Joint filler and sealant materials are specified in Division 7 sections of these specifications.

F. Contraction (Control) Joints in Slabs-on-Ground:

1. Construct contraction joints in slabs-on-ground to form panels of patterns as shown.
2. Use inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated.

G. Form contraction joints by inserting premolded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
1.
2. Contraction joints may be formed by saw cuts as soon after slab finishing as possible without dislodging aggregate.

3.3 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing materials are not acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to A/E.

END OF SECTION

03200 CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Codes and Standards: Comply with the latest edition of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 117 Tolerances for Concrete Construction and Materials.
2. ACI 301 Specifications for Structural Concrete for Buildings.
3. ACI 315 Details and Detailing of Concrete Reinforcement.
4. ACI 318 Building Code requirements for Reinforced Concrete.
5. ACI 439.3R Mechanical Connection of Reinforcing Bars.
6. AWS DI.4 Structural Welding Code Reinforcing Steel.
7. CRSI, Manual of Standard Practice.
8. CRSI, Placing Reinforcing Bars.
9. Wire Reinforcement Institute, Manual Standard Practice.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A82 Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. A184 Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. A185 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
4. A496 Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. A497 Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
6. A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
7. A775 Specification for Epoxy-Coated Reinforcing Steel Bars.
8. C1116 Specification for Fiber-reinforced Concrete and Shotcrete.

1.3 SUBMITTALS

A. General:

1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement.

a. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement and accessories.
b. Include special reinforcement required at openings through concrete structures.

2. Shop drawings made from sepias (or other reproductive methods) of the structural drawings will not be accepted and shall be cause for resubmittal.

B. Selection of splices: Splices shall be full tension, unless noted otherwise.

1. Splices noted on the drawings to be compression splices shall be furnished by one of the following:

    a. Compression lap splices according to ACI 315.
    b. Mechanical compression only connectors according to ACI 439-3R, staggered 1/2 Class "C" lap length and maintaining not less than 1/4 the total tensile capacity of any column face.
    c. Full penetration welds staggered not less than 18 diameters.

2. Splices shown on the drawings as either Class "A" or Class "B" may be one of the following:

    a. Class "B" lap splices.
    b. Class "A" (but not less than compression lap) lap splices staggered not less than one Class "B" lap length.

        1) Exception: This shall not be allowed when shown as class "B" in a location, which by design, has already accounted for other continuing bars or staggered splices.

    c. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 24 diameters.
    d. Full penetration welds staggered not less than 24 diameters.

3. Unless otherwise noted in the drawings, reinforcing shall be spliced to develop the full strength of the bar in either tension or compression. Those splices shall be furnished by one of the following:

    a. Class "B" lap splices where only 1/2 of the total rebars are spliced at any one floor.
    b. Full penetration welds staggered not less than 36 diameters.
    c. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 36 diameters.

4. Total steel at lap splices shall not exceed 8 percent for columns or shear wall cores containing the spliced bars.

    a. All bars may be lapped at one section for up to 4 percent steel.
    b. 1/2 of the bars may be lapped for up to 5.3 percent steel.
    c. 1/3 of the bars may be lapped for up to 6 percent steel.
    d. Above 6 percent steel, other splice choices shall be used.

5. Where staggered lap splices are used, provide a mixture of bar sizes as appropriate where vertical bar size changes on the drawings.
6. Where different size bars are lap spliced, the length of splice may be based on the smaller bar size. If there is a larger quantity of the smaller bar size, the splice length shall be based on the larger bar.
7. It shall be the responsibility of the reinforcing detailer to determine the concrete strength at the point of a lap splice, the bar position (top or other), bar spacing, confinement condition based on ties or stirrups or edge condition to select the proper lap length.

8. Increase laps for bundled bars according to ACI 318, with number based on total bars in group including lapped bars.

C. Detailing of Splices: Placing shop drawings shall specifically show splice lap lengths where they occur. Bar diameter lap tables and references to other charts are not acceptable.

D. Staggered Laps Required: Provide staggered laps in any member as necessary to keep space between bars within splice zone at least 1 inch or 1 bar diameter clear.

E. Detailing of Bar Placement: For any bar other than those placed at an edge condition, between edge condition or openings, or any other location where the bar cannot be shifted longitudinally, a dimension shall be shown from an identifiable building grid, wall, or edge to at least one end of the bar.

F. Congested Areas of Placement: For any conditions resulting in bar spacing less than 2 diameters clear or where the placement of bars in one member requires critical templating to allow bar placement in an intersecting member, furnish details of sufficient scale to show clearances, spacing, and arrangements for properly placing those bars.

G. Accessories: Show accessories, supports, chairs, bolsters, and spacers necessary to complete the installation. Where supports are beyond the scope of CRSI detailing standards and custom designed supports are required, provide engineering calculations demonstrating the capacity of the system.

H. Flat Plates: Provide not less than 3 separate drawings of each plate separately showing bottom bars, top bars, and accessories.

I. Welding Submittals:

1. If welding of reinforcing bars is to be included as part of the work, submit the following:

    a. A complete welding procedure specification according to AWS DI.4.
    b. A certified chemical analysis of the steel to be welded.
    c. Carbon equivalence calculations according to AWS DI.4.
    d. Qualification papers for welders who will be employed on the project. Welders shall have passed a qualification test within a 12-month period before the work or furnish a statement from a testing agency acceptable to A/E that they have observed or tested that welder's work under similar requirements within the past 6 months.

1.4 SUBSTITUTIONS

A. Reinforcing Splicing:

1. Splices shown in the drawings shall be considered mandatory for base bid purposes.
2. Alternative methods of providing for splices are available within the constraints of this specification and ACI 318.
3. If alternative splices are desired, the shop drawing submitted shall clearly indicate the change and include authorization by any other subcontractors involved in the change.

PART 2 PRODUCTS

2.1 REINFORCING MATERIALS

A. Comply with Chapter 5 of ACI 301.

B. Reinforcing Steel:

1. Bars #3 through #11 shall be deformed bars according to ASTM A615 Grade 60 and according to the additional requirements of Paragraph 5.2.2.1 of ACI 301.
2. Bars #2 in size shall be plain round meeting A615/A-96a Grade 40.
3. Welded wire fabric shall be of plain wire. Welded wire fabric shall be galvanized at exterior exposed concrete.
4. Unless indicated otherwise the minimum concrete protective cover specified in Paragraph 5.7.1 of ACI 301 is the specified cover for this project unless indicated otherwise.

C. Epoxy-Coated Reinforcing Bars: ASTM A775.

D. Form-Saving Splice Connectors: Flanged devices to allow insertion of threaded reinforcing bars into a previously formed face. Available products include, but are not limited to:

1. Form Saver by Lenton.
2. DB-SAE Splices System by Dayton Superior.
3. Rebar Flange Coupler by Williams Form Engineering Corp.

E. Mechanical Connectors and Splice Devices: Proprietary products suitable for the use intended and listed in ACI 439-3R-83.

F. Steel Wire: ASTM A82, plain, cold-drawn, steel.

G. Fabricated Deformed Steel Bar Mats: ASTM A184.

H. Welded Steel Wire Fabric: ASTM A185.

I. Deformed Steel Wire: ASTM A496.

J. Welded Deformed Steel Wire Fabric: ASTM A497.

K. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI Class C or Class A as required acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces and with legs of supports in contact with forms, provide supports with legs, either plastic protected according to CRSI, Class 1 or stainless steel protected according to CRSI, Class 2.
3. Provide custom supports as required to support top layer of mats and other special conditions not provided for within CRSI standards.

PART 3 EXECUTION

3.1 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as specified.

B. Clean reinforcement of loose rust and mill scale, dirt, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.

D. When any reinforcing bar is placed projecting either horizontally or vertically from a given element to subsequently lap with other reinforcing bar, verify the detailed lap length will be achieved.

1. Report any deviation to the A/E for correction before placing concrete in the first element.
2. Bar projections resulting in laps shorter than the detailed laps shall be considered rejected, and corrective measures shall be taken at the direction of the A/E with no additional cost to the City of Key Colony Beach.

E. Place reinforcement to obtain at least minimum coverages for concrete protection.

1. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.
2. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire fabric in as long lengths as practicable.

1. Lap adjoining pieces at least one full mesh plus 2 inches and wire splices.
2. Offset end laps in adjacent widths to prevent continuous laps in either direction.

G. Provide the A/E with not less than 48 hours notice before starting any welding of reinforcing bars.

1. Welding of reinforcing bars shall only be allowed under the direct supervision of the A/E.
2. Welding of crossing reinforcing bars is not allowed.
3. Any bars with unauthorized or unacceptable welds shall be replaced at no additional cost to the City of Key Colony Beach.

END OF SECTION

03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02511 - Asphaltic Concrete Paving.
2. 03100 - Concrete Formwork.
3. 03200 - Concrete Reinforcement
4. 03312 - Concrete Testing.
5. 07260 - Vapor and Radon Retarder
6. 07840 - Firestopping and Smoke Sealing.
7. 07900 - Joint Sealers.
8. Built-in items furnished under other sections.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1.	A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2.	C78	Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
3.	C150	Specification for Portland Cement.
4.	C260	Specification for Air-Entraining Admixtures for Concrete.
5.	C309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
6.	C494	Specification for Chemical Admixtures for Concrete.
7.	D1751	Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
8.	D1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 SUBMITTALS

A. Submit shop drawings for reinforcement and accessories:

1. Detail beams and reinforcing in elevation and not in schedules.
2. Show slab reinforcing in Plan View, similar to the structural drawings, not in schedules, and drawn to a minimum scale of 1/8" = 1'-0". Show reinforcing on the Plan view, along with size, quantity, marks, and spacing.
3. Detail walls and reinforcing in elevation and not in schedules.
4. Other items may be detailed as needed.
5. A/E will not review drawing submitted not complying with these requirements. Contractor shall verify detailing proceeds as specified to avoid untimely reinforcing arrival.

B. Materials and methods of curing.

C. Concrete materials and mix designs.

D. Certifications required for admixtures (chloride and solids).

E. Chlorides in concrete.

F. Test reports.

G. Waterstops and premolded joint fillers.

H. Curing compounds.

1.4 STANDARDS

A. Concrete work shall comply with requirements of ACI 301- Specifications for Structural Concrete for Buildings, except as specified.

B. The Contractor shall familiarize himself with the requirements of ACI 301 and this specification.

C. The requirements that follow are listed in the sequence of chapter numbers of ACI 301 for ready reference purposes.

D. Florida Building Code, 7th Edition 2020 (FBC).

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with Chapter 1 of ACI 301.

2.2 MATERIALS FOR CONCRETE

A. Comply with Chapter 2 of ACI 301 and the following:

1. Cement: Type I or III complying with ASTM C150.
2. Admixtures:

a. Water Reducing Admixture: The admixture shall comply with ASTM C494, Type A, and not contain more chloride ions that are present in municipal drinking water.

1) Eucon WR-75 by Euclid Chemical Co.
2) Pozzolith 200N by Master Builders.
3) Plastocrete 160 by Sika Chemical Corp.

b. Water Reducing, Retarding Admixture: The admixture shall comply with ASTM C494, Type D, and not contain more chloride ions that are present in municipal drinking water.

1) Eucon Retarder-75 by Euclid Chemical Co.
2) Pozzolith 100XR by Master Builders.

3) Plastiment by Sika Chemical Corp.

c. High-Range Reducing Admixture (Superplasticizer): The admixture shall comply with ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.

1) Eucon 37 by Euclid Chemical Co.
2) Sikament by Sika Chemical Corp.

d. Non-Chloride Accelerator: The admixture shall comply with ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.

1) Accelguard 80 by Euclid Chemical Co.
2) Darex Set Accelerator by W.R. Grace.

3. Air Entraining Admixture: Complying with ASTM C260.
4. Calcium Chloride: Calcium chloride or admixture containing more than 0.1 percent chloride ions are not allowed.

B. Certification: Written compliance to above-mentioned requirements and the chloride ion content will be required from the admixture manufacturer (include admixtures) before mix design review by the A/E.

2.3 PROPORTIONING

A. Comply with Chapter 3 of ACI 301 and the following:

1. Strength: Normal weight concrete - see drawings.

a. Concrete slabs, designated as "Concrete Pavement": 28-day compressive strength not less than 5,000 psi and a flexural strength (modulus of rupture) of not less than 650 psi when tested according to "Method of Test for Flexural Strength of concrete (using simple beam with third point loading)", ASTM C78. Include curb or curb and gutters.

2. Durability:

a. Pumped Concrete:

1) Testing shall be completed at the final discharge location after pumping.
2) Testing shall be completed at the truck before pumping.
3) Samples shall include samples for both slump and strength tests.
4) Adding of water to transit mixers/agitators.

a) Contractor shall maintain a maximum time limit of 90 minutes on the introduction of water into the cement.
b) Only 1 addition of water on the site to bring the mix to the producer's mix slump criteria is allowed.

b. Design Mixes:

1) Design mixes for concrete intended to be placed as-is from the truck shall be designed as such.
2) Design mixes for concrete intended to be pumped shall be made on one of the following bases:

a) The mix shall be designed as a truly plastic mix by proper proportioning. See ACI 304.2R - Placing Concrete by Pumping Methods for guidelines for a pumpable plastic workable mix. Trial batches shall be made, and without a device to test pumping ability, results of field trials shall be used.
b) Water shall not be added at the pump. One addition of water at the truck to meet the design slump (at the truck) is allowed.
c) A super plasticizer may be used.

c. Concrete slabs placed at temperatures below 40 degrees F. shall contain the "Non-Chloride Accelerator".
d. Concrete required to be air entraining shall contain the "Air Entraining Admixture", and air content shall comply with table 3.4.1 of ACI 301.
e. Pumped concrete and concrete with a water/cement ratio less than 0.50 shall contain the "High Range Water Reducing Admixture".
f. The "Water Reducing", Type A, or "Water Reducing and Retarding", Type D admixtures complying with ASTM C494 may be used at the option of the Contractor.
g. Concrete containing the "High Range Water Reducing Admixture" (superplasticizer) shall have a maximum slump of 8 inches unless otherwise directed by the A/E. The concrete shall be proportioned for a slump of 2 to 3 inches, be verified, then the high range water reducing admixture added to increase the slump to the approved level.
h. All other concrete shall be proportioned to have a maximum slump of 4 inches.

3. Normal weight concrete shall be air-entrained. Amount of air-entraining shall be according to Table 3.4.1.

2.4 FORM WORK

A. Comply with Chapter 4 of ACI 301 and the following:

1. Earth cuts shall not be used as forms for vertical surfaces. Natural rock formations maintaining a stable vertical cut may be used as side forms. Comply with OSHA's "Trench Safety Act".
2. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.
3. Removal Strength:

a. Wall forms and column forms may be removed 12 hours after pouring.
b. Slabs supported by precast joists may have forms removed as follows:

1) Joist spacing 4'-6" or less, 24 hrs.
2) Joist spacing between 4'-6" and 6'-8", 48 hrs.
3) Joist spacing between 6'-8" and 8'-8", 72 hrs.

c. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength. Beams shall be reshored immediately upon removal of forms.
d. In addition to the above, flat slab forms and stair slab forms shall not be removed for 5 days. Upon removal of forms, reshores shall be placed and remain in place until concrete is 14 days old.

2.5 REINFORCEMENT

A. Comply with Chapter 5 of ACI 301 and Section 03200 - Concrete Reinforcement.

2.6 FIBER REINFORCEMENT

A. Comply for use in plain concrete as defined in ACI 318.1. and Section 03200 - Concrete Reinforcement.

2.7 JOINTS AND EMBEDDED ITEMS

A. Comply with Chapter 6 of ACI 301 and the following:

1. Expansion Joints:

a. Premolded joint fillers shall be preformed bituminous type, ASTM D1751 for joints without sealant.
b. Premolded expansion joint fillers for pavements, for joints with sealant and where indicated shall be non-extruding and resilient type of ASTM D1752, compatible with urethane joint sealant compounds.

2. Waterstops:

a. Waterstops and fittings shall be manufactured from PVC. The waterstops shall be as manufactured by Greenstreak or accepted equivalent.
b. For construction joints, 4-inch serrated typed with Centerbulb, RS 316-4 or RB316-4 shall be used.
c. For expansion joints, 6-inch serrated type with Centerbulb, RB38T6 or RSB386 shall be used.
d. Make splices using splicing unions according to manufacturer's instructions. Make waterstop intersections using factory molded fittings.
e. Provide #14 tie wire at 2'-0" center to center embedded in base pour for waterstop support.

3. Safety Nosings for Exterior Concrete Stairs:

a. Cast abrasive aluminum 3 inches wide, equipped with manufacturer's standard continuous anchors.
b. Length shall be 6 inches less than the full width of stairs.
c. Provide factory-applied reinforced protective tape on exposed surfaces of nosings.
d. Manufacturers:
1) Model No.101 by Wooster Products Inc.
2) Model "A" by American Abrasive Metals.
3) Model "AX" by Safety-T-Metal Co., Inc.

2.8 PRODUCTION OF CONCRETE

A. Comply with Chapter 7 of ACI 301 and following:

1. Ready-Mixed Concrete:

a. Provide copies of each delivery ticket to the A/E. Include mix designation on delivery ticket.
b. Do not place concrete over 90 minutes old from the time it was batched.

2. Weather Conditions:

a. Where the relative humidity is less than the corresponding concrete temperature as placed, or intended to be placed, as indicated in the following Table, the Contractor shall follow the recommendations of ACI 305R, "Hot Weather Concreting".

Concrete Temperature (F)	Minimum Relative Humidity
100°	80
95°	70
90°	60
85°	50
80°	40
75°	30

b. The above Table is based upon a wind speed of 10 mph. For ambient wind speeds more than 10 mph, the Contractor shall follow the recommendations of Fig.2.1.5 of ACI 305R if the relationships of air temperature, wind velocity, relative humidity, and concrete temperature indicate a rate of evaporation more than 0.2 pounds per sq.ft. per hour.
c. Concrete having a temperature more than 100 degrees F. shall not be placed.
d. The requirements of Paragraph 7.6.1.2 of ACI 301 (cooling of concrete ingredients are not waived).

2.9 PLACING

A. Comply with Chapter 8 of ACI 301 and the following:

1. Protection: When the temperature of the concrete exceeds the minimum relative humidity relationship specified in Paragraph "Production of Concrete", the requirements of Paragraph "Production of Concrete" shall control.

2.10 REPAIR OF SURFACE DEFECTS

A. Comply with Chapter 9 of ACI 301 and the following:

1. With prior approval of the A/E, as to method and procedure, repair defective areas according to ACI 301, Chapter 9, except that the bonding compound Euco Weld by the Euclid Chemical Company or Weldcrete by the Larsen Company must be used.
2. Defects designated as "structural" by the A/E shall be repaired with prior approval of the A/E, as to method and procedure, using the epoxy adhesive epoxy mortar as furnished by the Euclid Chemical Company or Sika Chemical Corp.

2.11 FINISHING OF FORMED SURFACES

A. Comply with Chapter 10 of ACI 301 and the following:

1. Finishes:

a. All concrete shall be "rough form finish" according to Paragraph 10.2 of ACI 301, except concrete that will be exposed to view shall be "smooth form finish".

2.12 SLABS

A. Comply with Chapter 11 of ACI 301 and the following:

1. Finishes: Finishes shall be according to Paragraph 11.8 of ACI 301 except as specified.
2. Maximum allowable tolerances for floor slabs not receiving ceramic or quarry tile shall be 1/8" in a 10-foot radius.
3. Exterior slabs receiving tile, pavers, or similar covering shall be troweled finish.

2.13 CURING AND PROTECTION

A. Comply with Chapter 12 of ACI 301 and the following:

1. Preservation of moisture according to Paragraph 12.2 of ACI 301.
2. Curing and Sealing Compound: Super Floor Coat or Super Pliocure by the Euclid Chemical Company or Masterseal 66 by Master Builders. The compound shall comply with ASTM C309, Type 1 or Type 1D, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq.cm. when applied at a coverage rate of 300 sq.ft. per gallon. Manufacturers certification required.
3. Curing and Hardening Compound: "Eucosil" by the Euclid Chemical Company or "Curetox" by Toch Brothers. The compound shall be sodium silicate type.
4. Apply compounds according to manufacturer's directions.
5. Slabs receiving carpet or are of exposed concrete in the finished structure shall receive the "Curing and Sealing Compound". Exclude exterior walks and pavements.
6. Slabs receiving resilient tile, or cementitious or other toppings are to receive the "Curing and Hardening Compound".
7. Verify the compatibility of the compound with the applied coverings or toppings.
8. Submit manufacturer's data.
9. Application of Curing and Sealing and Curing and Hardening Compound: Apply compound to concrete floors and slabs according to manufacturer's directions and as follows:

a. After fresh placed concrete surface has been finished and will not be marred by application, uniformly apply undiluted compound by spray, brush or squeegee without allowing compound to collect in low spots.
b. Keep traffic off surface for 24 hours or until surface is completely dry.
c. Within 1 week of a date set by the A/E, thoroughly clean and wash exposed concrete interior floors, then apply a second uniformly applied coat of the specified Curing and Sealing Compound without allowing compound to collect in low spots. Keep traffic off surface for 24-hours following the second coat, or until surface is completely dry. Exclude walks, pavements, and exterior slabs.

B. Temperature, Wind, and Humidity: The requirements of "Production of Concrete" shall decide the conditions and precautions for hot weather concreting.

2.14 TESTING

A. Comply with Chapter 16 of ACI 301, Section 03312 - Concrete Testing, and the following:

1. Testing Agencies: The cost of testing services unless specified otherwise, will be as follows:
2. Services described in Paragraphs 16.3.1, 16.3.2, and 16.3.3 of ACI 301 (review or check test Contractor's materials and mix design, secure and test production samples at plants or stockpiles) will be paid by the City of Key Colony Beach, as required by the A/E.
3. Services described in Paragraphs 16.3.4, 16.3.5, and 16.3.6 of ACI 301 (strength, slump, and temperature tests of concrete) will be paid by the City of Key Colony Beach.
4. If air entrained concrete is specified, tests according to Paragraphs 16.3.5 and 16.3.6 of ACI 301 (air content will be paid by Contractor.
5. Services described in Paragraph 16.5 of ACI 301, additional testing and inspection because of changes proposed by Contractor, additional testing because of failure to meet specifications shall be paid by Contractor.

B. Testing Services:

1. For strength test of concrete, mold, cure, and test 5 specimens. Test 1 at 3 days, 1 at 7 days, and 3 at 28 days.
2. Make 1 strength test for each 50 cubic yards or fraction thereof placed in any 1 day.

2.15 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Comply with Chapter 17 of ACI 301.

2.16 ACCEPTANCE OF STRUCTURE

A. Comply with Chapter 18 of ACI 301.

PART 3 - NOT USED.

END OF SECTION

03312 CONCRETE TESTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, necessary equipment, services, and related work to complete the concrete testing work including, but not necessarily limited to, the following:

1. Testing and evaluation of concrete ingredients.
2. Sampling and testing of concrete.
3. Testing of grout.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C31 Practice for Making and Curing Concrete Test Specimens in the Field.
2. C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
3. C42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
4. C94 Specification for Ready-Mixed Concrete.
5. C143 Test Method for Slump of Hydraulic Cement Concrete.
6. C173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
7. C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
8. C494 Specification for Chemical Admixtures for Concrete.

1.3 QUALITY ASSURANCE

A. Comply with provisions of the latest edition of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301 Specifications for Structural Concrete for Buildings.
2. ACI 318 Building Code Requirements for Structural Concrete.
3. ACI 347 Guide to Formwork for Concrete.

B. Testing Laboratory Qualifications:

1. Testing laboratory shall comply with state and local requirements.
2. Compression testing machines shall comply with ASTM C39.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 SAMPLING FRESH CONCRETE

A. Comply with ASTM C172, except for slump to comply with ASTM C94.

B. Slump: ASTM C143, at each sample for strength tests, at each load for concrete of specified strength of 6,000 psi and greater, and at intervals not exceeding 10 minutes for concrete containing ASTM C494, Type F admixture. Perform visual slump evaluation of each load and perform test when questionable.

C. Air Content: One for each set of compressive strength test specimens and at every load where concrete is subject to hydrostatic pressure, according to the following.

1. ASTM C173 Volumetric method for lightweight or normal weight concrete
2. ASTM C231 Pressure for normal weight concrete.

D. Concrete Temperature:

1. Test hourly when air temperature is 40 degrees F. and below.
2. Test hourly when air temperature is 80 degrees F. and above.
3. Each time a set of compression test specimens is made.

E. Compression Test Specimens: ASTM C31;

1. Number of Cylinders per Set:

a. One set of 3 standard cylinders for each compressive strength test.

2. Frequency of Sampling:

a. One set for each 50 cubic yards or fraction thereof of each concrete class placed in any one day or for each 5,000 square feet of slab surface area placed.
b. When frequency of testing will provide less than 5 strength tests for a given class of concrete, take samples from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

3. Point of Sampling:

a. Samples may be taken at the discharge of the truck except when concrete is placed by conveyor or pumping, take samples at point of final placement of concrete within the structure at intervals not exceeding every 150 cubic yards placed.
b. Samples taken at point of final placement may be in place of samples at intervals required above, or samples may be taken at point of final placement, at option of testing agency.

4. Handling:

    a. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

3.2 COMPRESSIVE STRENGTH TESTS

A. Comply with ASTM C39.

B. Time of tests:

1. 1 specimen at 7 days.
2. 1 specimen tested at specified age and 1 reserve.

3.3 REPORTS

A. Reports of compressive strength test shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for tests.

3.4 ACCEPTANCE

A. When strength of field-cured cylinders is less than 85 percent of companion laboratory cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

B. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

3.5 ADDITIONAL TESTS

A. The testing service will make additional test of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by A/E.

1. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed.
2. Contractor shall pay for such tests conducted and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

03320 CONCRETE TOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02072 - Removals.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A185 /A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete Strength: Normal weight concrete - 4,000 psi at 28 days.
B. Welded Wire Mesh: According to ASTM A185, galvanized smooth wire 6 x 6 1.4/1.4.

PART 3 EXECUTION

3.1 INSTALLATION

A. Roughen substrate to insure bonding of topping.

B. Place concrete topping with wire mesh reinforcing and allow a minimum of 28 days curing time before proceeding with finished flooring materials.

C. Finish concrete surface with steel trowel, allowing not more than 1/8" variation in a 10'-0" radius.

1. Bring finished surface to a minimum 1/4" below level of existing flooring at door openings and other passageways.

D. Do not use sealing or curing agents of any kind.

E. Leave new concrete surface clean and free of dirt and other foreign matter ready to receive application of new troweled flooring materials.

F. Maintain substrate damp for the 24-hour period immediately preceding placement of topping.

G. Wet cure topping for 7 days with continuous spray/mist, burlap, or other accepted means.

END OF SECTION

03413 PRECAST PRESTRESSED CONCRETE JOISTS AND BEAMS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 03300 - Slab and beam forming other than specified.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A370 Test Methods and Definitions for Mechanical Testing of Steel Products.
2. A416 Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
3. A615 Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.3 QUALITY ASSURANCE

A. Fabricator: A recognized prestressed concrete manufacturer whose design, fabrication, and erection operations are supervised by a Florida registered professional engineer.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop and erection drawings for approval, showing:

1. Concrete design strength.
2. Unit dimensions and unit weights.
3. Size, number, location, and stress in prestressing strands.
4. Size, number, and location of reinforcing bars including reinforcing for erection and handling stresses.
5. Concrete cover over reinforcing and strands.
6. Bearing and anchorage details.
7. Size and locations of holes for slab form support pins.
8. Concrete finish.
9. Curing method.
10. Erection marks.
11. Joist points and shoring points.

B. Design Calculations:

1. Submit for approval, neat, legible, and complete design calculations before fabrication.
2. Calculations shall be by a Florida registered professional engineer whose seal shall appear on calculation sheets and shop drawings.
3. Revise calculations if required by A/E.

4. Calculations shall include predicted in-place cambers without superimposed loads, with superimposed dead loads, and with superimposed dead loads and live loads.
5. Span length in calculations shall be from center of bearing to center to center of bearing.

C. Certificates: Submit manufacturer's test certificates on prestressing strands and reinforcing.

D. Concrete Cylinder Tests: Submit copies of cylinder break reports by an approved commercial test laboratory, made from each casting for this project to verify that concrete has attained minimum ultimate prestressed transfer strength specified.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver and store units in upright position that will prevent significant stresses caused by delivery, storage, and handling.

B. Handling: Hoist units upright at pickup points designated by manufacturer and with care to prevent chipping. Chipped and cracked members are not acceptable, except that upon specific approval, minor chips may be allowed in portions of members not exposed to view.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete:

1. Minimum 7-day ultimate compressive strength of 4,000 psi.
2. Higher strength will be allowed to suit manufacturer's design. Use Type III Portland cement.
3. Concrete shall also comply with requirements of Section 03300, Cast-in-Place Concrete.

B. Prestressing Strands:

1. High strength 7-wire strand complying with ASTM A416.
2. Elongation test complying with ASTM A370 with minimum elongation at rupture of 3.5 percent in 24 inches.
3. Tests need not be made if certification of conformance with specifications is provided by manufacturer.

C. Reinforcing Steel: ASTM A615, Grade 60, deformed.

D. Forms:

1. Unit:
   a. Forms shall provide smooth units true to size, shape, and detail with flat planes, sharp lines, and arises free from warp, twist, bow, or similar distortions and spalling, broken edges, or similar defects.
   b. Dimensional tolerances shall be according to ACI 525 standard minimum requirements for thin section precast concrete construction.

2. Slab forms between joists and beam side forms at end of joists:

    a. Provide use of manufacturer's standard forms complete with slab form support pins.
    b. Provide coordination of forming.

2.2 FABRICATION

A. Fabricate units according to approved shop drawings and approved design calculations.

B. Unit Design and Fabrication:

1. Comply with ACI 318-95 for reinforced concrete, Prestressed Concrete Association Standards and Florida Building Code (FBC).
2. Fabricator shall design joists and beams according to loads indicated on drawings.
3. Camber under dead load or deflection under total load shall not exceed 1/360 of span.

C. Concrete Weight and Fire Rating: Concrete for other prestressed concrete units shall be of normal weight structural concrete and with appropriate concrete cover for reinforcing and strands to provide 2-hour fire rating.

D. Inserts: Install hanger inserts and sleeves in unit forms for mechanical and electrical items as provided under other sections.

E. Top Finish of Units Receiving Cast-In-Place Slab: Rough screeded. Provide projecting stirrups and slab reinforcing support bar according to manufacturer's composite action design.

F. Curing:

1. Top surface shall receive water curing only.
2. Sides and bottoms shall be water cured or membrane cured using approved wax free type compound.
3. Water cure units at least 5 days or cure until concrete reaches minimum specified 7-day strength.

G. Marking: Distinctively mark each unit with manufacturer's name and mark indicated on erection drawings.

H. Age: Units shall be minimum 10 days old before shipping or erecting.

PART 3 EXECUTION

3.1 ERECTION

A. Erection shall be by manufacturer or another firm with experience in this work and supervised by manufacturer's Florida registered professional engineer or authorized representative. Handle and install joists with precision, in compliance with drawings, details, and erection drawings.

B. Shoring: Before pouring of slabs over units, supervise shoring of unit bottoms for composite action. Shoring to remain in place until cylinder tests indicate the specified concrete strength for slabs and secondary pours over beams have been attained.

C. Forming: Furnish slab form support pins for joist units, slab forms between joists, and beam side forms between joists as required.

D. Repairs: Repair nicks or chips in exposed areas that occur after inspection for approval by A/E.

3.2 CLEANING

A. After slab pouring is complete, clean exposed surfaces of units of stains to a uniform appearance. Do not use caustic or acid cleaners.

END OF SECTION

03420 PRECAST PRESTRESSED CONCRETE SECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 05500 - Metal Fabrication.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) latest edition:

1. A370 Test Methods and Definitions for Mechanical Testing of Steel Products.
2. A416 Specification for Uncoated Seven-Wire Stress-Relieved Strand for Prestressed Concrete.
3. A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. C144 Specification for Aggregate for Masonry Mortar.
5. C150 Specification for Portland Cement.

1.3 SUBMITTALS

A. Submit shop drawings with the following:

1. Concrete design strength.
2. Unit dimensions and unit weights.
3. Size, number, location, and stress in prestressing strands.
4. Size, number, and location of reinforcing bars including reinforcing for erection and handling stresses.
5. Concrete cover over reinforcing and strands.
6. Bearing and anchorage details.
7. Concrete finish.
8. Curing method and erection marks before starting work.

B. Design Calculations: Submit for record purposes, neat, legible, and complete design calculations made by a Florida registered professional engineer whose seal shall appear on calculation sheets and shop drawings, before fabrication.

1. Calculations: Include predicted in-place cambers without superimposed loads, with superimposed dead loads, and with superimposed dead loads and live loads. Revise calculations if required by A/E.
2. Span Length in Calculations: From center of bearing to center of bearing.

C. Tests Certificates: Submit manufacturer's test certificates on prestressing strands and reinforcing.

D. Concrete Cylinder Tests: Submit copies of cylinder break reports by the City of Key Colony Beach’s testing laboratory, made from each casting for this project to verify the concrete has attained the minimum specified ultimate prestressed transfer strength.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver and store units in upright position that will prevent significant stresses caused by delivery, storage, and handling.

B. Handling:

1. Hoist units upright at pickup points designated by manufacturer and with care to prevent chipping.
2. Chipped and cracked members are not acceptable, except that upon specific approval by A/E, minor chips may be allowed in portions of members not exposed to view.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Joint Grout Latex Additive Materials:

1. Acryl 60, by Thoro a BSAF Company.
2. Laticrete 3701 Mortar Admix, by Laticrete International, Inc.
3. Mer-Krete 150 Acrylic Latex, by Mer-Kote Products, Inc.

2.2 MATERIALS

A. Concrete:

1. Minimum 7-day ultimate compressive strength of 4,000 psi. Higher strength will be allowed to suit manufacturer's design.
2. Comply with requirements of Section 03300 - Cast-In-Place Concrete.

B. Prestressing Strands:

1. High strength 7-wire strand complying with ASTM A416.
2. Elongation test complying with ASTM A370 with minimum elongation at rupture of 3.5 percent in 24 inches.
3. Tests need not be made if certification of compliance with specifications is provided by manufacturer.

C. Reinforcing Steel: ASTM A615, Grade 60, deformed.

D. Forms:

1. Provide smooth units true to size, shape, and detail with flat planes, sharp lines, and arises free from warp, twist, bow, or similar distortions, spalling, broken edges, or similar defects.
2. Dimensional tolerances shall be as provided in ACI 525 standard minimum requirements for thin section precast concrete construction.

E. Joint Grout Materials:

1. Portland Cement: ASTM C150, Type 1.

2. Sand: ASTM C144.
3. Latex Additive.
4. Water: Potable.

F. Joint Grout Mix:

1. 1 part Portland cement, 3 parts sand mixed with latex additive and water for a workable mix.
2. Mix 2 parts acrylic additive to not more than 1 part water.

G. Fabrication:

1. Fabricate precast prestressed concrete double tee slab units and according to reviewed shop drawings and design calculations.
2. Unit Design and Fabrication:

    a. Comply with ACI Standard 318-95 requirements for reinforced concrete, the Prestressed Concrete Association Standards, and the Florida Building Code (FBC).
    b. Fabricator shall design joists and slabs according to loads indicated on drawings.
    c. Camber under dead load shall not exceed 1/180 inches and deflection under total load shall not exceed 1/360 of span.
    d. Provide concrete cover over reinforcing and strands to provide 1 hour fire rating.

3. Inserts: Provide manufacturer's standard welding inserts anchored into edges of units at not over 10 feet on center.
4. Top Finish of Units: Smooth floated to receive rigid roof insulation.
5. Curing: Water cured, or membrane cured using approved wax free type compound. Water cure units at least 5 days or cure until concrete reaches minimum specified 7-day ultimate compressive strength.
6. Marking: Distinctively mark each unit with manufacturer's name and mark indicated on erection drawings.
7. Age: Units shall be minimum 10 days old before shipping or erecting.

PART 3 EXECUTION

3.1 ERECTION

A. Erection shall be by manufacturer or another firm with experience in this work, and supervised by manufacturer's Florida registered professional engineer, or authorized representative.

B. Handle and install tees and slabs with precision, in compliance with drawings, details, and erection drawings.

C. Side Anchorage: Place short pieces of reinforcing rods in slab joints between welding anchors in slab edges and weld according to manufacturer's erection drawings.

D. Joint Grouting:

1. Fill joints between double tee slab and slab edges flush with a latex cement and sand grout.

2. Where a difference in height occurs between adjacent double tee slab or slab edges, apply latex slurry, then apply additional latex cement and sand grout with top surface sloped down from higher to lower unit at no greater then 1/8" per foot slope. Float grout surface smooth.

3.2 REPAIRS

A. Repair nicks or chips in exposed areas that occur after inspection and for acceptance by A/E.

END OF SECTION

03600 GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. C109 Test Method for Compressive Strength of Hydraulic Cement Mortars.
2. C191 Test Method for Time of Setting Hydraulic Cement by Vicat Needle.
3. C531 Test Methods for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
4. C579 Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
5. C827 Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

1.3 SUBMITTALS

A. Manufacturer's literature including specifications and printed installation instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Grouting Mortar:

1. Bonsal American, an Oldcastle Company.
2. Five-Star Products Inc.
3. Master Builder.
4. Mobil.
5. Thoro.

2.2 NONSHRINK CEMENTITIOUS GROUT

A. Exhibit no visible bleeding 2 hours after placement in a fluid consistency of 20 to 30 second flow through CRD C79 Flow Cone.

B. Grout shall show no shrinkage and a maximum of 4.0 percent expansion at any time before initial set and tested according to ASTM C827.

C. Grout shall show no shrinkage and a maximum of 0.2 percent expansion in the hardened state when tested according to CRD C588.

D. Compressive Strength: Minimum of 5,000 psi at 7 days and minimum strengths as listed below according to ASTM C109 modified.

1. 24 Hours: 2,000 psi.
2. 7 Days: 5,000 psi.

E. Grout shall show initial set time of not less than 60 minutes when tested according to ASTM C191.

F. Grout shall contain no metallic substances, water reducing agents, accelerators super plasticizers, or other materials.

G. Technical service shall be provided by the manufacturer of grout upon request of contractor.

H. Water shall be clean and free from injurious amounts of oil, alkalies, and other deleterious materials according to AASHTO T26.

2.3 EPOXY GROUT

A. Grout shall be flowable and a 100 percent solids system.

B. Grout shall show no shrinkage and a maximum of 4 percent expansion when tested according to ASTM C531 (Modified).

C. Compressive strength shall be determined by ASTM C579 attaining the minimum strengths listed below:

1. 24 hours: 5,000 psi.
2. 2 days: 8,000 psi.
3. 7 days: 11,000 psi.

D. Peak exotherm temperature of a 2-inch diameter by 4-inch-high cylinder of grout shall not exceed 95 degrees F. when tested at 75 degrees F. material and air temperatures.

E. Grout shall not exceed a coefficient of thermal expansion of 30 x 10^{-6} in/in/degrees F. when tested according to ASTM C531.

2.4 GROUT STORAGE

A. Grout components shall be delivered to the construction site in moisture proof bags. Bags shall be stored in a dry weatherproof area within a temperature range of 40 to 90 degrees F.

B. Remove damp or defective material from the site at expense to the Contractor.

C. Storage time of nonshrink cement grout mix shall be limited to 10 months.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Concrete surfaces shall be prepared for grouting by removing all oil, grease, laitance, and other foreign substances.

B. Roughen surfaces to receive grout by chipping or nail raking of plastic concrete to assure a good bond of grout to existing concrete. Clean thoroughly with water and soak surface for 24 hours before placing cement grout. Surfaces shall be kept completely dry for epoxy grout.

C. Metal surfaces of equipment bases to be epoxy grout shall be thoroughly cleaned to bright metal.

3.2 FORMS

A. Forms for fluid grout shall be built of materials with adequate strength to withstand the placement of grout.

B. Forms for nonshrink cement grout shall be tight against all surfaces and joints shall be sealed with tape. Form oil shall be used for easy form release.

C. Forms for grout shall be watertight with chamfer strips in place. Caulking shall be used on all joints. Forms for epoxy grout shall be lined with polyethylene or waxed for easy form release.

D. Forms shall be 4 to 6 inches higher than the base plate on one side of forms when using hydraulic head pressure for placing.

E. Provide air relief holes at least 1/4" in diameter at every recessed base plate corner.

3.3 MIXING

A. Grout shall be mixed according to manufacturer’s recommendations.

B. Nonshrink cement grout shall be added to water to obtain the desired consistency.

C. Epoxy Grout:

1. Components shall be conditioned to a temperature of between 70- and 85-degrees F. before use.
2. Epoxy hardener shall first be added to resin and thoroughly mixed for 2 to 3 minutes without whipping air into the mix.
3. Low speed mixer or hand stirring shall be used.
4. Mixed resin and hardener shall then be put into clean mortar mixer and the entire bag of aggregate added.
5. Epoxy grout component ratios shall not be altered, and no solvents or thinners added to the mix.

D. Mix nonshrink cement grout between 3 and 5 minutes for uniform consistency.

E. Epoxy grout shall be mixed until aggregate is uniformly wetted.

F. Mortar mixer shall be used instead of a concrete mixer for mechanical mixing of grout.

G. Remixing of grout by adding more water or remixing of stiffening grout is not allowed.

3.4 REINFORCEMENT

A. Reinforcement and joints for epoxy grout shall be provided when and by methods recommended by the manufacturer of the grout.

3.5 PLACEMENT

A. Grout shall be rapidly placed continuously from one side of baseplate only in one direction.

B. Grout under base plates to fill all spaces and completely fill anchor bolt sleeves.

C. Hydraulic head grouting pressure shall be maintained by keeping the level of grout in the head box above the bottom of the base plate. Head box shall be filled to the maximum level and grout worked down to top of base plate.

D. Shims used for temporary leveling of equipment and base plates shall be removed after the grout has obtained sufficient strength to carry the baseplate loading. Voids left by the removal of shims shall be filled with a second placement of grout.

3.6 FINISHING

A. Alter cement grout has reached final set, it shall be trimmed back to the level as shown on drawings.

B. Top surfaces of epoxy grout may be finished by troweling with a steel trowel moistened with oil before set.

3.7 CURING

A. Nonshrink Cementitious Grout:

1. Grout shall be cured according to manufacturer's specifications and recommendations.
2. Forms shall remain in place for 24 hours.
3. Temperature of base plates and supporting concrete shall be maintained between 40- and 90-degrees F. during grouting and for a minimum of 12 hours after placing.

B. Epoxy Grout:

1. Grout shall be cured according to manufacturer’s specifications and recommendations.
2. Forms shall remain in place for a minimum of 24 hours after placing grout.
3. Temperature of base plate and supporting concrete shall be maintained between 40- and 80-degrees F. during grouting and for a minimum of 24 hours after placing.

3.8 TESTING

A. Contractor shall be responsible for preparing, storing, curing, and transporting the test samples to the laboratory for testing.

B. Grout shall develop required compressive strength according to ASTM C109 (modified) for packaged grouts and ASTM C579 for epoxy grout.

C. Three test cubes shall be made for each day of grouting. Tests shall be made of one cube at the following intervals:

   1. Cement Grout: 24 hours, 7 days, and 28 days.
   2. Epoxy Grout: 24 hours, 2 days, and 7 days.

D. Test reports shall be submitted to the A/E immediately after the result of each age test is available.

END OF SECTION

04221 CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate concrete unit masonry (also termed “CMU” and “block”) work with work before and after, especially:

1.	Dovetail assemblies in concrete, for anchoring masonry work	03100
2.	Concrete framing.	Div 03
3.	Welding masonry anchors to steel structure.	Div 05
4.	Insulation beneath interior wall finish at exterior walls	07210
5.	Wall vapor barrier (if used)	Div 07
6.	Anchoring devices for door frames, windows, entrances, louvers, curtain walls and other openings	Div 08

1.2 OVERALL STANDARDS

A. Perform reinforced concrete masonry work in accordance with the latest edition of the following:

1. ACI 530 - Building Code Requirements for Masonry and.
2. ACI 530.1 - Specification for Masonry Structures, except as more stringently specified herein.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition. Specifications for:

1.	A153	Zinc Coating (Hot Dip) for Iron and Steel Hardware.
2.	A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3.	A951	Masonry Joint Reinforcement.
4.	C33	Concrete Aggregates
5.	C55	Concrete Brick.
6.	C90	Loadbearing Concrete Masonry Units.
7.	C91	Masonry Cement.
8.	C94	Ready-Mixed Concrete.
9.	C144	Aggregate for Masonry Mortar.
10.	C150	Portland Cement.
11.	C206	Finishing Hydrated Lime
12.	C270	Mortar for Unit Masonry.
13.	C476	Grout for Masonry.
14.	C1019	Test Method for Sampling and Testing Grout.
15.	C1142	Extended Life Mortar for Unit Masonry.

1.4 SUBMITTALS

A. Shop Drawings: Window opening shop drawing, detailing special profiles in concrete, masonry units, shapes or cast stone surrounds needed to accommodate and support the particular types of window and louvers that will be installed in this Work.

B. Product Data: Submit for fire-rated block, plain block, [textured block,] special shape, cast stone surround, horizontal joint reinforcement, and each metal accessory and plastic accessory – with special attention to the weight of galvanizing on steel items.

1.5 MOCKUP

A. Sample Wall: Erect an 8 ft x 8 ft high x 8 in. (or full thickness if double wythe) sample wall on a 36 in. wide concrete base, propped against overturning by wind, to serve as a standard of appearance and construction.

1. Sample wall shall contain a 3 x 3 ft opening with head, jamb and sill profiles and special surround shapes for window installation.
2. Remove sample wall and base only when permitted by A/E.

PART 2 PRODUCTS

2.1 CONCRETE BLOCK AND BRICK (CMU)

A. Description: Normal Weight (>125 lb/ft^3)] [Medium Weight (105 to 125 lb/ft^3)] loadbearing units including shapes as needed to execute details.

1. Texture: A uniform, medium texture that is neither very smooth nor very coarse. Face surfaces shall have a texture that will bond well to cementitious materials, yet not leave unpainted pits when painted by roller.
2. Linear shrinkage at time of delivery: 0.065% maximum
3. Solid units: Where shown, provide solid units with <25% voids.
4. Shapes: Provide appropriate shapes to execute each condition shown.
5. Prohibited: Block of non-loadbearing grade; also U-block.
6. Fire rating of masonry units: As will attain UL fire rating shown for each wall.

B. Standards:

1. Concrete Block: ASTM C90, Type II. Do not use ASTM C129 units.
2. Concrete Brick: ASTM C55.

2.2 CAST STONE

A. Description: F'c = 4000 lb/in^2 units, with small coarse aggregate, white cement, and #2 galvanized steel rod reinforcing held 1-1/2 in. from weather surfaces.

2.3 MORTAR

A. Types and Uses.

1. Type S or RS, with 1800 lb/in^2 compressive strength, for use above grade.
2. Type M or RM, with 2500 lb/in^2 compressive strength, for use only below grade.
3. Mix: Portland cement, lime and sand, or, if proportions and test results are approved by structural engineer of record, portland cement, masonry cement and sand.
4. For filling cells in courses below structural loads, at jambs of openings, and elsewhere as shown on Drawings, Type S or RS may be used unless a mix of compressive strength greater than 1800 lb/in^2 is shown on the Drawings.

5. For sustainability, follow ASTM recommendation that mortar strength always be less than block compressive strength.
6. Compressive strength: Average measure when tested in 28 days.

B. Standards:

1. Mortar (site mixed): ASTM C270, S and M.
2. Extended life mortar: ASTM C1142, RS and RM.

2.4 GROUT

A. Description: Thoroughly transit-mixed portland / blended cement – lime – sand – water, high-slump, grout. Use coarse type if it can be verified at all hours of the day that it will flow to fully fill all voids given the conditions of air temperature, block temperature and moisture content, slump, and ease of rodding or vibrating. Otherwise use fine type.

1. Coarse Type: Containing Size 8 or 89 aggregate (1/2 in. to No.16).
2. Fine type: Containing Size 1 or 2 aggregate (3/8 in. to No.100).
3. Slump: 6 to 10 in. as will produce an ASTM C1019 compressive strength at 28 days of 3000 lb/in^2; ASTM C1019.

B. Standards:

1. Grout for masonry fill: ASTM C476.

2.5 MORTAR AND GROUT INGREDIENTS

A. Standards: Use no calcium chloride in any mix.

1. Portland cement: ASTM C150, Type I or II.
2. Hydrated lime: ASTM C206, Type S.
3. Masonry cement: ASTM C91.
4. Mortar aggregate: ASTM C144.
5. Grout aggregate: ASTM C404.
6. Mixing water: Potable.

2.6 LINTELS

A. Lintels: Precast concrete lintels except where cast-in-place concrete or steel is shown.

1. Precast concrete and CIP concrete lintels shall be of depth and with reinforcing sufficient to support superimposed live and dead loads.

2.7 REINFORCEMENT AND ACCESSORIES

A. Horizontal Joint Reinforcement: Welded 0.188 in. (9 ga) continuous deformed ASTM A951 hot dip galvanized steel side rods with 0.148 in. (12 ga) cross ties. Width shall be 1-1/4 to 1-3/4 in. less than wall thickness. Provide preformed corner pieces.

B. Steel Bar Reinforcement: ASTM A615, Grade 60, galvanized deformed bars.

C. Corrugated and Plain Anchors and Wall Ties in Masonry: Hot-dip galvanized steel; ASTM A153.

D. Masonry Anchors: 16 ga minimum, hot-dip galvanized steel; ASTM A153.

1. Check jamb anchors supplied with doors, windows and curtain walls to ensure that sufficient number and size have been provided and located in the frames so as to withstand design wind pressures when installed by block-masons.
2. Anchors for Fastening Masonry Walls to Concrete and Structural Steel.

    a. Dovetail anchors, fitting the installed dovetail slots, are to be supplied to the block-mason as specified in the Concrete Forming and Accessories section.
    b. Where no dovetail slots have been installed in concrete, use anchoring devices such as the following by Heckmann, or equal approved by A/E and CITY OF KEY COLONY BEACH: 282, 315C, 315D, 316, 317C, fastened to concrete no more than 16 in. oc using shielded 1/4 in. bolts in drilled holes.
    c. To fasten masonry to structural steel, use anchoring devices such as the following by Heckmann, or equal approved by A/E and City of Key Colony Beach: 190, 193, 315, 316, 317B, 320 and 321. Weld 315, 316, 317B, 320 and 321 to steel.

E. In-Wall Flashings: Self-adhering SBS membrane, or 5 oz/ft^2 sheet copper bonded to fiber-reinforced asphalt treated kraft paper.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATORY ANCHORING

A. Dovetail Anchors: Where masonry walls will abut concrete walls or columns, check to see that properly positioned dovetail slots have been cast into the concrete. Also check to see that sufficient dovetail anchors (fitting the slots) have been supplied for use by the masons to bond the masonry walls to the concrete walls and columns.

1. If dovetail slots in concrete are found to be missing or are not properly positioned and installed, provide instead the anchors specified above, 16 in. oc, to take the place of dovetail slot & anchor bonding of the masonry walls to the concrete structure.
2. Fasten corrugated strap anchors to the concrete and place the corrugated portion in each horizontal masonry mortar joint.

B. Other Anchors: Prepare to anchor masonry walls to cast-in-place concrete and structural steel by providing the specified masonry anchors 16 in. oc the full height of each masonry wall along each line of contact.

3.2 INSTALLING MASONRY

A. Follow ACI 530 and 530.1 except as more stringently specified herein.

B. Environmental Conditions:

1. Temperature: 40 °F. minimum and rising.
2. Weather: Do not lay up masonry during rain. Overnight and when rain is imminent, cover walls and block piles. Design and construct temporary bracing against overturning by wind; remove and repair when no longer needed.

C. Worksite Tolerances: Maximum variances from shown dimensions (as selected from the more detailed list of permitted variances in ACI 530.1 3.3.G.):

1.	Bed joint thickness	± 1/8 in.
2.	Head joint thickness	± 1/4 in.
3.	Bed joint, from level, in 10 ft	± 1/4 in.
4.	Bed joint, from level, overall	± 1/2 in.
5.	Top surface of bearing walls, in 10 ft	± 1/4 in.
6.	Top surface of bearing walls, overall	± 1/4 in.
7.	Walls, from plumb line, in 10 ft	± 1/4 in.
8.	Walls, from plumb line, in 20 ft	± 3/8 in.
9.	Walls, from level line, in 10 ft	± 1/4 in.
10.	Walls, from level line, in 20 ft	± 3/8 in.
11.	Bearing walls, alignment bottom to top	± 1/8 in.
12.	Non-bearing walls, alignment bottom - top	± 3/4 in.
13.	Corners, from plan, in any direction	± 1/8 in.
14.	Wall waver in plan, from level line, in 20 ft	± 1/2 in.
15.	Wall waver in plan, from level line, overall	± 3/4 in.

3.3 OPENINGS AND SURROUNDS IN EXTERIOR WALLS

A. Window Openings: Because window dimensions and perimeter details vary from producer to producer, and because the window detail shown on the Drawings is only schematic in order to accommodate different producers' window designs, prepare a masonry opening shop drawing showing how the block masonry opening will accommodate and support the specific window that will be used in the Work.

1. Obtain window shop drawings by which to coordinate, prepare and get approval of the masonry opening shop drawing before the start of exterior wall masonry work.
2. The masonry opening shop drawing shall address at least the following :

    a. Providing the shim and blocking room needed for the producer's window frames,
    b. Fastening of window frame to transmit wind loads to wall,
    c. Providing a lip against which to seal the 1/2 to 3/4 in. wide window flange at sill, jambs and head,
    d. Providing space and access for a heavy bead of sealant around the entire perimeter of each window,
    e. Providing an outward sloping sill, and
    f. Providing a proper seat at the interior to support the window stool against live loads.

3. Construct window openings to:

    a. Transmit wind loads on windows to surrounding masonry in such a way that design wind loads do not cause masonry failure.
    b. Ensure that water does not flank the window units and penetrate by way of the masonry construction.

B. Special Surround Shapes for Window and Louver Openings:

1. From the approved window opening shop drawings prepared by the mason, fabricate cast stone surrounds pieces (sills, jambs and heads) that will accommodate and support the window or louver unit that is in each opening.

2. Each part of the surround shall have a lip approximately 3/4 in. wide against which the flange at the window's perimeter can be sealed tight. See Drawings for schematic detail that is made generic to accommodate various producers' windows.
3. The sill piece, unless detailed differently on the drawings, shall extend from lip to a distance at least 1 in. beyond face of block and shall have drip cast in the overhang.
4. Extend #2 or #3 galvanized steel anchoring bars extending approximately 8 in. from each surround piece, no more than 16 in. oc, in sufficient quantity to transfer design wind loads from the opening to surrounding reinforced masonry structure.

C. Other Openings: Prepare other exterior wall openings, such as those for door frames, entrances, louvers and curtain walls, to transmit wind loads to surrounding masonry in such a way that design wind loads do not cause masonry failure and to ensure that water does not flank the opening units and penetrate by way of the masonry construction.

3.4 LINTELS

A. Coordinate installation of cast-in-place concrete lintels with masonry work so that lintels at window heads have the proper profile to receive the particular window that will be installed.

1. Do not use precast concrete lintels in exterior walls.

B. Where a window, door, louver, or other opening's head is not more than 14 in. below a cast-in-place concrete beam, coordinate with concrete installer to cause the beam to continue downward to form a lintel for the window or door.

1. Where a window, door, louver, or other opening's head is more than 14 in. below a cast-in-place concrete beam, coordinate with the structural engineer of record and the concrete installer to cast in place a separate beam that has sufficient depth, bearing, and reinforcing to support live and dead loads over the opening.

C. Precast concrete lintels are permitted in interior partitions unless cast-in-place is shown. Set lintels in full mortar beds with 8 in. minimum bearing each end.

3.5 REINFORCING

A. Horizontal Joint Reinforcement: Provide at least at every second course and at first joint above and below openings, for all masonry, interior or exterior.

1. In masonry areas shown to have concrete filled cores, provide reinforcement in every horizontal joint.
2. At other areas, provide reinforcing in every second block course joint and at first joint above and below openings for exterior and interior masonry.
3. Cut and lap corners and intersections as recommended by reinforcing producer.
4. Extend reinforcement 6 in. into concrete tie columns and concrete encasement of steel columns cast after block is in place.
5. Unless walls have cast-in-place concrete corner tie columns, make wall and partition joint reinforcing continuous around corners and at intersections following reinforcement producer's published directions.
6. Lap splices in joint reinforcement no less than 6 inches. Reinforcement shall not be continuous through expansion joints.

3.6 ANCHORING

A. Corrugated Anchors: Place in every second block course for masonry walls and partitions abutting structural concrete and wherever dovetail anchors cannot be incorporated. Secure each upturned end to concrete with 2 heavy-duty screws in drilled shields.

B. Dovetail Anchors: Place in every second block course for masonry walls and partitions that abut cast-in-place concrete using the continuous dovetail anchor slots.

C. When anchors have been fastened to the concrete or steel structure, place the corrugated portion in the nearest horizontal masonry mortar joint.

3.7 BLOCK LAYING

A. Lay masonry plumb, true to line, with level and accurately spaced courses. Lay up units in common bond unless stack bond is shown in certain areas.

1. Lay up only fully dry units. Cut units without using water.
2. Use masonry saws for cuts that will be exposed in the finished work.
3. Lay corners and reveals plumb and true. Line up vertical joints.
4. Fully bond and interlock masonry courses at corners and intersections.
5. Use concrete brick or soaps to course out walls concealed in the finished work.
6. Do not over-plumb corner and jamb units after they are set in position. If adjustment is needed after mortar starts to harden, remove mortar and replace with fresh mortar.

B. Steel Opening Frames: Fill door and other opening frames with mortar and embed the anchor straps, evenly spaced, in the mortar joints as block is laid up along the jambs.

C. Joint Treatment:

1. Joint Thickness: 3/8 in.
2. Tool joints until thoroughly compacted, pressing mortar hard against edges of units.
3. Joint finish at block exposed to view: Concave-tooled joints unless flush float-finished joints are specifically shown. Do not rout joints or make reveals of any sort.
4. Joint finish at concealed block: Joints struck flush.
5. Point holes in mortar and block using mortar of matching color.
6. Cut out and point up defective joints.

D. Jointing Methods:

1. Where block cores are shown to be filled with grout, lay in full mortar beds with full mortared end joints.
2. Lay all other block with fully mortared joints at vertical and horizontal face shells.
3. Do not furrow mortar beds. Butter and shove vertical joints tight.
4. Finish tooled joints smooth and free of tool marks.
5. Joints between masonry and door frames: Rake to 3/8 in. depth suitable to receive a full bead of sealant.
6. Joints around electrical outlets in wet locations: Rake to receive full bead of sealant.

E. Opening Frames: Fill steel door frames with mortar and embed frame anchor straps in mortar courses as masonry is laid up along jambs.

F. Covering the Work: When stopping work, place waterproof covers over exposed wall tops outside as well as exposed block piles. .

3.8 WALLS

A. All Walls:

1. Grout dovetail slots and space between end of masonry units and concrete solid.
2. Wedge full height partitions and walls tight to soffit except for gap for firestopping where deflection can take place.
3. Set precast concrete (or steel) lintels in full beds of mortar with at least 8 in. bearing at each end.
4. Accommodate the forming, reinforcing and placing of cast-in-place concrete lintels, with care to see that concrete leakage does not ruin the look of exposed walls.
5. Fill the first block core in each block that adjoins an opening, and the last block core where a block wall terminates in a free end.
6. Fill voids around pipes, ducts and conduit penetrating walls except for space needed for the specified firestopping.
7. Point up joints solid and flush on both sides of partitions.

B. Load Bearing Masonry Walls:

1. Erect walls before reinforced concrete members that bear on walls, as well as tie beams and tie columns within walls, are cast in place.
2. Fill block cores in top course using mortar or concrete where slabs or beams bear on masonry.
3. Fill block cores in block adjoining openings.
4. Close bottoms of masonry top-course cores 8 in. below cast-in-place concrete beams unless more filled-block courses are shown. Close with metal or fiber-reinforced paper.
5. Do not use flush-end type units against columns and cast-in-place concrete walls. Butter both shell ends to columns and walls.

C. Non-Load Bearing Masonry Wall and Partition Anchorage:

1. Erect masonry after steel and concrete frames are in place, and after concrete floors and roof decks are in place.
2. After forms are stripped, remove slot fillers.
3. At edges of non-bearing interior masonry walls and partitions abutting concrete columns and cast-in-place concrete walls, provide corrugated dovetail type anchors
4. Grout dovetail slots and space between end of masonry units and concrete solid.
5. Point up joints solid and flush on both sides of partitions.

D. Partition Heights:

1. Make partitions continuous from floor to underside of structural or fire-rated floor and roof construction above unless otherwise shown.
2. Wedge full height partitions and walls tight to soffit except for gap for firestopping where deflection can take place.
3. Where there are suspended ceilings on both sides of partitions, partitions other than those shown as continuous may be stopped 6 to 10 in. above the ceiling level.
4. Use concrete brick or solid units (soaps) for top masonry course.

3.9 REINFORCED BLOCK MASONRY

A. Concrete Fill for Cored Masonry Units:

1. Coordinate masonry work to allow placing of pea rock concrete as indicated and as specified in Concrete section.
2. Fill top courses of concrete masonry walls with concrete before placing or use concrete brick for top courses to assure solid masonry.
3. Pipe chase walls and partitions: Erect after pipes are in place, tested, and accepted.
4. Slots, chases, recesses, openings: Provide as needed for other work or equipment.
5. Setting of items supplied under other sections: Set anchors, bolts, sleeves, access panels, door frames, and other items occurring in masonry as the work proceeds.
6. Steel door frames: Set frames on floor, with floor clips fastened and frames braced in proper position. Grout anchors into masonry joints as walls are erected.

B. Fill the Following Voids with Mortar:

1. First cell of blocks abutting door jambs and window frames.
2. Cells of blocks at free ends of partitions and walls.
3. Where necessary for embedment of anchors, and where otherwise shown.
4. Voids around ducts, pipes, conduit, wires, cable trays and other items passing through masonry work, leaving only a small, uniform, smooth aperture to receive firestopping as specified in the Firestopping section.
5. Steel door frames and elevator hoistway door frames in masonry walls and partitions: Grout solid with mortar as masonry is laid. Fill tops of door frames with mortar.

C. Grouting Reinforced Masonry:

1. Grout reinforced concrete unit masonry following ACI 530.1 except as more stringently specified herein.
2. Balance slump of grout with size of cores, amount of reinforcement and obstructions, air temperature, dryness of block, and means of rodding or vibrating to attain full columns of grout without voids.
3. Do not grout if the ambient air temperature on sunny days is above 85° F.
4. Check to see that grout appears at each weep hole at the bottom of each column of cores. Plug holes and clean up mess.
5. Provide consolidation by rodding of vibrating as needed to ensure no voids.

3.10 BLOCK MASONRY IN TIE BEAM AND TIE COLUMN CONSTRUCTION

A. In concrete tie column construction, stagger alternate block courses 8 in. back from tie column dimension and terminate block courses at tie columns with field block, not flush-end units.

1. Provide weep hole at bottom of each column of cores that is to be filled with grout or concrete.

B. Layout: No column of grouted cores shall exceed 8 ft. in height. No tie column shall exceed 12 ft in height below or above a tie beam unless approved by structural engineer of record.

END OF SECTION

05120 STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03342 - Insulating Cellular Concrete.
2. 05210 - Steel Joists.
3. 09900 - Painting.

1.2 REFERENCES

A. America Society for Testing and Materials (ASTM), latest edition:

1.	A36	Specification for Carbon Structural Steel.
2.	A53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3.	A123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4.	A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
5.	A325	Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6.	A385	Practice for Providing High Quality Zinc Coatings (Hot Dip).
7.	A490	Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
8.	A500	Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9.	A501	Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

1.3 QUALITY ASSURANCE

A. Florida Building Code, 7th Edition (FBC).

B. American Institute of Steel Construction, Inc., (AISC): Manual of Steel Construction, latest edition.

1. Specification for Design, Fabrication and Erection of Buildings.
2. Code of Standard Practice for Steel Buildings and Bridges.
3. Structural Joints Using ASTM A325 or ASTM A490.

C. American Welding Society (AWS); Structural Welding Code, AWS D1.1.

D. Steel Structures Painting Council (SSPC).

E. Where requirements of AWS are in conflict with requirements of AISC, requirements of AISC shall take precedence.

1.4 SUBMITTALS

A. Submit both shop and erection drawings with indexes for structural steel for review before starting work.

B. Submit calculations and connection details signed and sealed by a Florida registered Professional Engineer, demonstrating compliance with FBC - ASCE 7-16, for High Velocity Hurricane Zones, Exposure D.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rolled Shapes and Plates: ASTM A36.

B. Anchor Bolts: ASTM A307, with regular series hexagonal head nuts, unless otherwise specified, hot dipped galvanized where noted.

C. Nuts and Bolts Except Anchor Bolts: ASTM A325, washers as required. Bolts connecting galvanized members shall also be galvanized.

D. Electrodes: E70 or F7 Series, as appropriate.

E. Shop Paint: Manufacturer's standard, compatible with finish coats. Refer to Section 09900.

F. Structural Tubing: ASTM A500, Grade B, Fy=46KSI.

G. Pipe: ASTM A501, Fy=36 ksi or ASTM A53, type E or S, Grade B, Fy=35 ksi.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Unless otherwise specified, comply with AISC specifications and "Standards" for fabrication and erection.

B. Connections:

1. Shop connections shall be welded or bolted at the option of the Contractor, unless otherwise indicated.
2. Field connections shall be bolted except where specifically indicated to be welded. Field moment connections may be welded.
3. Bolts shall be ASTM A325, friction type, unless otherwise indicated.
4. Connections shall be as generally indicated where the complete connection is shown.

5. Connections not detailed will be designed by the Contractor for the controlling stresses indicated using AISC requirements.
6. Minimum connection is two 3/4" diameter ASTM A325, bolts or equivalent in weld, (15.5K).
7. For framed connections in non-composite construction and for beams without concentrated loads, where reactions are not indicated, design the connection for one-half of the total uniform load capacity of the beam shown in "Tables for Allowable Loads on Beams", AISC.
8. Where moment connection or continuous framing is indicated, design connections for the moment indicated, but not less than 50 percent of the moment capacity, however, where the design moment is not given, design the connection for 100 percent of the moment capacity. Moment connections shall be Type 1, rigid frame.
9. Columns shall be detailed as indicated, bearing surfaces shall be finished (planed).
10. Moment connections, shop or field, shall not have bolts through the top flange plates to avoid interference with the metal decking.
11. Stiffened seats, unless indicated, are not allowed unless the Contractor verifies architectural clearances are maintained and interferences with any elements of the building will not occur.

C. Shop Cleaning: Clean steel to the requirements of SSPC-SP2.

D. Shop Painting: Shop paint steel except steel intended to be encased in concrete and steel to be hot dipped galvanized.

E. Erection Marks:

1. Column marks shall be the column number assigned on the structural drawings supplemented by tier or level number.
2. Beam marks shall be prefixed by floor or level number.

F. Hot Dip Galvanize After Fabrication: According to ASTM A123, ASTM A385, and ASTM A123, all steel exposed to the weather, shall be hot dip galvanized. Erect those members with galvanized ASTM A325 bolts. Seal weld all members to be hot dipped galvanized.

G. Camber: Shop or mill camber beams indicated.

3.3 TESTING

A. The City of Key Colony Beach may elect to inspect work in shop or field or both by nondestructive means as specified.

1. Contractor shall make no claim for extra work or delay using as a basis the inspection of work by the City of Key Colony Beach.

B. Welding Inspection:

1. Inspector designated by the City of Key Colony Beach will assume the duties and responsibilities of "Inspector" specified in Chapter Six of AWS D1.1-79.
2. Acceptance Criteria:

a. Visual: AWS D1/1, Para.3.7 and 8.15.

b. Radiographic, Ultrasonic, Magnetic Particle, and Dye Penetrant: AWS D1.1, Para.8.15.
c. Where more than one type of testing is used, acceptance criteria is "passing" all testing procedures used.

3. Inspector will spot inspect by ultrasonic means, 100 percent (one spot per weld) of all tension groove welds and 50 percent of all compression groove welds shop and field.

    a. Where metal thickness is less than 5/16", radiographic spot testing will be used.

4. Inspector will inspect welds by visual rules.
5. Inspector may use radiographic means where ultrasonic testing is not feasible.
6. Inspector may supplement any testing with dye penetrate, magnetic, radiographic, or ultrasonic plans.
7. Contractor shall be responsible for associated costs of inspections including handling, surface preparation and repair of discontinuities.

C. Provide ladders or other appropriate means for inspecting personnel to properly gain access to field joints.

D. Bolting Inspection: Inspector will test bolts both in the shop and in the field by methods specified in "Structural Joints Using ASTM A325 or ASTM A490 Bolts".

END OF SECTION

05400 LIGHT GAGE METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 05500 - Metal Fabrications.
2. 08110 - Steel doors and Frames.
3. 09200 - Metal Studs, Suspension Ceilings, Plaster, and Stucco.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data including specifications and installation instructions before starting work.

B. Submit calculations for door rough framing to resist additional dynamic loads of acoustical doors and all other items shown on the plans to require a specialty engineer.

C. Samples:

1. Metal framing.
2. Required accessories.

1.4 QUALITY ASSURANCE

A. Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Light Gage Metal Framing:

1. ClarkDietrich Building Systems
2. Dale Industries (Dale Inc.)
3. Marino/WARE
4. Other A/E approved manufacturer of equal quality and performance.

2.2 MATERIALS

A. Steel Studs:

1. 3-5/8", 22 gage, (minimum), galvanized.
2. 4", 20 gage (minimum), galvanized.
3. 6", 20 gage (minimum), galvanized.
4. 8", 18 gage (minimum), galvanized.

B. Steel Runner Track:

1. 22 gage for 3-5/8" studs.
2. 20 gage for 4" studs.
3. 18 gage for 6" and 8" studs.

C. Coating: Steel studs and runner track shall comply with ASTM A653 and have a G-60 galvanized coating.

D. Steel Studs, Runner Track, and Accessories:

1. 12, 14, and 16 Gage: Form of steel meeting the requirements of ASTM A653, Grade D, with a minimum yield of 50,000 psi.
2. 18 and 20 Gage: Form of steel meeting the requirements of ASTM A653, Grade A, with a minimum yield of 33,000 psi.

E. Metal Screws: According to steel stud manufacturer's recommendations.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

B. Stud Spacing: Maximum 16 inches on center, unless otherwise indicated on the drawings.

C. Runner Track: Securely anchor to floor and overhead structure.

D. Seat studs squarely in runner track with stud web and flanges abutting track web, plumbed and aligned, and securely attached to flanges or web of both upper and lower runner tracks.

END OF SECTION

05500 METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 03420 - Precast, Prestress Concrete Sections.
3. 04221 - Concrete Unit Masonry.
4. 09900 - Painting.
5. 10400 - Identifying Devices.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A36 Specification for Carbon Structural Steel.
2. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. A307 Specification for Carbon Steel Bolts and Studs, Threaded Rod 60,000 psi Tensile Strength.
5. A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. A385 Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
7. A501 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
8. B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
9. B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

B. American National Standards Institute (ANSI) A14.3 for fixed ladders.

C. Occupational Safety and Health Administration (OSHA).

1.3 SUBMITTALS

A. Shop and erection drawings for review before starting work.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Roof Access:

1. Ship's Ladders: Steel construction complying with ANSI A14.3 and OSHA, 63 to 75 degrees from horizontal, and handrails at both sides.

B. Aluminum Impact Bahama Shutter:

1. Basis of Design: Florida Shutters, Inc. 1055 Commerce Avenue, Vero Beach, FL 32960 or approved equal.

C. Security Grilles:

1. Able to withstand a 200-pound force applied to any point from any direction and reject a 1/2" diameter sphere.
2. 16 gage, powder coat finish, G-90 galvanized steel, with 50 percent minimum open area.
3. Manufacturers:

a. Crime Shield Barriers by Exeter, Wyoming, PA.
b. Other A/E approved equivalent.

D. Security Grilles - Missile Impact Resistant:

1. Certified missile impact resistant.
2. 14 gage, powder coat finish, A40 galvannealed steel, with 50 percent minimum open area.
3. Manufacturers:

a. Storm Shield Barriers by Exeter, Wyoming, PA.
b. SureGuard Hurricane Barriers by Phoenix Architectural Products, Smyrna, GA.

E. Security Screens - Missile Impact Resistant:

1. Certified missile impact resistant.
2. Type 304 stainless steel, No. 12 mesh, 0.028" diameter, with aluminum alloy frame.
3. Manufacturers:

a. Protect Series by Protech Screens, Pearland, TX.
b. Select Security Screen Co., Cleveland OH.

F. Aluminum Alloy Sheet and Plate: ASTM B209, 5050-H32 or temper best suited.

G. Structural Steel Shapes, Plates, Flat Bars, and Rods: ASTM A36M, Grade 36.

H. Steel Pipe: ASTM A53.

I. Columns:

1. Steel Tube: ASTM A501.
2. Other Columns: As shown.

J. Welding Electrodes for Steel: AWS A5.1-69, Class E60 and E70 for manual welds.

K. Bolts, smaller than 1/2" diameter: ASTM A307.

L. Bolts, 1/2" diameter and larger: ASTM A325.

M. Concrete Expansion Bolts: Galvanized steel self-drilling type as manufactured by:

1. Philips Drill Co., Michigan City, IN.
2. Rawl Plug Co., Inc., New Rochelle, NY.
3. Star Expansion Industries Corp., Mountainville, NY.

N. Galvanized Metal Repair Compound:

1. Hot Applied: Federal Specifications O-G-93.
2. Cold Applied: Galvaneal, Galvicon, or Z.R.C.

O. Shop Prime Coat: Zinc chromate primer.

P. Stainless Steel Shapes and Plates: Type 304 with stainless fasteners.

Q. Isolation Coating: Zinc chromate paint or acceptable non-conductive tape.

R. Fastenings, Anchors and Bolts:

1. Provide required cast-in-place or built-in anchor bolts for miscellaneous metal items of galvanized steel, complete with matching washers and nuts.
2. Where not practical to prelocate bolts, provide self-drilling or toggle type concrete anchors.

S. Hot Dip Galvanizing: Where specified or indicated, hot dip galvanize ferrous items according to ASTM A385 and ASTM A123, minimum 2.0 ounces per square foot.

2.2 FABRICATION

A. Repair to Galvanized Surfaces: Repair damaged galvanized surfaces with hot or cold applied compound.

B. Shop Painting of Ferrous Metal Items: Provide 1 coat of shop primer unless indicated or specified to be hot dip galvanized.

C. Contact With Dissimilar Materials: Provide isolation coating where dissimilar metals are in contact or where aluminum contacts masonry, concrete, plaster, or mortar.

D. Fabricate ferrous items according to AISC Specifications and approved shop drawings.

1. Grind and buff smooth rough edges, sharp corners, and welded joint of exposed steel and miscellaneous ferrous items.

E. Concrete filled metal filled pan stairs may have treads precast and delivered to job site integral with pan at option of Contractor. Landings shall be engineered to have a live load capacity of 100 psf.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordination: Coordinate miscellaneous metal items, including field dimensions where required with masonry openings and various other trades as applicable so items fit and function as intended.

B. Erect and install miscellaneous metal items at proper locations and elevations, plumb, level, in alignment and not distorted by fastenings, according to approved shop and erection drawings, manufacturer's directions, and as specified. Provide adequate temporary supports to allow field connections of members without misalignment.

C. Supplementary Parts: Furnish and install necessary to complete each item.

D. Conform to best quality and accepted standard practice.

E. Weld on back or bottom side so welds are not visible.

F. Provide acceptable fasteners, inserts, and expansion anchors for supports placed in shear position where possible.

G. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

H. Install interior stair nosings to full step length.

3.2 FIELD QUALITY ASSURANCE

A. Touch up abrasions to shop prime surfaces and welds with specified primer after erection and installation operations are complete.

END OF SECTION

05520 METAL HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SUBMITTALS

A. Properly identified manufacturer's literature, including shop and erection drawings before starting work.

B. Railing Assemblies or Railing Components: Submit shop drawings and calculations prepared by an engineer licensed in the State of Florida showing compliance to the Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 HANDRAIL AND RAILING COMPONENTS

A. Wall Brackets: Malleable iron or aluminum as manufactured by Julius Blum & Company, Inc., Carlstadt, NJ, or other A/E accepted equivalent.

1. Material:

a. Type A: Aluminum, Model #376 for use with aluminum pipe handrail section.

B. Pipe Handrail Sections:

1. Stair Handrails:

a. Size:

1) Handrail (Typical handrail at 34 to 38 inches): 1-1/4" to 1-1/2" outside diameter.

b. Aluminum:

1) Schedule 80, Alloy 6061-T6 of design and dimensions indicated with smooth bends and welded joints ground smooth and flush.

2. Vertical Members (Posts):

a. Aluminum:

1) 1-1/4" nominal square tube size, Schedule 40, Alloy 6061-T6 of design and dimensions indicated with welded joints ground smooth and flush.

3. Design and construct to withstand 200-pound concentrated load applied at any point, from any direction.

a. Wall brackets and other points of support are shown to indicate general appearance. Submit shop drawings to indicate accurate location of necessary brackets and other points of support to show compliance with load requirements.

4. Provide complete with necessary sleeves, brackets, tamper-resistant bolts, and tamper-resistant fastening devices as required for a complete installation.

2.2 HANDRAIL AND RAILING ASSEMBLIES

A. Manufacturers:

1. Dixie Metal Products, Inc., Ocala, FL.
2. Southeastern Railing, Tampa, FL.
3. Other A/E accept equivalent.

B. Aluminum railing assembly, or accepted equivalent, composed of both solid castings and aluminum extrusions or shapes designed with integrally extruded locking grooves, fastener seams, and other appendages to insure a rigidly constructed assembly. Railings shall be able to withstand a 200-pound concentrated load applied to any point from any direction and a 50-pound per lineal foot load applied from any direction.

C. Fabrication:

1. Intermediate Posts:
   a. Size: Square shaped, composed of two extrusions joined to form a square shape of not less than 4" x 4", designed to be mechanically fastened to the top rail channel with approved fasteners using not less than 2 extruded fastener seams.
   b. Material: Alloy 6061-T6.
   c. Minimum Wall Thickness: 0.062".
   d. Maximum Spacing: 60 inches on center.
   e. Provide post base and cap as indicated in drawings.

2. Corner Posts: Same as intermediate posts except mechanically attached to top rail using a specially designed aluminum casting.

3. Pickets:

   a. Size: Square shaped, 3/4" x 3/4" mechanically fastened to the top rail channel with approved tamper-resistant fasteners using 2 extruded fastener seams to prevent picket rotation within the top and bottom extrusions.
   b. Material: Alloy 6061-T5.
   c. Minimum Wall Thickness: 0.062".
   d. Spacing: Equal spacing placed to reject a 4-inch diameter ball.

4. Guardrails:

   a. Size: Oval shaped, 2-1/4" x 1" mechanically fastened to top rail channel with approved tamper-resistant fasteners at maximum 24 inches on center.
   b. Material: Alloy 6063-T6.
   c. Minimum Wall Thickness: 0.062".
   d. Julius Blum #6929 or equal.

5. Top Rail Channel:

   a. Size: Rectangular shaped, 1-1/2” x 1-1/2””.
   b. Material: Alloy 6063-T6.

c. Minimum Wall Thickness: 0.062".

6. Bottom Rail:

a. Size: Rectangular shaped, 3” x 1-1/2" mechanically fastened to the post with approved fasteners using 2 extruded fastener seams.
b. Material: Alloy 6063-T6.
c. Minimum Wall Thickness: 0.062".

7. Decorative Panel Insert:

a. Provide decorative panels inserts in locations shown in the drawings. Panels may be custom fabricated of purchased. Basis of design is “Chippendale” insert to fit within top rail channel and bottom rail. Refer to drawings for design.

8. Approved Tamper-Resistant Fasteners: 18-8 stainless steel screws with the head to be tamper-resistant, sized as recommended by the aluminum railing assembly manufacturer.

2.3 FINISHING

A. Aluminum Handrail and Railing Components and Assemblies:

1. Finish with organic paint coating that meets AAMA 2605-17a.

a. 70-percent polyvinylidene fluoride (PVDF) coating

2.4 MISCELLANEOUS

A. Expanding Grout: Premix Anchoring Cement by Premix-Marbletite, Miami, FL, or other A/E accepted equivalent.

2.5 FASTENINGS, ANCHORS, AND BOLTS

A. Provide required cast-in-place or self-drilling anchor bolts as indicated or as recommended by the handrail and railing assembly manufacturer, complete with matching washers and nuts.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Erection:

1. Erect metal handrail and railing components and metal handrail and railing assemblies at proper locations and elevations as indicated, plumb, level, in alignment, and not distorted by fastenings.

2. Erect according to accepted shop drawings and manufacturer's directions or as specified in this section.

B. Supplementary Parts: Provide as necessary to complete each item.

C. Contact With Dissimilar Materials:

1. Apply isolation coatings where dissimilar metals are in contact or aluminum components contact dissimilar metals or concrete or lime mortar surfaces.
2. Select coatings appropriate to the condition from materials specified in this section.

D. Expanding Grout: Apply according to manufacturer's printed instructions to clean and dust free surfaces to ensure proper mechanical bond.

E. Malleable Iron Handrail and Railing Components: Paint to match adjacent surfaces.

END OF SECTION

05590 STEEL FRAMED EQUIPMENT SUPPORTS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate framed equipment supports with other parts of the Work.

1.	Roof Assembly components	Div 07
2.	Air Cooled Condensing Units	15670
3.	Roof Mounted Single Packaged Air Conditioning Units	15770
4.	Air Handling Units	15855
5.	Air Moving Equipment	15861

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) Specifications, latest edition. Standard Specifications for:

1. A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. A307 Carbon Steel Bolts and Studs, and Threaded Rod 60,000 psi Tensile Strength.
3. A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
4. A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
5. A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
6. A992 Structural Steel Shapes.

1.3 DEFINITIONS

A. Roof Assembly: Defined in 07522.

B. HVHZ: High velocity hurricane zone, defined in FBC to include Monroe County,

C. Equipment support: Open structural steel structures of beams and flashable legs that hold equipment a distance above the roof membrane sufficient for both roofing maintenance and for servicing the equipment and its piping from below.

D. Piping supports, specified in 07721: Flashable curb-like structures that securely support pipes and conduit crossing the roof.

1.4 QUALITY ASSURANCE

A. Wind pressure diagrams: Tables on the Drawings, prepared by the A/E (a professional engineer registered in Florida) show maximum positive and negative (±) wind pressures based FBC and American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures.

B. Equipment shapes, sizes, weights and heights above grade: Provide to A/E. A/E will follow ASCE 7 requirements in its calculations, which will be supplied to the Contractor.

C. Design and fabricate steel equipment supports for resistance to overturning from HVHZ winds, following calculations of A/E for each item of rooftop equipment.

1. Follow American Institute of Steel Construction (AISC) Manual of Steel Construction, latest Edition.
2. Follow American Welding Society (AWS) Structural Welding Code, AWS D1.1.
3. Shop Painting: Follow Society for Protective Coatings (SSPC) SP, PS, CS & PA Standards and Specifications.

1.5 SUBMITTALS

A. Shop Drawings: Design and detail each equipment support to support rooftop equipment and to resist the calculated overturning wind forces at its location.

1. Show method of fastening to structural deck to counter wind forces.
2. Show the shape and method of fastening vertical members to structure below.
3. Show the roof insulation depth where each support is located. Also show the resulting clear dimension from top of the roof membrane to the bottom of the lowest horizontal member of the equipment support.
4. Submit for approval of Contractor and equipment installer before fabricating.

PART 2 PRODUCTS

2.1 FRAMED ROOF EQUIPMENT SUPPORTS

A. Function and Performance: Provide open-sided structural steel frames with round or square tubular legs that support items of rooftop equipment at least 18 in. clear above the roof membrane, with ample clearance for roof maintenance and for installing and maintaining piping, ducts, conduit and wiring that serves rooftop equipment.

1. Roof equipment supports, when fastened to supported equipment, shall withstand the calculated wind uplift and toppling effect of HVHZ wind forces.

B. Description:

1. Horizontal members: Bolted galvanized steel shapes. ASTM A992 (60,000 lb/in^2 yield point, min.) or ASTM A36 (36,000 lb/in^2 yield point, min.). Welding may be used in sub-assemblies within the support assembly
2. Vertical members: Round galvanized structural tubing steel, welded to horizontal members, with welded base plates drilled for bolting to roof structure: ASTM A501 or ASTM A500, Grade B or C (42,000 lb/in^2 yield point, min.) or ASTM A501.

    a. Vertical members shall accommodate circular (or square) stainless steel roof flashings. Do not use angle, WF, or other steel shapes for vertical members in roof equipment support assemblies.

3. Restraint brackets and base flange attachments: Galvanized steel; ASTM 7.
4. Welding electrodes: AWS A5. 1-69, Class E60 and E70 for manual welds.
5. Galvanizing: Hot dip after fabrication; ASTM A123, Grade 75 to 95, 3.0 oz/ft^2 min.
6. Bolts: ASTM A325 (105 lb/in^2 yield point, min.), at least 5/8 in. diameter, with nuts and washers, hot dip galvanized.

2.2 ACCESSORIES

A. Repair of Galvanizing: Compound with high metallic zinc content such as Galvaneal, Galvicon, or Z.R.C.

B. Shop prime coat: SSPC SP 1 solvent cleaning and SP 12.01 zinc-rich primer.

C. Isolation sheets: Provide neoprene or EPDM separators between dissimilar metals that are in contact.

D. Concrete expansion bolts for fastening to concrete structure: Galvanized steel self-drilling type as produced by Philips Drill or Rawl Plug.

2.3 FABRICATION

A. Fabricate ferrous items following the A/E's calculated loads, AISC Manual, AWS Code, SSPC standards, and approved shop drawings.

1. Grind and buff smooth rough edges, sharp corners, and welded joints. Repair damaged galvanized surfaces with hot or cold applied galvanizing repair compound.
2. Shop painting: Shop-prime zinc coating with 1 coat of primer, ready for field painting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect and install steel framed supports following approved shop drawings and producer's directions. Touch up cleaned welds, galvanizing, and abrasions to shop coat.

END OF SECTION

06100 CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Carpentry work including grounds, nailers, blocking, miscellaneous framing, plywood backing panels, plywood sheathing, preservative treatment, and necessary accessories indicated or specified in this section.

B. Related Sections:

1. 06300 - Wood Treatment.
2. 07210 - Building Insulation.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. D226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

1.3 QUALITY ASSURANCE

A. Factory mark each piece of lumber and plywood to identify type, grade, agency providing inspection service, producing mill, and other qualities as specified.

1.4 DELIVERY AND STORAGE

A. Keep materials dry during delivery and storage.

1. Protect against weather and contact with damp or wet surfaces.
2. Stack lumber and plywood and provide air circulation within stacks.

1.5 SITE CONDITIONS

A. Gunpowder activated fastening systems may be used on City of Key Colony Beach Projects only on a limited basis. They shall not be used as the main support for construction elements located overhead. Approval must be obtained from City of Key Colony Beach Building Department.

PART 2 PRODUCTS

2.1 MATERIALS

A. Exterior Plywood:

1. Conform with US Department of Commerce PS 1-66, bearing APA grade mark.
2. Grade: APA rated sheathing, EXT, span rating to suit rafter spacing.
3. Thickness: Indicated on drawings.

B. Interior Plywood (Concealed): Where plywood will be concealed by other work, provide exterior type plywood C-D plugged grade, unless otherwise specified.

C. Interior Plywood (Painted Finish): Same as concealed, except with hardwood plywood or medium density overlay, Grade MDO EXT-101; smooth surface with no grooves.

D. Interior Plywood (Transparent Finish):

1. Exterior type plywood, Grade A veneers on exposed surfaces, Grade B veneers on semi-exposed surfaces, and Grade D or better veneers on concealed surfaces.

    a. Birch - (Natural) (Select) (Rotary Cut) (Red) (White).
    b. Oak - (Rotary Cut) (Plain Sliced) (Red) (White).

E. Lumber:

1. Standard:

    a. Comply with American Softwood Lumber Standards PS-20 by U.S. Department of Commerce.
    b. Nominal sizes are shown or specified, except as shown by actual dimensions.
    c. Provide actual sizes complying with minimum size requirements for PS-20 for moisture content specified for each use.

2. Moisture Content: Seasoned lumber with 19 percent maximum moisture content at time of dressing and complying with dry size requirements of PS-20, unless otherwise specified.

F. Framing Lumber:

1. Lumber complying with grading rules according to requirements of National Grading Rule for Dimension Lumber of American Lumber Standards Committee established under PS-20.
2. Light Framing (2 inches to 2 inches thick and 2 inches to 4 inches wide): "Stud" grade lumber for stud framing and "standard" grade for other light framing.

G. Boards:

1. Boards complying with dry size requirements of PS-20 where lumber less than 2 inches in nominal thickness and 2 inches or more in nominal width is shown or specified.
2. Moisture Content - Exposed Work: Moisture content of 19 percent maximum, SDRY Southern Pine No.2 per SPIB for paint finish.
3. Moisture Content - Concealed Work: Moisture content of 19 percent maximum, Southern Pine (SPIB) No.2 boards.

H. Miscellaneous Materials:

1. Fasteners and Anchorages:

    a. Provide size, type, material, and finish and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices.

b. Provide metal hangers and framing anchors of size and type recommended by the manufacturer for each use including recommended nails.
c. Where rough carpentry Work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with hot-dip zinc, ASTM A153.

2. Building Paper: ASTM D226, Type I, asphalt saturated felt, non-perforated, 15 lb. type.

I. Treated Wood: Refer to Section 06300, "Wood Treatment".

PART 3 EXECUTION

3.1 PREPARATION

A. Protect installed carpentry work from damage by work of other trades until accepted by the City of Key Colony Beach.

1. Review proposed protection methods with A/E for acceptance.

B. Examine substrates, adjoining construction, and conditions where work is to be installed.

C. Do not proceed with work where unsatisfactory conditions exist.

D. Where rough carpentry is fitted to other work, obtain measurements of other work and verify dimensions shown on shop drawing details.

E. Apply heavy brush coat of same chemical treatment material to surfaces exposed by sawing, cutting, or drilling.

3.2 INSTALLATION

A. Materials: Use only sound, thoroughly seasoned materials of longest practical lengths and sizes to minimize jointing, free from warp that cannot be easily corrected by anchoring and attachment.

B. Installation:

1. Attachments and Anchors:

a. Closely fit and accurately set members to required lines and levels, and rigidly secure in place.
b. Nail size and nail spacing shall be sufficient to develop adequate strength for connection without splitting the member.
c. Countersink nailheads on exposed carpentry work and fill holes.
d. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish material(s).
e. Make tight connections between members.
f. Install fasteners without splitting wood, pre-drill as necessary.

2. Wood Grounds, Nailers, Blocking, and Sleepers:

a. Provide as shown and as required for screeding or attachment of other work.
b. Form to shapes as shown and cut as required for true line and level of work to be attached.
c. Set true to line and level, plumb, with intersections true to required angle.
d. Coordinate location with other work involved.
e. Provide wood blocking to strengthen and supplement horizontal metal stud framing members between studs required for recessed or surface mounted items including, but not limited to, cabinets, finish hardware, magnetic door holding devices, chalkboards.
f. Cut blocking to fit between framing members and rigidly attach thereto.
g. Secure blocking and nailers to building structure as indicated and as specified.
h. Provide wood grounds for attachment of finish trim and other work to plaster.
i. Grounds shall be dressed, preservative treated. Use key-beveled lumber not less than 2-inch nominal width and of thickness required to bring face of ground to exact thickness of finish material involved.
j. Remove temporary grounds when not longer required.

3. Roof Sheathing: Nail or staple to framing and use spacer clips at edges for expansion/contraction control.

END OF SECTION

06300 WOOD TREATMENT

PART 1 GENERAL

A. Related Sections:

1. 06100 - Carpentry.
2. 06400 - Architectural Woodwork.

1.2 SUBMITTALS

A. Wood Treatment Data:

1. Submit chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.
2. Preservative Treatment: For each type specified, including certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
3. Water-Borne Treatment: Include statement that moisture content of treated materials was reduced to levels indicated before shipment to project site.
4. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with specified standard and other requirements.

1.3 QUALITY ASSURANCE

A. Wood treatment shall comply with Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MATERIALS

A. Preservative Treatment:

1. Where lumber or plywood is specified to be treated, comply with applicable requirements of AWPA Standards C2, Lumber, and C9, Plywood and of AWPB standards listed.
2. Mark each treated item with AWPB Quality Mark Requirements.
3. Pressure treat aboveground items with water-borne preservatives to comply with AWPB LP2.
4. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent.
5. Treat indicated items and the following:

    a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
    b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
    c. Wood Framing Members: Maximum 18 inches above grade.

6. Pressure treat the following with water-borne preservatives for ground contact use complying with AWPB LP22:

a. Wood members in contact with ground.
b. Wood members in contact with fresh water.

7. Pressure treat softwood lumber, timber, and plywood for wood foundation systems with water-borne preservatives for ground contact to comply with AWPB FDN.
8. Complete fabrication of treated items before treatment, where possible.
9. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

B. Fire-Retardant Treatment:

1. Where fire-retardant treated wood (FRTW) is specified, pressure impregnate lumber and plywood with fire-retardant chemicals shall comply with Military Specification MIL-L-19140E for Lumber and Plywood, Fire-Retardant Treated. Comply with AWPA C20 and C27, respectively, for treatment type indicated.
2. Identify FRTW lumber with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
3. Interior: Use where FRTW is indicated for interior applications.
4. Exterior: Use where FRTW is indicated for exterior, exposed applications.
5. Inspect each piece of treated lumber or plywood after drying, discard damaged or defective pieces.

PART 3 EXECUTION

3.1 APPLICATION

A. Place treated lumber and plywood as detailed.

END OF SECTION

06400 ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

A. Provide necessary services, tools, equipment, material, and labor required to furnish and install millwork and cabinet work. Install cabinet hardware specified. Do all finishing work in the shop.

B. Related Sections:

1. 08210 - Wood Doors
2. 08710 - Finish Hardware.

1.2 REFERENCES

A. ANSI/AHA A135.4 - Basic Hardwood.

B. American Society for Testing and Materials (ASTM), latest edition:

1. D1037 Test Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials.

1.3 SUBMITTALS

A. Manufacturer's Data: Submit 3 copies of manufacturer's data for each item furnished under this Section.

B. Shop Drawings:

1. Submit 3 copies of shop drawings showing plans, elevations, and large-scale details for each fabricated item. Identify locations of each item. Show plastic laminate colors, patterns, and inserts.

C. Samples:

1. Submit samples of each wood species to receive transparent finishes.
2. Submit a finished sample of each finish.
3. Submit samples of milled paneling and trim items.

1.4 QUALITY ASSURANCE

A. Built-ins and casework shall be constructed and installed to carry intended loads, not have sharp corners, splinters, or any construction features or projections that would be hazardous to occupants and users. Casework and cabinets shall be constructed in conformance with applicable state and federal accessibility requirements.

B. Cabinet work shall follow minimum requirements described in the latest edition of the Architectural Woodwork Institute (AWI) following "Custom Grade" standards.

C. Particle board is not allowed.

D. Casework shall be "Custom Grade" overlay design with plastic laminate finish.

E. Only manufacturers with financial stability and 5 years experience in casework manufacture and installations of similar scope will be considered.

1. The installer must be a company whose primary business is the manufacturing of plastic laminate casework.
2. The installer shall have adequate physical facilities and personnel for this size project with a qualified engineering department to provide layout and shop drawings for review before fabrication.

F. Evidence of qualifications shall include product catalog, descriptive literature, and specifications for the proposed product. Submit a sample cabinet, complete with drawer, door hardware, and corner sample of countertop with the product literature.

1.5 PRODUCT DELIVERY AND STORAGE

A. Deliver casework when the building is secure and weather tight.

B. The air circulation control system shall be operating and maintaining humidity and temperature conditions similar to the conditions to be maintained by the City.

C. Interior plaster and plaster veneer work shall be complete and dry.

D. Painting and other finish work shall be complete in immediate and adjacent areas within the building where millwork/cabinet work/casework is stored.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Plastic Laminate:

1. Formica.
2. Wilson Art.

2.2 MATERIALS

A. Case members, tops, bottoms, sides, dividers, shelves, door fronts, and drawer fronts shall be 3/4" thick 7 ply closed grain hardwood plywood.

B. Case backs shall be 1/4" thick closed grain hardwood plywood.

C. Plywood shall have type II water-resistant glue.

D. Plywood: Provide manufacturer's association stamp except where exposed to view.

E. Plywood exposed to view unless otherwise specified shall be hardwood plywood with exterior glue.

F. Plastic Laminate: High pressure laminate conforming to NEMA specification LD3 latest edition. Laminate the plastic laminate sheets to the core stock under pressure with water resistant adhesive to achieve a Type II bond.

1. Material Thickness:

    a. 0.050" - Exposed surfaces and edges of drawer fronts, door fronts, counter tops, backsplash, and all other remaining exposed exterior horizontal and vertical surfaces.
    b. 0.027" - Exposed interior surfaces of door backs, cabinet sides, backs, and shelving and all other remaining exposed interior horizontal and vertical surfaces.
    c. Concealed Surfaces: Not applicable.

2. Colors and Patterns:

    a. As shown on the drawings.
    b. Any preselected colors and patterns shown on the drawings or in the specifications shall govern.
    c. Where colors or patterns are not shown, plastic laminate equivalent in cost to standard solid colors shall be bid upon, assuming not more than 10 colors.
    d. A/E's range of color selection shall not be limited to colors stocked locally, but by entire color line of specific manufacturer as determined by samples in A/E's office.

G. Wood trim, cabinet stiles and rails, and wood door frames:

1. Soft wood: Clear "C" or better when covered by laminated plastic.
2. Hardwood: AWI "Custom" Quality.
3. Where hinges or other attachment requiring screws for holding power in concealed wood are required, lumber shall be one of the following:

    a. Southern Yellow Pine.
    b. Birch.
    c. Beech.

4. Where screw holding power is not required, concealed lumber shall be:

    a. Southern Yellow Pine.
    b. Birch.
    c. Beech.
    d. Pine.
    e. Poplar.

5. Lumber scheduled or detailed to be covered with plastic laminate shall be one of the following:

    a. Southern Yellow Pine.
    b. Poplar.
    c. Birch.
    d. Beech.

6. Lumber used for construction of bins or shelving supports located in kitchen pantries, storage rooms, or janitor closets shall be, unless otherwise shown on the drawings, finished under Painting Section with "natural finish" and shall be of one of the following:

    a. Southern Yellow Pine.
    b. Poplar.
    c. Birch.
    d. Beech.

7. Lumber scheduled or detailed to be transparent finished (varnished, stained, oil-rubbed, gloss, or satin polyurethane finish) shall be the following:

    a. Birch.
    b. White Oak.
    c. Red Oak.

8. Lumber scheduled to be painted or enameled shall be one of the following. Do not use fir plywood in this application:

    a. Southern Yellow Pine.
    b. Poplar.
    c. Birch.
    d. Beech.

H. Fiberboard: Class 1 Tempered, smooth face hardboard, with 6,000 psi average modulus of rupture. Comply with ANSI/AHA 135.4 and ASTM D1037.

1. Use fiberboard only where specifically scheduled or called for on drawings or in specifications.
2. Fiberboard as backs for wall supported cabinets is not allowed.

I. Adhesives: Use adhesives meeting Strength and Rate of Loading, Moisture Resistance, and Heat Resistance requirements set forth in AWI 100-G-11. Do not use glues containing formaldehyde.

1. For interior work:

    a. Modified Polyvinyl Acetate: For normal use except items requiring high moisture resistance.
    b. Casein Glue: For normal use except waterproofed items.
    c. Contact Cements (not the solvent type): For bonding high water pressure laminates only.

2. For exterior work or in kitchen, toilets or other rooms with rooms with moisture:

    a. Phenolic Resin: Generally for moisture resistance of fully waterproof bond.

J. Wood Paneling:

1. Fabricate with solid lumber to configuration shown on the drawings.
2. Quality: Hardwood meeting AWI Custom Grade.
3. Species: Birch.

4. Type sawing: Plain sawn.
5. Type matching: Random.
6. Type finish: Transparent.

K. Large Hollow-core Doors in Cabinet Work: Comply with requirements of Section 08210 - Wood Doors.

L. Finish Hardware:

1. Hinges for 3/4" Thick Doors:

    a. US26D satin chrome plated steel, 5 knuckle, wrap around type allowing 270-degree swing at end of cabinet work unit, mounted with minimum 4 plated No.8 self-tapping screws per hinge leaf. Concealed European type hinges are not allowed.
    b. For doors up to and including 48 inches high: Provide 2 hinges.
    c. For doors over 48 inches high: Provide 3 hinges.
    d. Manufacturers:

        1) RPC 376-26D.
        2) Other A/E accepted equivalent.

2. Pulls: 5/16" wire pull, 4" long, solid brass, US26D satin chrome plated.

    a. Stanley 4484.
    b. Epco MC.
    c. Colonial 753

3. Door Catches: Stanley SP45.

    a. For doors up to and including 38 inches high: Provide 1 heavy duty magnetic type catch, slotted for adjustment. Attach with screws.
    b. For door 38 inches high and over: Provide 2 heavy duty magnetic type catches, slotted for adjustment. Attach with screws.

4. Surface bolts for inactive doors in cabinet door pairs with locks indicated:

    a. Ives 40 x US26D x 6 inches.
    b. Quality B-6 x US26D x 6 inches.
    c. Baldwin 0324 x US26D x 6 inches.

5. Locks for 3/4" doors with plastic laminate finish: (Where indicated on drawings). Satin chrome or nickel-plated steel 6 tumbler lock with grooved key.

    a. KV 987, with strike.
    b. Yale 9660, with strike.
    c. Corbin 0764L, with strike.

6. Drawer Slides: Zinc plated cold rolled steel. Grant or KV 1300 rated for 75-pound capacity.
7. Steel Standards: KV 233ZC with zinc plated finish, 5/8" screw nails, and KV 237ZC shelf clips. Surface mount.

2.3 FABRICATION

A. Construct cabinet work as shown on the drawings and meeting the following requirements:

1. Cabinet members, bottoms, sub-top, sides, and back shall be joined by dado and rabbeted joints secured with glue and concealed mechanical fasteners. Case backs shall have a 3-inch anchor cleat the full width of the unit at the top.
2. Case construction of butt joins with dowel pins is not allowed.
3. Construct the toe space base from solid lumber and separately framed.
4. Drawers: Lock shouldered.
5. Drawer Sides and Backs:

    a. Well sanded Southern Yellow Pine, Poplar, Gum, or Birch, with corners rounded and natural finish.
    b. Plastic laminate on 1/2" plywood with plastic laminate interior and exterior.

6. Drawer Bottoms: 1/4" tempered fiberboard with factory applied gloss surface of color approved by A/E.
7. Cabinet interior sides drilled to receive shelf pins leaving exposed core are not acceptable.
8. Shelving:

    a. 3/4" plywood for lengths less than 36 inches.
    b. 1 inch plywood or 3/4" plywood with 3/4" x 1-1/2" hardwood edges at front and rear of shelf for lengths 36 inches or greater.

9. Adjustable Shelving: Use surface mounted standards and notched shelving ends.
10. Exposed Shelving: In storage rooms, utility rooms, kitchen pantries, shops, mechanical or electrical rooms, or in janitor closets, shall be "natural finish" constructed of plywood with edges banded of similar material and have outside face veneers of similar material of either:

    a. Gum.
    b. Poplar.
    c. Beech.
    d. Birch.

B. All other Shelving: Hardwood plywood with bonded edges, finished "transparent" and of plywood with veneers meeting the following criteria:

1. Cabinet and casework hardware will be supplied under the finish Hardware Section and shall be installed by the cabinet and casework fabricator. Locate hardware accurately on shop drawings.
2. Species: Birch, APA grade marked MDO 1 face/2 face, interior grade.
3. Where normally exposed to view (behind cabinet doors): Birch, AWI Custom Quality.
4. Where normally concealed from view (behind cabinet doors): Birch, AWI Economy Quality.

C. When specifically called for on the drawings as laminated plastic faced cabinets doors, ends, drawer fronts, dividers, and backs (except against walls):

1. Provide plywood with laminated plastic on all surfaces not occurring against building walls or fixed partitions.
2. Provide stiles and rails of laminated plastic covered lumber.

D. All other cabinets not specifically called for on the drawings as laminated plastic faced shall be constructed of "transparently finished" hardwood plywood doors, ends, drawer fronts, dividers, and backs (except against walls) with lumber stiles and rails of same species, as follows:

1. Species: Birch or White Oak APA grade marked MDO 1 face/2 faced, interior grade.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which the millwork/ cabinetwork is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of this phase of the Work. Do not proceed with this phase until the unsatisfactory conditions have been corrected. Commencement of work shall be construed as acceptance of the conditions.

B. Contractor shall take accurate field measurements and adjust the shop drawings accordingly before fabrication. The A/E shall be informed in writing of any dimension changes resulting from such field measurement before fabrication.

C. The casework shall be set in place, leveled, and secured to walls and floors as normal and standard to the trade. Fillers shall be used between casework and walls and shall be accurately scribed to walls for a neat installation. Casework shall be caulked where meeting walls, floors and soffits. Seal all counter joints and where backsplash meets countertop.

D. The casework installer shall accurately cut openings required for sinks or other equipment as indicated on plans.

3.2 INSTALLATION

A. Provide first quality construction following best trade practices.

B. Cuts, miters, joints, etc. shall be well sawn and joined. Nail heads or holes shall not be exposed in finish work. Drive nails and screws true and straight. Glue joints securely together. Sand all surfaces thoroughly, leaving clean and ready for finishing.

C. Bond plastic laminate to surfaces with technique and contact cement approved by laminated plastic manufacturer.

D. Install cabinet hardware according to requirements of the finish hardware as specified and in accurate positions as indicated on the drawings.

END OF SECTION

07120 FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. Division 7 - Moisture and Thermal Protection.
3. 09200 - Metal Studs, Metal Lath, Suspension Ceilings, Plaster, and Stucco.
4. 09310 - Ceramic Tile.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data before starting work.

1. Submit an affidavit from manufacturer approving applicator before installation.

a. Applicator shall provide evidence of 5 years satisfactory application experience of the system specified.

2. Submit material product data, material specifications, and application manual from manufacturer describing completely the preparation of surfaces and application of specified materials.

1.3 QUALITY ASSURANCE

A. Waterproofing Applicator:

1. Manufacturer trained and manufacturer approved for waterproofing system proposed.
2. Minimum of 5 years experience in the application of fluid applied waterproofing.

B. Waterproofing Manufacturer's Factory Trained Representative:

1. Inspect and approve surfaces to receive waterproofing before start of the work.
2. Be present and observe start of application of waterproofing.
3. Periodically inspect the work and inspect completed waterproofing work.
4. Report unsatisfactory surfaces to receive waterproofing and unsatisfactory materials and construction to Contractor and A/E.

1.4 PROJECT CONDITIONS

A. Environment Requirements:

1. Surface Temperature: Between 40- and 110-degrees F. during application.
2. Weather: Clear with no rain during application or anticipated within 12 hours.

1.5 WARRANTY

A. Furnish warranty covering watertight integrity or waterproofing for 5 years from date of Substantial Completion.

1. Warranty shall provide for prompt repair of leaks, ruptures, blisters, and other imperfections at no cost to the City.
2. Warranty shall be signed by contractor and waterproofing applicator.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fluid Applied Waterproofing (for non-exposed areas):

1. Anti-Hydro Waterproofing Co.: A-H Seamless Membrane, 2H and 2V.
2. 3M Company: Scotch-Clad Deck Coating System M.
3. Sonneborn Building Products Division Contech, Inc.: Hydrocide Liquid Membrane No.5000 in roller grade and trowel grade.
4. Tremco Manufacturing Co.: Tremproof No.60.

B. Protection Board:

1. Celotex Corp.: Elastiboard.
2. J&P Petroleum Products, Inc.: Tex-Mastic Backerboard.
3. W.R. Meadows: PC-2 Protection Course.
4. Tremco Mfg. Co.: Tremboard.

C. Fluid Applied Waterproofing (for exposed areas):

1. Sonneborne Inc: Sonoguard.
2. Tremco Inc.: Volkem 350/351.

2.2 MATERIALS

A. Fluid Applied Waterproofing: One-component moisture-curing or two-component urethane type waterproofing suitable for covered non-traffic below grade locations.

B. Primer: As recommended by waterproofing manufacturer for each type of surface encountered.

C. Protection Board: 1/8" thick asphalt composition board.

D. Joint Filler: Closed cell, round expanded polyethylene foam.

E. Sealant: As recommended by waterproofing manufacturer for compatibility with waterproofing system.

F. Materials: Provide 1/16" thick neoprene sheet material, adhesives or trowel grade urethane waterproofing, woven uncoated fiberglass mesh flashing reinforcement or non-woven polyester fabric, thinners and application equipment necessary to complete work of this section as recommended by the waterproofing manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Condition of Concrete Surfaces:

1. Horizontal: Trowel finished without sharp ridges, projections, voids, and concrete or mortar droppings.
2. Vertical: Smooth, formed without sharp ridges, projections, voids, and concrete or mortar droppings.

B. Condition of Concrete Surfaces to Receive Waterproofing:

1. Water cured or cured with silicate type chemical curing compound compatible with waterproofing.

    a. Resin type curing compounds are not allowed.

2. Surfaces shall be dry and acceptable to waterproofing applicator.
3. Application of waterproofing will be considered as acceptance of surfaces to receive waterproofing.

3.2 PREPARATION

A. Surface Preparation:

1. After concrete substrate has cured 14 days with a maximum of 8 percent moisture content, and with projections, voids, concrete, and mortar droppings corrected, thoroughly clean surfaces immediately before installation of waterproofing using compressed air, vacuum, or other methods.
2. Remove oil, grease, form oils, and resin type curing compounds with sandblasting or a commercial grade alkaline cleaner or solvent. Thoroughly rinse and dry.
3. Concrete surface shall be dry and pass a 4-hour rubber mat test with no condensation before application of waterproofing system.

    a. Test will not be required on vertical walls open on both sides.

3.3 INSTALLATION

A. Joints, Cracks, and Depressions:

1. Clean expansion, control, and construction joints by cutting back a minimum of 1 inch.

    a. Install polyethylene foam joint backing rod compressed 50 percent providing a channel below level of slab of depth equal to 1/2 width and with 1/2" depth maximum.
    b. Fill joint to surface level with sealant, apply bond breaker, and cover with nonflowing type waterproofing, preformed neoprene, or urethane sheet to a width of 3 inches on each side of joint as specified.

2. Rout or saw cut cracks exceeding 1/16" in width and fill with sealant.

a. Treat cracks by cleaning thoroughly and applying 60 mils of waterproofing extending 3 inches from each side of crack.

3. Prepare concrete substrates by filling voids, holes, and depressions with epoxy grout or bonding agent and cement-sand grout as recommended by waterproofing manufacturer.
4. At horizontal, vertical, and corner expansion joints, provide joint filler and sealant application compatible with waterproofing system.

    a. Bridge joints using preformed neoprene or urethane membrane or with 60 mil coating of fiberglass mesh reinforced waterproofing or strip of neoprene sheet as standard with manufacturer, applied over bond breaker on expansion joint.
    b. Extend waterproofing a minimum of 6 inches from each side of joint, adhered to deck and vertical surfaces.

B. Vertical Protrusions and Drains:

1. Clean exposed metal surfaces such as pipes, sleeves, drains, bases, and ducts by removing paint, rust, scale, or any foreign matter.

    a. Metal Preparation and Priming: According to manufacturer's recommendations and, if required, prime coat metal surfaces a maximum of 8 hours before membrane application with waterproofing manufacturer's metal primer.

2. Apply a 60-mil waterproofing coating to entire surface, extending waterproofing up to bottom of sealant in top surfaces of deck areas and extend membrane out on or up vertical surfaces 4 inches on projections.
3. Extend waterproofing over flanges of drains without sealing weep holes.

C. Waterproofing:

1. Two Component Type Waterproofing: Mix materials according to manufacturer's published instructions without incorporating air bubbles.

    a. Do not thin or dilute mixture.
    b. Conform to recommended "Pot-Life" requirements.

2. For single component type waterproofing, use as furnished without dilution.
3. Apply waterproofing uniformly on surfaces to produce 60 mils (dry film) thickness using a trowel, calibrated notched squeegee or roller equipment approved by the manufacturer.

    a. 60-mil thickness is exclusive of previously applied waterproofing materials at cracks and joints.

4. Apply nonflowing type waterproofing material wherever a vertical surface exists, forming a continuous flashing and a 1/2" x 1/2" triangular cant, or other size recommended by waterproofing manufacturer.

    a. Extend waterproofing vertically up to bottom of sealant in deck top surfaces unless otherwise indicated.

5. Apply waterproofing under exterior quarry tile, paver tile, or concrete toppings above first floor.
6. At waterproofed basement floors, apply waterproofing on top of exterior wall foundations, interior column and wall foundations, mat type foundations, and working slabs.
7. Apply waterproofing to walls on earth side of room walls remaining earth fill.

    a. Extend waterproofing from foundation up to underside of floor resting on earth fill.

8. Apply waterproofing on exterior of elevator pit walls retaining earth fill from top of foundation up to finished floor on fill and from top of foundation up to within 4 inches of finished grade on exterior of building.
9. Apply waterproofing on exterior of below grade basement walls from top of foundation up to within 4 inches of finish exterior finish grade.
10. In planting bins within basement, apply waterproofing on interior bottoms and on interior sides from bottom to underside of ground floor slab.
11. Extend waterproofing material 6 inches minimum out on top of foundations.
12. At below grade rock anchors, pipe and conduit penetrations, extend membrane out on anchors, pipes and conduits 6 inches minimum to seal penetrations watertight.
13. Apply waterproofing to mechanical equipment room structural floor slabs below "floating slabs".

    a. Extend waterproofing on walls, curbs, pipes, and conduits up to top of the floating slab.

14. Tie-in to existing roofs require special detailing such as an area divider to properly seal both roof systems and maintain warranties.

D. Protection Board:

1. Do not apply protection board to deck waterproofing until successful testing has been completed.
2. Apply protection board to horizontal surfaces and vertical surfaces of waterproofing. Adhere with spots of waterproofing.
3. On vertical surfaces where mechanical attachment is necessary to prevent protection board from sliding down, apply additional heavy trowel coat of fluid applied waterproofing where fasteners penetrate waterproofing.

    a. Use galvanized masonry nails for attachment of protection board.

4. Where protection board is to be applied to curved inside surfaces of planting bins, preform protection board using heat over a curved form.

E. Alternate Protection for Vertical Surfaces of Fluid Applied Waterproofing (Contractor's Option):

1. In place of protection board, apply splatter coat of 1:3 mixture of cement and sand mortar, by hopper gun to final coat of waterproofing before coating cures.
2. After waterproofing and mortar splatter coat have set, apply 3/8" thick coat of Portland cement plaster by gun or by trowel.
    a. Finish surface smoothly without damage to waterproofing.

b. Refer to Section 09220, Metal Studs, Metal Lath, Suspension Ceilings, Plaster, and Stucco.

3.4 TESTING

A. Do not flood test waterproofing sooner than 36-hours following completion of application.

1. Flood test each horizontal or deck area for 48 hours minimum using a minimum of 2 inches of standing water.
2. Plug drains and place barriers to contain water.
3. Notify the manufacturer's representative before testing.

B. Patching: Repair leaks that develop and retest.

1. Patch voids, bubbles, depressions, imperfections, or tears according to manufacturers published recommendations.

END OF SECTION

07121 FLUID APPLIED WATERPROOFING WALL COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Elastomeric wall coating for exposed exterior wall surfaces requiring waterproofing in colors, selected by A/E from manufacturer's standard color selection chart.

1.2 SUBMITTALS

A. Provide field sample of installed waterproofing. Approved sample may be incorporated as part of the work.

1.3 WARRANTY

A. Provide 10-year warranty. Include coverage of materials and installation from failure of installation to resist penetration of moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fluid Applied Waterproof Wall Coatings:

1. Thoro Systems, Thorolastic by BASF.
2. VIP8100 Last-O-Coat , by GE Sealants & Adhesives,
3. Other products equal in quality and performance as approved by A/E.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

1. Allow for proper curing of wall substrate before application.

END OF SECTION

07210 BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 05400 - Light Gage Metal Framing.
2. 06100 - Carpentry.
3. 09200 - Metal Studs, Lath, Suspension Ceilings, Plaster, and Stucco.
4. 09250 - Gypsum Wallboard.
5. Division 7 - Thermal and Moisture Protection.

1.2 REFERENCES AND CODES

A. Florida Building Code (FBC).

B. American Society for Testing and Materials (ASTM), latest edition:

1. C272 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
2. C739 Specification for Cellulose Fiber Loose-Fill Thermal Insulation.
3. C578 Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. C612 Specification for Mineral Fiber Block and Board Thermal Insulation.
5. C1029 Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
6. C1149 Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation.
7. C1289 Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
8. C1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials.
9. C1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
10. D1622 Test Method for Apparent Density of Rigid Cellular Plastics.
11. D5116 Guide for Small-Scale Environmental Chamber Determination of Organic Emissions from Indoor Materials/Products
12. E84 Test Method for Surface Burning Characteristics of Building Materials.
13. E96 Test Methods for Water Vapor Transmission of Materials.
14. E136 Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750° C.
15. E662 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
16. E736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
17. E759 Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.
18. E859 Test Method for Air Erosion of Sprayed Fire Resistive Materials (SFRMs) Applied to Structural Members.

C. National Fire Protection Association (NFPA) - latest edition:

1. NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.
2. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's product data including installation instructions before starting work.

B. Submit Southern Building Code Congress International (SBCCI) Public Safety Testing and Evaluation Services reports including trade name, application, and thermal protection requirements of insulation used.

1.4 QUALITY ASSURANCE

A. ASTM E84 Flame Spread: 25 or less.

B. ASTM E662 Smoke Development: 450 or less.

C. Sprayed-Applied Cellulose Insulation:

1. Use factory trained applicators.
2. The product shall not be reactive or prone to chemical degradation that reduces the required fire resistance over time.

D. Materials used shall contain no formaldehyde.

E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Multi-Story Fire Test: Foam-plastic board insulation materials used in above-grade wall construction must have been tested in accordance with NFPA 285 and 286 and passed for the specific type of wall assembly construction in which the insulation will be utilized.

PART 2 PRODUCTS

A. Foil-Faced Blanket Insulation:

1. Manufacturers:

a. CertainTeed.
b. Owens Corning.
c. Johns Manville.

2. Physical Data:

a. "R" Value: 11 minimum at 75 degrees Fahrenheit mean.
b. For use between wall furring.

c. Spun mineral foil faced fiber or fiberglass blankets, ___ inches thick x ___ inches wide x lengths as long as practicable.

B. Polyisocyanurate Roof Insulation.

1. Manufacturers:

a. AC Foam II by Atlas Roofing Corp.
b. Other A/E accepted equivalent.

2. Physical Data:

a. "R" Value: 5.6 per inch minimum at 75 degrees Fahrenheit mean.
b. Board Thickness: 1/2-inch minimum (12.7mm), 2 inches (51mm) maximum.
c. Board Size: 4'-0" x 4'-0" maximum.
d. ASTM D1622 Board Density: 2.0 pcf.
e. ASTM D1621 Compressive Strength: 23 psi minimum.
f. ASTM C209 Water Absorption: 1 percent by volume, maximum.
g. ASTM E-96 Moisture Vapor Transmission: 1 perm, maximum.
h. Dimensional Stability: 2 percent maximum linear change when conditioned at 158 degrees F. And 97 percent relative humidity for 7 days.
i. Curing Time: 24 hours minimum, plus an additional 24 hours minimum per inch (25mm) of thickness at a minimum of 60 degrees F. before shipment from manufacturer.

3. Protection: Provide 1/2" minimum Dens Deck Type X or accepted equivalent.

C. Polyisocyanurate Wall Insulation: (Type I, Class 1 or 2)

1. Manufacturers:

a. Energy Shield Pro by Atlas Roofing Corp.
b. Thermax CI by Dow.
c. Xci 286 (Class A) by Hunter.

2. Physical Data:

a. "R" value: 7.2 per inch minimum at 75 degrees Fahrenheit mean.
b. ASTM D1622 Board Density: 2 pcf.
c. ASTM D1621 Compressive Strength: 25 psi, minimum.
d. ASTM C209 Water Absorption: 0.3 percent by volume maximum.
e. ASTM E96 Moisture Vapor Transmission: 0.03 perm maximum.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install the accepted insulation according to the manufacturer's printed instructions for the specific product.

END OF SECTION

07503 LIGHTWEIGHT INSULATING CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulating concrete fill over structural roof decking
B. Perimeter joint filler

1.2 REFERENCES

A. ASTM A185/A185M - Standard Specification for Steel Welded Wire, Reinforcement, Plain for Concrete
B. ASTM C138/C138M – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C. ASTM C150/C150M - Standard Specification for Portland Cement
D. ASTM C260/C260M - Standard Specification for Air Entraining Admixtures for Concrete
E. ASTM C332 - Standard Specification for Lightweight Aggregates for Insulating Concrete.
F. ASTM C495/C495M – Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
G. FBC - Florida Building Code

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Thermal Resistance of Installed Fill: Refer to plans and energy calculations form for required R-value.

1.4 SUBMITTALS FOR REVIEW

A. Section 013300 - Submittals Procedures
B. Shop Drawings: Indicate layout of slopes, drain locations, and interruptions.
C. Product Data: Provide physical characteristics, thermal values, and product limitations.
D. Certificates: Certify that products meet or exceed specified requirements and achieves the required density, thermal value and performance.
E. Manufacturer's Installation Instructions: Indicate mix instructions.

1.5 QUALITY ASSURANCE

A. Installer: Company specializing in placing lightweight concrete fill-material specified in this section with minimum three years documented experience and licensed by manufacturer.
B. Thermal Resistance Values: Use values base the thermal conductivity of insulating concrete in accordance with ASTM specifications at 40°F mean temperature.
C. Wind Uplift Resistance: Use a deck system tested approved and listed in Factory Mutual System Approval Guide for FM Class rating matching the required uplift loads of the structural plans.
D. Certification: Upon completion of roof deck, supply the City through the Architect the Manufacturer’s certificate certifying the concrete is per manufacturer's requirements by

certified installer.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility requirements.

1.7 WARRANTY

A. Provide the City with a no-dollar limit insulating concrete warranty for a minimum of 10-years, signed by the manufacturer stating:
   1. Insulating concrete system shall retain a minimum of 80% of designed thermal resistance for the warranty period.
   2. Warranty shall include the composite roof deck system - both the concrete and insulation board.
   3. Insulating concrete system shall remain re-roofable for the warranty period.
   4. Warranty shall not limit by geographic location the City's right for claims, actions, or proceedings.
   5. Insulating concrete shall remain in place when the roof membrane sustains wind damage.

1.8 PRE-INSTALLATION MEETING

A. Section 01310 – Project Management and Coordination: Pre-installation meeting.
B. Convene two weeks prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material Equipment and approved equals: Environmental conditions affecting products on site
B. Do not place fill at ambient temperatures below 40°F without heating mix water to 90-110°F.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150/C150M, Portland Type I Normal, gray color
B. Lightweight Aggregate: ASTM C332; Group I, perlite or vermiculite
C. Concrete Materials: Aggregate required by manufacturer and water
D. Air-Entrainment Agent: ASTM C260/C260M, type recommended by lightweight aggregate manufacturer.

2.2 ACCESSORIES

A. Reinforcement: Hexagonal woven wire mesh, galvanized.
B. Perimeter Joint Filler: Glass fiber strips, compressible to 50% original thickness under load of 25 psi with full recovery
C. Vents: Type recommended by lightweight aggregate manufacturer
D. Insulation: Molded polystyrene with venting holes to 3% of board area

2.3 CONCRETE MIX

A. Provide cellular concrete mix to:

Compressive Strength	Wet Density	Oven Dry Density
350 psi Minimum	50 lb/cu ft Maximum	36 lb/cu ft Maximum

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01310 Project Management and Coordination: Verify existing conditions prior to beginning work.
B. Verify the grouting/taping of joints in roof members to prevent seepage of wet insulating concrete.

3.2 PREPARATION

A. Install one-inch-thick expansion joint filler at:
   1. Perimeter of roof decking
   2. Around penetrations through deck
   3. Every 100' of deck surface dimension
   4. Each change of deck direction on metal roof deck surfaces

3.3 INSTALLATION

A. Slurry deck surface; place insulation; use mix to fill holes and breaks.
B. Place insulating concrete and screed surface to achieve minimum thickness.
C. Slope surface ¼"/foot minimum for roof surface drainage
D. Provide ½"/foot sloped crickets on the high side of roof equipment curb.

3.4 CURING

A. Cure in accordance with lightweight aggregate manufacturer's instructions.
B. Protect insulating concrete from excess evaporation of surface moisture.
C. During low humidity conditions, sprinkle water over concrete surface to aid hydration and curing.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control Field inspection and testing for dry density.
B. Testing Laboratory: Take three test samples from each 75 or less cu yds of insulating concrete placed.
C. Testing Laboratory: Take one additional test sample during cold weather concreting.

END OF SECTION

07520 MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section.

1.2 SECTION INCLUDES

A. Three ply system; modified bitumen roofing system, consisting of vented anchor sheet, base ply (interply), and granular surface cap sheet, over light weight concrete, structural concrete deck.

B. Flashing material system by the roofing manufacturer for use with their roofing system.

1.3 REFERENCES

A. ASTM D41/D41M – Standard Specification for Asphalt Primer for Used in Roofing, Dampproofing, and Waterproofing
B. ASTM D312 – Standard Specification for Asphalt Used in Roofing
C. ASTM D2178/D2178 – Standard Specification for Asphalt-Impregnated Glass Felt used in Roofing and Waterproofing
D. ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics
E. ASTM D4586/D4586M – Standard Specification for Asphalt Roof Cement, Asbestos Free
F. ASTM D6164 – Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
G. ASTM E96/E96M – Standard Test Method for Water Vapor Transmission of Materials
H. ASTM E108 Standard Test Methods for Fire Test of Roof Coverings
I. ASCE 7-16 – Minimum Design Loads for Buildings and Other Structures
J. NRCA – Roofing and Waterproofing Manual, Current Edition
K. UL – Fire Hazard Classifications
L. UL – Roofing System & Material Guide
M. FBC – Florida Building Code
N. FFPC – Florida Fire Prevention Code

1.4 SUBMITTALS

A. Product Data: Submit specifications, installation instructions, and general recommendations from manufacturers of roofing system materials, for type of roofing required.
B. Shop Drawings: Submit complete installation details showing roof configuration, sheet layout, seam locations, flashing, roof slopes, details at each different perimeter condition and special conditions.
    1. Provide fastening pattern layout in compliance with ASCE 7-16.
    2. Provide a copy of product approval for the system, per FBC requirements.

C. Samples: Submit 8” x 10" sized products.
D. Certificates included with closeout documents:
   1. At completion of work, submit Manufacturers certification that roofing system installation is in accordance with Manufacturer’s warranty requirements.

E. Safety Provisions:
   1. Submit a complete detailed schedule of special safety provisions implemented to insure the health and safety of the people.
   2. Work shall not start without the City of Key Colony Beach’s agreement of the following provisions:
      a. A plan for the sequencing of work, including the removal of debris from the site during and after construction.
      b. A fall protection plan indicating the contractor plans for complying with OSHA’s requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer:

   1. Obtain primary roofing materials from a single manufacturer, with at least 10-years of documented experience in the roofing material business.

B. Installer: Shall be a Company specializing in installation of bituminous roofing, minimum five-years of continuous documented experience operating under the same name, with extensive experience in the application of roofs of similar size and type and approved in writing by manufacturer of accepted roofing system.
   1. The job supervisor shall have minimum 5-years of documented experience in supervising projects of this size and scope.

C. All work shall conform to NRCA Roofing and Waterproofing Manual, and to manufacturers' instructions.

D. Requirements of Regulatory Agencies:
   1. Underwriter's Laboratories, Inc.: Class A fire hazard classification.
   2. Roofing system shall meet current ASCE 7-16 wind requirements for the roofing system.

E. Pre-Installation Conference:
   1. Prior to installation of roofing system, conduct a pre-installation site conference after submittal approval.
   2. Attendance: City’s Representative, Building Department Representative, Architect, Contractor, Job Superintendent, Subcontractors, and Manufacturer’s Representative related to roofing work.
   3. Agenda: Review project conditions, application, coordination with other work, and protection of completed roofing.

F. Inspections:
   1. Provide on-site weekly inspections by City’s representative during and after installation of roofing system.
   2. Provided through the Building Department as necessary to assure proper installation of the roofing system.

3. Manufacturer’s representative as necessary to supply the warranty.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible, including required fire resistance classification labels.

B. Store and handle material per manufacturer's requirements.

C. Store rolled goods on end on clean raised platforms with a breathable weather protective covering, such as canvas, when stored outdoors.

D. Provide continuous protection of materials against wetting and absorption; remove wet materials from project site.

E. Rooftop Storage: Disperse material evenly across the roof to avoid concentrated loading.

1.7 PROJECT CONDITIONS

A. Proceed with roofing work only if weather conditions permit work in accordance with manufacturers' recommendations and warranty requirements.

B. Do not apply roofing membrane to damp deck surface.

1.8 WARRANTIES

A. Installer's Warranty: Provide written warranty signed by the roofing Installer and the Contractor agreeing to replace or repair defective components and workmanship of the total roofing system for a period of two-years after date of Substantial Completion of the project.

B. Manufacturer's Warranty: Provide written warranty signed by the Manufacturer of the primary roofing materials agreeing to replace or repair defective roof membrane and flashing materials and workmanship as required to maintain the roofing system in a watertight condition at no expense to the City for a period of 20-years after date of Substantial Completion of the Project.

1. In addition, provide written warranty signed by the manufacturer of primary roofing materials agreeing to allow the City of Key Colony Beach to make emergency repairs to roof without voiding manufacturer's warranty.
2. Specifications on repair of the membrane, the City of Key Colony Beach may do without voiding warranty.
3. Warranty shall include coverage for damage to building resulting from failure of roof system to resist penetration of water with no dollar limit to the value of repairs or replacements covered.
4. Warranty shall include coverage up to design wind loads against damage due to wind uplift. Prefabricated coping is a requirement of this project and shall be included as part of such warranty.

C. Provide on-site inspections by roofing manufacturer’s representative during installation of roofing.

D. Manufacturer's Certification: Submit written certification signed by manufacturer stating that the roofing system manufacturer will provide warranties and that this specification meets the requirements of the 20-year warranty.

PART 2 PRODUCTS

2.1 MODIFIED BITUMEN ROOFING SYSTEMS: & 3-PLY

A. Approved Manufacturers:

1. Johns Manville
2. Soprema Inc
3. Tremco

B. THREE-PLY SYSTEM over light weight concrete, structural concrete deck, Membrane Properties:

1. Vented anchor sheet (anchor ply), reinforced modified bitumen coated membrane, per ASTM D4601
   a. 1.5mm (59 mils) thickness minimum
2. One ply (interply), modified bitumen base sheet per ASTM D6164
   a. 3.0 mm (118 mils) minimum thickness
3. One ply, modified bitumen membrane, granular surfaced, fire retardant, cap sheet per ASTM D6164
   a. 4.0 mm (160 mils) nominal thickness
   b. The cap sheet will meet energy code requirements as absolute minimum criteria.

C. COMMON ELEMENTS/COMPONENTS

1. Roof covering shall be Class A fire rating
2. Primer: ASTM D41/D41M
3. Roofing Cement: ASTM D4586/D4586M, asbestos-free
4. Mineral Granules: Size No. 11 ceramic, white in color, free of fines and dust, unaffected by airborne acids and ultraviolet radiation.

2.2 ACCESSORIES

A. Cant Strip: mineral wool, modified bitumen, torch or cold adhesive applied (optional use of cant strip if approved by manufacturer.

B. Walk Pads: SBS-modified bitumen ply, 5.0 mm (197 mils) minimum.

2.3 LIGHTWEIGHT CONCRETE INSULATION

A. Lightweight Concrete Insulation: cellular insulating concrete with EPS insulation board, stair stepped as required.

1. Acceptable insulation products as manufactured by Elastizell, Celcore, Concrecel, or Mearlcrete.

a. Insulation thickness as shown on drawings to a minimum of 2” at all roof drains shall provide a minimum insulation value as required by FBC-Energy Conservation.

B. Fastening Devices: Provide membrane manufacturers' insulation fastening system of appropriate size and nailing pattern as designed and tested in the Product Approval documents.

C. Provide vented deck system for lightweight concrete.

PART 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Do not start the installation of accessories or membrane without the presence of the Manufacturer's Technical Representative. This requirement shall not be waived.
   1. Due to the incompatibility of various materials with the roofing membrane, the Representative shall inspect the substrate and shall have a barrier applied for complete separation and protection of the roofing membrane and accessories.

B. Install all vents, drains, curbs, nailers, blocking, insulation, and projections through the roof before starting membrane installation.
   1. These items may be installed after the membrane installation only with Architect’s written approval, proper provision for re-inspection, and continued warranty protection.

3.2 PREPARATION OF SUBSTRATE

A. Insulation:
   1. The applicator shall carefully inspect all surfaces to receive insulation and assure all surfaces are satisfactory prior to beginning installation.
   2. Beginning insulation installation constitutes acceptance of substrate without recourse.

B. Roofing Membrane: The manufacturer's Technical Service Representative shall carefully inspect the substrate receiving the roofing and provide a written report.

C. Install all nails, blocking, vertical surfaces, etc. prior to proceeding with membrane installation.

D. Verify that all units are properly secured in place prior to proceeding with membrane installation.

3.3 LIGHTWEIGHT CONCRETE INSTALLATIONS

A. Slurry: Cover the metal deck with a ⅛" inch slurry coat of the lightweight insulating fill.

B. Insulation Board: Place the insulation board in the ⅛" slurry coat.
   1. Place the insulation board within 30 minutes of slurry coat placement.
   2. Place the insulation board in a manner that provides full contact of slurry to board.

3. Install the insulation board in a stair-stepped configuration to achieve the minimum ⅛" per foot slope.

C. Lightweight Insulating Fill: Within 4 hours of insulation board placement, install a minimum of 2" of lightweight insulating fill over the insulation board, screened to an even surface for the receive the roofing membrane.

D. Do not install more insulation each day than can be covered with a watertight cover before end of day or start of inclement weather.

E. Vent insulation board to roof edges as recommended by manufacturer.

3.4 INSTALLATION OF ROOFING MEMBRANE SYSTEM & LIGHTWEIGHT CONCRETE & STRUCTURAL CONCRETE DECK

A. Install in accordance with accepted roofing manufacturer's specification and recommendations, and as specified below.
   1. Phased construction of roofing membrane is strictly prohibited.

B. Apply an anchor sheet and two plies, over a lightweight concrete and structural concrete deck

   1. Mechanically attach the anchor sheet to the new lightweight concrete deck in a pattern to meet ASCE 7 as per manufacturer recommendations and the Product Approvals for wind uplift classification, minimum 200 mph or as specified by structural engineer.
   2. Torch apply to adhere a base sheet and a cap sheet to complete the system.
      a. Remove the roll wrapping tape and labels before membrane installation.
      b. Unroll first roll of membrane completely and align.
         i) Unroll remaining rolls approximately halfway in order to align the side laps and maintain the required end lap.
         ii) Installation shall start at the lowest point and continue in a shingle method.
      c. Re-roll one end of the roll, approximately halfway to facilitate alignment.
      d. Roll up the un-adhered half of the membrane sheet and repeat the above procedure to complete the installation of the roll.
      e. Apply membrane: seal seams, ends, and permanently waterproof.
      f. Apply membrane smooth, free from air pockets, wrinkles, or tears.
      g. Extend membrane up cant strips a minimum of 4" onto vertical surfaces.
      h. Seal membrane around roof penetrations.
      i. Keep rooftop traffic to a minimum shortly after installation of membrane in order to minimize damage.

C. Complete installation of modified roofing system up to line of termination of day's work.
   1. Install temporary water cut-offs of plastic cement and base sheet strips at end of each day's work.

   2. Remove upon resumption of work.

D. Base Flashing:

1. Install in accordance with requirements of roofing system manufacturer.
2. Install where roofing system abuts vertical surfaces and at other locations detailed.

E. Roof Edging:

1. Prior to application of metal edging treatment, extend roofing felts up over tapered edging and secure to wood nailer with base felt extended and folded back over ply felts.

2. After metal edging is in place, flash as recommended by roofing manufacturer.

F. Flashings: Install metal flashings in such a manner as to prevent leaks.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide periodic inspections of roof application by qualified technical representative of roofing manufacturer.

3.6 CLEANING

A. Clean up debris, excess materials, and equipment and remove from site.
B. Remove bitumen from surfaces other than those requiring bituminous roof coatings.
C. Remove bituminous markings from finished surfaces.

3.7 PROTECTION

A. Provide special protection or avoid heavy traffic on completed work when ambient temperature is above 80°F.
B. Restore to original condition or replace work or materials damaged during handling of bitumen and roofing materials.
C. Do not transverse any walkways where new work has been completed where traffic must continue over finished roof membrane, protect surfaces.
D. Do not throw or drop debris from roof, use chutes, or high lift trucks.

END OF SECTION

07600 FLASHING, GUTTERS, DOWNSPOUTS, AND OTHER ACCESSORIES

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.
B. Modified Bitumen Membrane Roofing, - Section 07520
C. Joint Sealants - Section 07920

1.2 SECTIONS INCLUDE

A. Shop or field-formed sheet metal work for moisture protection
B. Miscellaneous sheet metal accessories

1.3 QUALITY ASSURANCE

A. All welding personnel affiliated with the site construction shall be approved certified welders and shall supply certified welding certificates to the City of Key Colony Beach prior to commencing work.
B. Applicator/Installer shall be a company specializing in sheet metal flashing work with minimum 5 years of experience.
C. Job supervisor shall have minimum 5-years of documented trade experience in supervision of projects of this size and type.

1.4 REFERENCES

A. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
B. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
C. ASTM B32 – Standard Specification for Solder Metal
D. ASTM B101 – Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction
E. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
F. ASTM B370 – Standard Specification for Copper Sheet and Strip for Building Construction
G. ASTM B813 – Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
H. ASTM D226/D226M – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
I. ASTM D4586/D4586M – Standard Specification for Asphalt Roof Cement, Asbestos-Free
J. FED A-A-51145 – Flux, Soldering, Non-Electronic Paste and Liquid
K. NRCA (National Roofing Contractors Association) – Roofing Manual
L. SMACNA – Architectural Sheet Metal Manual
M. FBC – Florida Building Code

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, and general recommendations for each specified sheet material and fabricated product.

B. Samples: Submit 8" square samples of specified sheet materials exposed as finished surfaces.
   1. Submit 12" long, completely finished units of specified factory-fabricated products.
   2. Submit samples of splash pads.

C. Provide FBC product approval if system is not covered in the product approval for roof covering.

PART 2 PRODUCTS

2.1 FLASHING, GUTTERS, DOWNSPOUTS, and OTHER ACCESSORIES

A. Sheet Metal Flashing/Trim:
   1. Copper: ASTM B370, cold rolled 20-oz/sq ft; lacquered finish
   2. Stainless Steel: ASTM A167, Type 304, soft temper; smooth patterned finish.

B. Sheet Metal Gutters:
   1. Form gutters in sections as long as possible, but not less than 8' in length complete with end pieces, outlet tubes, and special pieces as required.
   2. Keep joints to minimum, but any joint that is required, rivet, and seal.
   3. Unless otherwise indicated, provide expansion joint with cover plate where indicated but no more than 50' between expansion joints.
   4. Furnish gutter supports constructed of same metal as gutters, spaced at 3'-0" o.c. per SMACNA plate 13, Chart 9.
      a. Provide standard aluminum-wire ball strainers at each outlet.
   5. Gutters shall be aluminum.
   6. The Architect based the gutter size upon a minimum rainfall rate of 8" per hour over five-minute duration.

C. PVC Downspouts:

   1. All downspouts shall be PVC Schedule 40, painted.
   2. Space 8-gauge aluminum downspout straps at a maximum of 4' o.c.
   3. All strap edges shall be rolled or smooth.
   4. Downspout size and configuration shall be at a minimum the sizes and locations shown on the drawings.
   5. The Architect based the gutter size upon a minimum rainfall rate of 8" per hour for five-minute duration.
   6. Configure supports to avoid forming ladders for people to use as a means to climb to the roof while maintaining proper support of the downspout to prevent separation of the downspout at all connections joints.

D. Vent Stack Flashing:
   1. Provide and install stainless steel vent extensions with a stainless-steel vandal resistant cap.

2. Field verify the flashing height prior to ordering/installation to comply with the plans.

E. Finish: All flashing, trim, gutters, and downspout guards shall be of color selected by architect.

F. Reglets and Counter-flashings: Shall be prefabricated, 24-gauge stainless steel with factory mitered corners.
   1. Provide continuous foam backer rod and elastomeric sealant where shown.

G. Miscellaneous Materials and Accessories:
   1. Solder: Provide approved sheet metal compatible lead-free solder with resin flux.
   2. Fasteners: Provide and install Stainless Steel or other non-corrosive metal as recommended by manufacturer.
      a. Match finish of exposed heads with material it is fastening.
   3. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
   4. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material it is fastening, non-corrosive, size, and gauge required for performance.
   5. Roofing Cement: Provide product meeting ASTM D4586 with no asbestos.
   6. Master Sealant: For slipping joints in flashings shall be polyisobutylene and be non-hardening, non-migrating, non-skinning, and non-drying.
   7. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15-mil.

2.2 FABRICATED UNITS

A. Shop-fabricate work to greatest extent possible.
B. Comply with details shown and with applicable requirements of SMACNA Architectural Sheet Metal Manual.
C. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated with exposed edges folded back to form hems.
D. Fabricate non-moving seams in sheet metal with flat-lock seams.
E. When movable expansion type joints indicated on plans or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

2.3 ACCESSORIES

A. Splash Pads: Provide and install precast concrete type.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

B. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners and set units true to line and level as indicated.

C. Provide drip edge flashing with concealed splice plates for joints 10' o. c.
D. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproofing performance.
E. Install counterflashing in reglets by snap-in seal arrangement.

3.2 CLEANING AND PROTECTION

A. Clean all exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
B. Provide for surveillance and protection of flashings and sheet metal work during construction, to ensure the work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION

07611 METAL ROOF PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to work specified in this Section.

1.2 DESCRIPTION OF WORK

A. Extent of this work as indicated on the drawings and or specified herein. Including but not limited to pre-coated metal roofing panels and associated, wall, rake, valley, and counter flashings.

1.3 REFERENCES

A. ASCE 7 – Minimum Design Loads for Buildings and other Structures
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
C. ASTM B32 – Standard Specification for Solder Metal
D. ASTM D226/D226M – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
E. ASTM D2178/D2178M – Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
F. ASTM D4586/D4586M – Standard Specification for Asphalt Roof Cement, Asbestos-Free
G. FED A-A-51145 - Flux, Soldering, Non-Electronic, Paste and Liquid
H. NRCA (National Roofing Contractors Association) - Roofing Manual
I. SMACNA - Architectural Sheet Metal Manual
J. FBC - Florida Building Code

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum of 10-years documented experience.
B. Installer: A Company specializing in sheet metal roof installations with 5-years documented experience, approved, and certified by the manufacturer.
C. Job Supervisor shall have a minimum of 5-years documented trade experience in supervising on projects of this size and type.

1.5 SUBMITTALS

A. Provide shop drawings with erection layouts, details, and manufacturer's installation instructions.
    1. Details and layouts shall show weights, gauges, or thickness of sheet metal, jointing, fastening, and expansion joint spacing and installation procedures.
    2. The Contractor is responsible for detailing and fabrication and for the correct fitting of sheet metal roofing shown on the shop drawings.
    3. May submit scaled catalog cuts for factory-fabricated items.

B. Submit two samples of all materials, and accessories with a full color range proposed for use illustrating standing seam, materials, and finish.
C. Certification: Submit written certification prepared, signed, and sealed by a Professional Engineer, registered to practice in the State of Florida verifying that the metal roof system design meets indicated loading requirements and codes of authorities having jurisdiction.
D. Submit certification verifying that metal roofing system is tested and approved to meet the requirements of ASCE 7.
E. Submit fall protection plan/system for use both during construction and City of Key Colony Beachs' use after construction for roof repair, meeting OSHA requirements.
   1. Provide for a permanent tie-off system.
F. Provide copy of Florida or Monroe County product approval documentation to Architect and the City of Key Colony Building Department.

1.6 PRE-INSTALLATION CONFERENCE

A. Prior to start of roofing installation and accessory work, conduct an on-site meeting with installer, architect, City of Key Colony Beach, manufacturer's representative, the City's building inspector, and other parties with a direct involvement in the process.

1.7 PRODUCT HANDLING

A. Pack factory fabricated components in cartons, with the Manufacturer's name or trademark.
B. Carefully handle sheet metal items to prevent damage to the surfaces, edges, and ends, and store at the site above the ground in a covered, dry location.
C. Damaged items that cannot be restored to like-new condition will be rejected at no additional cost to the City of Key Colony Beach.

1.8 WARRANTY

A. Provide manufacturers written weather-tightness warranty for a minimum of 20-years against leaks in roof panels arising out of or caused by wear and tear under weather and atmospheric conditions.
   1. Both the metal roofing system manufacturer and the metal roofing system contractor shall sign warranty.

B. Warranty: Cover damage to building resulting from failure to resist penetration of water with no dollar limit to the value of repairs or replacements covered by the warranty.

C. Provide manufacturer's standard written warranty for 20-years against perforation of metal roof panels due to corrosion under normal weather and atmospheric conditions.
   1. Metal roofing system manufacturer shall sign warranty.

D. Inspection and Report Services:
   1. Metal roof system manufacturer or his authorized agent shall perform an inspection of the entire roof system and shall submit a written report to the City of Key Colony Beach detailing all conditions requiring maintenance and repair by parties under the above warranties.
   2. Perform inspections and reports once every other year over the 20-year weather-tightness warranty period.

3. Cost of Inspection and Report Service shall be included in the contract amount.

E. Manufacturer's Certification: Submit written certification signed by the manufacturer stating that the metal roof system manufacturer will provide warranties and inspection and Report Service specified herein.

1.9 JOB CONDITIONS

A. Weather: Proceed with roofing work only when weather conditions permit work performance in accordance with manufacturer's recommendations and warranty requirements.

PART 2 PRODUCTS

2.1 MATERIAL

A. Metal roofing, drip edge, wall, rake, valley, counter flashing, and related metal shall be 24-gauge Galvalume.
   1. Architect shall select finish from the manufacturers standard color range.
   2. Profile of standing seam pans shall be 18” (min.) spacing with a 1½" standing seam height.

B. Roofing underlayment shall be 1-layer of “Protecto Wrap" lay dry with minimum salvage 32" lap horizontally and 6" minimum end laps or an approved equal peel & stick self-adhering waterproof membrane.
   1. Install per manufacturers recommendations.

C. Fasteners, sealants, primer, and roof accessories shall be in accordance with manufacturer's written recommendations.

D. Substrate shall be ¾” CDX plywood deck secured to 22-ga metal deck attached to structure as required to conform to ASCE 7 wind loading, unless noted otherwise on the contract drawings.

E. Directly apply self-adhering ice and water shield underlayment to plywood deck.

2.2 SHEET METAL ACCESSORIES

A. General: Unless otherwise indicated, provide accessories of same material as roofing system.
   1. Fasteners:
      a. Galvanized steel and Stainless steel with neoprene washers, and in accordance with manufacturers written recommendations.
      b. Design all fasteners to withstand a wind uplift load to meet ACSE 7.
   2. Primer: Zinc chromate or Galvanized iron type.
   3. Protective Backing Paint: Zinc chromate alkyd or bituminous.
   4. Sealant, install in accordance with manufacturer's written recommendations.
   5. Bedding Compound, install in accordance with manufacturer's recommendations.
   6. Reglets: Recessed type galvanized steel, face and ends covered according to manufacturer's recommendation and Architect's designs.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Surfaces that are to receive sheet metal roofing and roofing underlayment shall be even, smooth, sound, thoroughly clean and dry and free from defects that may affect the application.
B. Thoroughly cover the deck with roofing underlayment before installation.

3.2 INSTALLATION

A. Conform to quality, procedures and methods recommended by NRCA & SMACNA, where they apply.
   1. Accurately form, fit snugly, and have exposed edges folded under at least 2" and no sharp corners left exposed.

   2. Securely fasten the product to form watertight roof system.

B. Any materials furnished but installed by others shall be in condition for final installation.

   1. Do all cutting, fitting, drilling, or other operation in metal required to accommodate work of other trades.
   2. Provide any items essential to complete the installation though not specifically shown or specified.
   3. Such items shall be of the same kind, quality, and type as similar items utilized elsewhere in the building.
   4. Apply all sealant and butyl tape per requirements of manufacturer.

3.3 APPLICATION:

A. Install metal roofing system including insulation board in strict accordance with manufacturer's directions and approved shop drawings.

B. Erect all work plumb, level, square, and in proper alignment with work of other trades.

C. Lay all seams in the direction of the roof slope.

D. Sheet Metal Accessories: Install sheet metal accessories per Manufacturer's recommendations unless indicated otherwise for positive anchorage to building and weather-tight mounting.

3.4 PROTECTION

A. Dissimilar Metals: When aluminum materials are in contact with or fastened to dissimilar metals, with the exception of stainless steel or zinc, cover the contact surface of the dissimilar metal with 1-layer of 30-pound roofing felt.

B. Masonry or Plaster: When aluminum materials are in contact with or built into masonry or plaster, cover with a heavy brush coat of alkali-resistant bituminous paint or clear methacrylate lacquer.

C. Wood:
   1. When aluminum materials are in contact with green or wet wood, or any other absorptive material subjected to repeated wetting, or treated wood with a non-compatible preservative, cover the contact surfaces with 1-layer of 30-pound roofing felt.
   2. Seal joints with approved caulking material.

3.5 PATCHING

A. Maintain the finish of roofing and siding at all times.

B. Rusted areas and scarred during installation shall be thoroughly cleaned and touched-up with an approved manufacturer's paint.

END OF SECTION

07723 ROOF HATCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.

B. Modified Bitumen Membrane Roofing – Section 07520

1.2 DESCRIPTION OF WORK

A. Prefabricated roof hatches with integral support curbs, operable hardware, counter-flashings, and OSHA compliant hatch rail system.

1.3 REFERENCES

A. OSHA – Occupational Safety and Health Administration
B. FM – Roof Assembly Classifications
C. UL – Fire Hazard Classifications
D. Florida Building Code

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5-years documented experience.

B. The same manufacturer shall provide roof hatches and hatch railing system.

1.5 SUBMITTALS

A. Product Data: Provide data on unit construction, size and configuration, jointing methods, attachment method, and manufacturer's installation instructions.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable Code for UL and FM requirements for fire rated roof hatches.

B. Provide certificate of compliance from the manufacturer indicating testing lab approval of fire or smoke rated units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Bilco Company, Type "S-20"
   2. Milcor, Inc., Type "RB-1"
   3. Babcock-Davis Hatchways, Inc., Type "B-RHG3630"

2.2 ROOF HATCH SYSTEM

A. Integral Steel Cover: 14-gauge galvanized, prime painted steel, ASTM A653/A653M, with rigid foam insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
   1. Cover to be double wall construction with 1-inch-thick insulation core.

B. Flush Steel Cover: 14-gauge galvanized, prime painted steel with foam insulation, 22-gauge steel interior liner, and continuous neoprene gasket to provide weatherproof seal.

C. Gaskets: Provide Manufacturer's standard design of neoprene or EDPM.

D. Hardware:
   1. Provide compression spring operators and shock absorbers.
   2. Steel manual pull handle for interior and exterior operation.
   3. Steel hold-open arm with vinyl covered grip handle.
   4. Padlock hasp.
   5. Hinges use manufacturer's standard type.

2.3 HATCH RAIL SYSTEM

A. Furnish and install as indicated on plans hatch rail system with self-closing gate.
   1. HSF series by Fall Protection USA.com
   2. KHML series by Keehatch Roof Hatch Railing System
   3. RHSR series by Keehatch Roof Hatch Railing System
   4. Milcor safety rail system
   5. SRCG series by Babcock-Davis
   6. Approved equal

B. Performance characteristics:
   1. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.

C. Posts and Rails: Shall be round hot dipped galvanized steel, stainless steel, or aluminum. Fiberglass is not acceptable.

2.4 FABRICATION

A. Fabricate units to withstand 40-lb/SF (external) and 20-lb/SF (internal) loading pressure.
   1. Curb to be min. 12" high, integral with double wall construction and insulation.

B. Fully weld all joints and corners.

C. Provide for removal of condensation occurring within components or assembly.

D. Fit components for weather-tight assembly.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate with installation of the roofing system and related flashings for a weather-tight installation.

3.2 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

B. Protect installation during construction activities

C. Adjust hinges for a smooth operation.

END OF SECTION

07840 FIRESTOP SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Applications of Firestop systems include:
   2. Penetrations for passage of duct, cable tray, conduit, piping, electrical busways and raceways through fire rated vertical barriers (walls and partitions), horizontal beams (floor/ceiling assemblies) and vertical service shaft walls and partitions
   3. Safing gaps between edge of floor slabs and curtain walls
   4. Gaps between tops of walls and ceiling or roof assemblies
   5. Expansion joints in fire rated walls and floors
   6. Openings and penetrations in fire rated partitions or walls containing fire doors
   7. Openings around structural membranes which penetrate fire rated floors or walls

B. Related sections:
   1. Concrete: Division 3 Concrete Sections
   2. Masonry: Division 4 Masonry Sections
   3. Insulation: Division 7 Saving Insulation and accessories
   4. Gypsum Drywall: Section 09250
   5. Mechanical and Plumbing: Division 15 Mechanical Sections
   6. Electrical: Divisions 16 Electrical Sections

1.2 REFERENCES

A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
B. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials
C. ASTM E814 – Standard Test Method of Fire Tests of Through Penetration Firestop
D. ASTM E1966 – Standard Test Methods for Fire Tests of Joints
E. FM (Factory Mutual) - Fire Hazard Classifications
F. UL - Fire Hazard Classifications
G. UL 2079 – Tests for Fire Resistance of Building Joint Systems
H. UL 1479 – Fire Tests of Through-Penetration Firestop
I. WH (Warnock Hersey) - Certification Listings
J. FBC - Florida Building Code

1.3 SYSTEM DESCRIPTION

A. Provide Firestop systems manufactured and installed to maintain performance criteria stated by manufacturing without defects, damage, or failure.

1.4 SUBMITTALS

A. Comply with pertinent provisions of Section 01330.

B. Product Data:
   1. Materials list of items used under this Section.

2. Provide the manufacturer's specifications and data.
3. Provide written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of references for verification.
4. Certification from sealant manufacturers that their products are suitable for the use indicated and comply with specification requirements.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Applicator Qualifications:
   1. Applicator shall have at least 3-year's experience in installing materials of types specified and shall have successfully completed at least 3-projects of similar scope and complexity.
   2. Manufacturer approved applicator.
   3. Applicator shall designate a single individual as project supervisor who shall be on site at all times during installation.

C. Single source responsibility for firestopping materials:
   1. Obtain Firestop materials from single manufacturer for each different product required.
   2. Manufacturer shall instruct applicator in procedures for each material.

D. Regulatory Requirements:
   1 Firestop System installation shall meet requirements of ASTM E814 and provide a fire-rating equal to that of the construction it penetrates.
   2 Proposed Firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
   3 For those Firestop applications not having an UL or third party tested system available through any manufacturer.
      a Prior to installation the manufacturer may submit to the authorities having jurisdiction for their consideration an engineering judgment derived from similar independently tested system of similar design.
      b Manufacturer's engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.6 MOCKUP

A. Provide mockups of applied Firestop assemblies under provisions of Section 01400.
B. Apply 3 sq. ft. to a representative substrate surface.
C. Apply Firestop material to a representative penetrated masonry, concrete, stud wall, and substrate.
D. If accepted, mockup will demonstrate minimum standard of the Work.
E. Mockup may remain as part of the Work.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is

below 60°F.

B. Maintain this minimum temperature before, during and three days after installation of materials.
C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 GENERAL

A. Product Categories
   1. SILICONE ELASTOMERIC COMPOUND
      a. Single-component, neutral cure silicone firestopping sealant.
      b. Silicone Elastomeric high performance sealant is capable of plus or minus 25% movement.
   2. ELASTOMERIC SEALANT
      a. Single component water-based acrylics Fire stop sealant, that allows for a plus or minus 25% movement.
   3. INTUMESCENT SEALANTS
      a. Single component water-based, intumescent acrylic firestop sealant that expands filling any void caused when combustible materials burn.
      b. Sealant qualities include superb unprimed adhesion, easy gunning, and the ability to be painted once fully cured.
   4. FIBER STUFFING
      a. 4 lb. to 8 lb. Mineral Wool or Cerablanket Insulation
   5. MECHANICAL DEVICE WITH FILLERS
      a. Field fabricated or pre-fabricated collar device used to Firestop combustible pipe penetrations through walls or floors.
      b. Pre-fabricated Cast-in-Place devices affixed to forms prior to concrete pour used to Firestop combustible or non-combustible pipe penetrations through floors.
   6. INTUMESCENT PUTTY
      a. A moldable intumescing putty that remains pliable allowing for easy retrofit and reduces sound transmission through assemblies.
   7. FIRE PREVENTION PILLOW SYSTEM
      a. Intumescent moisture resistant, dust free fiberglass bags for sealing cable tray openings.
   8. ACCESSORIES
      a. Use primer recommended by firestopping manufacturer for specific substrate surfaces.
      b. Installation Accessories are clips, collars, fasteners, temporary stops/dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Provide copy of manufacturer's product data including product technical bulletins, product catalog, installation instructions, and product packaging instructions.

3.2 EXAMINATION

A. Site Verification of Conditions:
   1. Verify substrate conditions, previously installed under other sections, are acceptable for product installation and product packaging instructions.
   2. Examine areas and conditions of work area and identify conditions detrimental to proper and timely completion.

3.3 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material or other matter that may affect bond of firestopping material.
B. Verify that penetrations and joints are properly sized
C. Remove incompatible materials that may affect bond.
D. Do not proceed until unsatisfactory conditions have been corrected.

3.4 INSTALLATION

A. Install Firestop materials in accordance with published "Through-Penetration Firestop Systems" in UL's Fire-Resistant Directory or the publication of another approved independent laboratory.

B. Comply with manufacturer's instructions for installation of Firestop Materials
   1. Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.
   2. Seal all joints to ensure an air and water-resistant seal, capable to withstand compression and expansion due to thermal, wind or seismic joint movement
   3. Consult with Mechanical Engineer, Project Manager prior to installation of Third Party Tested Firestop Systems that might hamper the performance of fire dampers as it pertains to duct work.

3.5 FIELD QUALITY CONTROL

A. Examine Firestop areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

3.6 IDENTIFICATION

A. Identify Firestop systems with pressure-sensitive, self-adhesive, printed vinyl labels.

B. Attach labels permanently to surfaces of penetrated construction on both sides of each Firestop system installation where labels will be visible to anyone seeking to remove penetrating items or Firestop systems.
   1. Include the following information on labels:
      a. The words: "Warning: Through-Penetration Firestop system – Do Not Disturb"
      b. Contractor's name, address and phone number
      c. Designation of applicable testing and inspection agency
      d. Date of installation
      e. Manufacturer's name for Firestop materials.

3.7 CLEANING

A. Clean work under provisions of Section 01770.

B. Clean adjacent surfaces of firestopping materials.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01500.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

07900 JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.

1.2 DESCRIPTION OF WORK

A. This Contractor shall furnish and install all joint sealers as shown on the drawings or herein specified, or both.

1.3 JOB CONDITIONS

A. This Contractor shall inspect the job conditions as he finds them, and his starting of the work constitutes approval of all conditions.

1.4 QUALITY ASSURANCE

A. All manufacturer items must be factory labeled, on the material or its container.
B. Manufacturer shall have a minimum of 10 years of experience specializing in specified item.
C. Applicator shall be Sealant Manufacturer approved with 5-years of successful experience.

1.5 REFERENCES

A. ACI 504 R – Guide to Joint Sealants for Concrete Structures
B. ASTM C834 – Standard Specification for Latex Sealants
C. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications
D. ASTM C920 – Standard Specification for Elastomeric Joint Sealants
E. ASTM C1193 – Standard Guide for Use of Joint Sealants
F. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

1.6 SUBMITTALS

A. Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of bond breakers, backer rods, and accessories.
   1. Submit full color samples for Architect selection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer’s requirements to prevent

their deterioration or damage due to moisture, temperature, contaminants, or other causes.

1.8 WARRANTY

A. The Contractor shall furnish written warranty that work executed under this section is free from defects of material and workmanship for a period of 1-year from date of substantial completion of the entire project.
   1. Include coverage that the Contractor will immediately and at its own expense, repair and replace all such defects as may develop during the term of this warrantee.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with the requirements, provide products by one on the following:
   1. DAP Products Inc., Dayton, Ohio
   2. Dow Corning Corp., Midland, Michigan
   3. Sonneborn Products Division of BASF
   4. Tremco

B. Contractor may request other products or manufacturers for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product.

2.2 MATERIALS

A. General
   1. The term “Acceptable Standard” when used within this Section, refers to the manufacturer and product listed, specified as to type and quality required for this project.
   2. Contractor shall supply a single resource responsibility for joint sealer materials.
   3. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and final experience.

B. Caulking Compounds (Acrylic Latex Sealant)
   1. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer’s standard, one-part, non-sag, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated for accepting paint. (Product recommended for exposed interior locations involving joint movement of less than 5%).
   2. Acceptable Standard
      a. “Sonolac”; Sonneborn Products, Inc
      b. “Acrylic Latex Caulk834”; Tremco, Inc
      c. “Acrylic Latex Caulk with Silicone”; DAP
      d. “AC-20”; Pecora Corp

C. One-Part Elastomeric Sealant (Silicone)
   1. One component elastomeric sealant complying with ASTM C 920, Class 25, Type NS (non-sag), unless manufacturer recommends Type S (self-leveling) for the application shown.(general caulking , glazing applications).
      a. Acceptable Standard
         i) “Pecora 864NST Architectural Silicone Sealant; Pecora Corp.
         ii) “Dow Corning 791; Dow Corning Corp
         iii) “SCS2700 Silpruf”: General Electric
         iv) “Spectrem 2”; Tremco, Inc
   2. One component mildew resistant silicone sealant used around countertops, backsplashes, and other wet interior locations.
      a. Acceptable Standard
         i) “Dow Corning 786”, Dow Corning Corp
         ii) “Sanitary 1700”; General Electric
   3. One-component high movement joints (+100/-50) use sealants in locations indicating high movement.
      a. “Dow Corning 790”; Dow Corning Corp
      b. “Spectrem 1”; Tremco, Inc

D. Elastomeric Sealants (Polyurethane) – Precast concrete & Tilt-Up Concrete Panels
   1. One component polyurethane sealant, complying with ASTM C 920, Type S, Grade NS (non-sag), Class 25 (expansion and control joints, precast concrete panel joints, tilt-up concrete panel joints, perimeter caulking, flashing and sheet metal conditions).
      a. Acceptable Standard
         i) “Sonolastic NP 2”; Sonneborn Products, Inc
         ii) “Dymonic”: Tremco, Inc
         iii) “Dynatrol I”; Pecora Corp
         iv) “CS 2130”; Hilti
   2. Multi- component polyurethane sealant, complying with ASTM C920, Type M, Grade N(non-sag)Class 25 (same uses as in previous item)
      a. Acceptable Standard
         i) “Sonolastic NP 2” Sonneborn Products, Inc
         ii) “Dymeric”; Tremco, Inc
         iii) “Dynatrol II”; Pecora Corp
         iv) “Vulkem 922”; Tremco
   3. Multi-component epoxidized polyurethane sealant complying with ASTM C 920, Type M, Grade NS, Class A (same uses as described in item 1, also used on fire resistance rated joint design details.)
      a. Acceptable Standard
         i) “Dymeric”; Tremco, Inc
         ii) “DynaTrol II”; Pecora Corp
E. One-part self-leveling polyurethane sealant (for traffic areas)
   1. One component polyurethane self-leveling sealant, complying with ASTM C 920, Type S, Grade P, Class 25.
      a. Acceptable Standard
         i) “Sonolastic SL 1”; Sonneborn Products, Inc
         ii) “NR-201 Urexpan”; Pecora Corp
         iii) “Vulkem 45”; Tremco
   2. Two component polyurethane self-leveling sealant, complying with ASTM C920, Type M, Grade P, Class 25.

a. Acceptable Standard
   i) “Sonolaastic SL 2”; Sonneborn Products, Inc
   ii) “NR-200 Urexpan”: Pecora Corp
   iii) “Vulkem 245”; Tremco
   iv) “THC900/THC901”: Tremco, Inc

F. Flexible Polyurethane Security Sealant (for use on interior joints, perimeter of fixtures, penetrations, vents, doors, windows and similar openings)
   1. Two component polyurethane sealant, complying with ASTM C 920, Grade NS, Class 12.5, with a Shore A Hardness of 55, Type M.
      a. Acceptable Standard
         i) “Dynaflex”, Pecora Corp

G. Miscellaneous Materials
   1. Provide joint cleaner and joint primer sealer as recommended by the sealant or caulking compound manufacturer.
   2. Sealant backer rod shall be compressible rod stock, polyethylene foam; polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other materials as recommended by sealant manufacturer.
      a. Where plans indicate a 2" building expansion joint, provide an expanding foam secondary sealant, “BackerSeal” as manufactured by Emseal Joint Systems, Ltd., or Apolytite Standard as manufactured by Polytite Manufacturing Corporation, behind sealant in lieu of standard backer rod.
   3. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer substrate tests and field tests.
   4. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type acceptable to manufacturer of sealant and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in service performance.
   5. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 EXECUTION

3.1 INSPECTION

A. This Contractor shall notify the General Contractor when he has completed his work and is ready for A/E inspection.

3.2 INSTALLATION

A. Install all products in strict accordance with all manufacturers' recommendations.

B. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

C. Install bond breaker where joint backing is not used.

D. Tool joints concave.

3.3 ADJUSTMENT AND CLEANING

A. After installation, thoroughly clean all exposed surfaces and restore all damaged material to its original condition or replaced with new material.

END OF SECTION

08110 STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Steel doors and frames including necessary accessories.

B. Section Does Not Include: Use of aluminum doors.

C. Related Sections:

1. 04221 - Concrete Unit Masonry.
2. 06100 - Carpentry.
3. 07900 - Joint Sealers.
4. 08710 - Door Hardware.
5. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
6. 09900 - Painting of Unpainted Surfaces.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. A924 Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
3. C270 Specification for Mortar for Unit Masonry.

B. Factory Mutual (FM), latest edition.

C. National Builders Hardware Association - "Recommended Locations for Builders", latest edition.

D. Steel Door Institute (SDI), latest editions.

1. SDI 100 Standard Steel Doors and Frames.
2. SDI 105 Recommended Erection Instructions for Steel Frames.
3. SDI 107 Hardware on Steel Doors (reinforcement application).

E. Underwriters Laboratories (UL), latest edition.

F. UL 1784 Air Leakage Test of Door Assemblies.

G. National Fire Protection Association (NFPA), latest edition:

1. NFPA 80 Standard for Fire Doors and Windows.
2. NFPA 101 Life Safety Code.
3. NFPA 105 Smoke and Draft Control Assemblies.

H. Florida Building Code (FBC).

I. Americans with Disabilities Act and Accessibility Guidelines (ADA).

J. American National Standards Institute (ANSI), latest edition:

1. A250.4 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.
2. A224.1 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.
3. All7.1 Accessible and Usable Buildings and Facilities.

K. Warnock Hersey International (WHI), Division of Inchcape Testing Services.

1.3 SUBMITTALS

A. Exterior Door Certification: Monroe County Notice of Acceptance (NOA) or State of Florida Product Approval. Provide calculations signed and sealed by a Florida registered Professional Engineer demonstrating compliance with FBC and ASCE 7 missile impact requirements.

B. Submit properly identified product data including manufacturer's specifications and installation instructions before starting work, and any information necessary to indicate compliance to these specifications.

C. Shop Drawings:

1. Indicate manufacturer's model number, door and frame elevations and sections, materials, gauges and finishes, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved by A/E.
2. Provide shop drawings for louver kits and light kits.

D. Upon request, submit nonreturnable samples necessary to be evaluated for construction compliance.

E. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for each door and frame assembly constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

1.4 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies complying with NFPA 80 and have been tested, listed, and labeled according to UBC-43-2 and ISO-3008 by a nationally recognized independent testing and inspection agency.

B. Provide doors and frames complying with SDI 100 and as specified.

C. CITY OF KEY COLONY BEACH reserves the right to cut open, at no cost to the City, a random door to verify construction and reinforcements for compliance with CITY OF KEY COLONY BEACH previously accepted manufacturer’s shop drawings. Non-Compliance will be grounds for removal and replacement of installed door at no expense to the City.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver steel doors and frames cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

B. Inspect steel doors and frames upon delivery for damage. Minor damage may be repaired if refinished items are equal in all respects to new work and acceptable to A/E. Remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

D. Deliver all doors and frames to the jobsite in a timely manner to not delay progress of other trades.

1.6 WARRANTY

A. Hollow metal doors and frames shall be supplied with a l year warranty against defects in materials and construction.

B. Warranty shall begin on date of substantial completion of the project.

1.7 DEFINITIONS

A. Areas subject to wet mopping include kitchens, dining rooms, toilets, locker/showers, custodial, and other similar spaces with hard or resilient flooring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Doors and Frames: Steel doors referenced below are “stock” models which shall be modified by appropriate manufacturer as may be necessary to meet all the requirements stated in this document.

1. Model MS Medallion by Ceco Door Products, Carol Stream, IL.
2. Model 747by Curries Company, Mason City, IA.
3. Model “H” Series by Flemming.
4. Model F-16 by Quality Engineered Products Co., Inc., Tampa, FL.
5. Model “B” Series by Steelcraft, Cincinnati, OH.
6. Model DE416by Republic Builders Products, Pembroke Park, FL.

2.2 DOORFRAMES

A. Fabricate exterior frames and interior frames to profiles indicated of 16-gauge hot-dip zinc-iron alloy coated sheet steel, A366, with A60 coating designation according to ASTM A924 and ASTM A653 0.50 oz. zinc per sq.ft. total both sides. Steel shall be of commercial quality, stretcher leveled flatness.

B. Frames: Fully welded with mitered or butted head and jamb members with integral stops and with combination buck and trim as shown.

1. Corners shall have continuous flush and smooth welds without dishing.
2. Sanitary or hospital type stops shall have 6-inch-high cutoffs with 45-degree caps.

C. Hardware Reinforcements and Preparations:

1. Frames shall be mortised, reinforced, and drilled/ tapped for mortised hardware according to approved finish hardware schedule and templates by hardware supplier.

a. Drilling and tapping for surface applied hardware shall be done in the field.
b. Locate finish hardware according to "Recommended Locations for Builder's Hardware" published by National Builders Hardware Association, or as otherwise directed by A/E.

2. Butt (Hinge) Reinforcing:

a. Steel plate 3/16" thick by 1-1/4" minimum to 1-1/2" maximum by 10 inches long, offset as required to have faces of butts flush with doorframe edge and secured by not less than 6 spot welds.

3. Strike Reinforcement: Offset clips of 12-gauge steel, 1-1/4" x 4-7/8" long.
4. Closer Shoe Reinforcing for Parallel Arm:

a. 12-gauge steel plates (minimum 20" long x 1-3/4" wide) at bottom of doorstop located next to door rabbet on hinge.
b. Provide styrofoam or treated wood over plates to allow closer foot screws to seat without interference from grout fill.

D. Silencer (Mute) Provisions: Punch frames to receive silencers on strike jamb scheduled in Section 08710.

E. Center Hardware Mullions, Removable: Grout filled and fabricated with only one thickness of metal occurring at point of silencer punch-outs, 2" x 3", 11-gauge hardware mullion by exit device manufacturer.

F. Grout:

1. Grout Guards:

a. Provide 26-gauge sheet metal covers welded to the back of frames at hinges, lock, bolts, tapped reinforcements at hardware and silencer locations.
b. At Silencer locations, furnish suitable removable plugs in holes to keep grout free.

2. Coatings:

a. Provide full coverage at frame interior before grouting with corrosion inhibiting bituminous coating.

3. Grouting of Frames:

a. Grout fill-in-place doorframes at the following locations:
   1) All exterior door openings,
   2) All door openings in masonry, and concrete.
   3) Other areas as indicated on the Construction Documents.
b. Grout shall be a mortar mix complying with ASTM C270, Type S-1800 psi minimum.
c. Grout must be mixed to a 4" (102mm) maximum slump per *ASTM C476-20 – Standard Specification for Grout for Masonry.*
d. Grout must be hand troweled in place as the masonry is laid.
e. Brace the frame during grout application to prevent bowing and sagging.
f. The installers should reference the frame manufacturer's instructions.
g. Mortar grout is recommended because it cures with a chemical reaction and hardens throughout.
h. Grout that gets on the exposed side of the frame should be removed immediately.
i. STC (Sound Transmission Class) doors (over STC 40) require that the frame be grouted with a cement-based grout or mortar as this was the tested condition. In these cases, the frames should be grouted and thoroughly cured prior to installation of the frame in the drywall wall.

G. Jamb Anchors: Provide according to frame manufacturer's recommendations for attachment to masonry walls, concrete columns, and metal stud system as shown on drawings.

H. Floor Anchors: Provide 14-gauge galvanized sheet steel angle shaped anchors for each jamb extending to the floor, punched for not less than two 1/4" diameter bolts.

I. Spreaders: Provide frames with temporary steel spreader bars tack welded to jambs to maintain full rigidity and proper alignment during installation.

J. Security Switch Preparation: Refer to the Drawings.

2.3 HOLLOW METAL DOORS

A. Fabricate exterior and interior doors to profiles indicated of 16-gauge hot-dip zinc-iron alloy coated sheet steel, A366, with A60 coating designation according to ASTM A924 and ASTM A653 0.50 oz. zinc per sq. ft. total both sides. Steel shall be of commercial quality, stretcher leveled flatness.

B. Types: Flush, seamless hollow construction with louvers or vision cutouts as shown or specified.

C. Sizes and Thickness: Sizes shall be as indicated and with 1-3/4" thickness unless otherwise specified or shown.

   1. Provide undercuts where indicated for ventilation. Do not exceed 3/4" undercut for fire labeled doors.
   2. Provide 3/8" undercut at doors for exterior openings with ADA threshold.

D. Door Perimeters:

   1. Stile Edges: Bevel for single acting doors shall be 1/8" in 2 inches.
   2. Top and Bottom Channels.

a. Not less than 16-gauge A60 zinc coated steel channels-flush or inverted.
b. Welded to the face sheets.
c. Exterior door tops shall have flush surface.

E. Doors:

1. Classification: SDI Grade III - Model 2, 16-gauge, seamless, and steel stiffened with required reinforcement and as shown on Drawings.
2. Doors shall have minimum 20-gauge, continuous one-piece, vertical steel stiffeners spaced not to exceed 6 inches apart and welded at 6 inches on center to face skin.
3. Lock Rail shall be one-piece, full height minimum 16-gauge channel.
4. Hinge Rail Reinforcement Manufacturer's Option:

    a. One-piece, full height, 12-gauge channel formed, and tapped for hinges.
    b. One-piece, full height, minimum 16-gauge channel formed and with minimum 3/16" thick steel by minimum 8" long at each hinge.

5. Cylindrical Lock Reinforcement: Minimum 16-gauge standard hardware lock box.
6. Exit Device Reinforcement: Minimum 12-gauge channel or box, minimum 20" long by 4" wide on both sides of door.
7. All spaces between stiffeners shall be insulated with fiberglass or mineral insulation.
8. Door closer reinforcement shall be minimum 12-gauge channel or box, welded to top channel. Bottom of reinforcement shall be a minimum of 5-3/4" from top of door, by width of door.
9. Astragals: Flat security type or "Z" as indicated in drawings or specifications.
10. All doors shall comply with ANSI A250.4-1994 Level "A" criteria and be tested to 1,000,000 operating cycles and 23 twist tests.

    a. Certification of Level "A" doors shall be submitted with approval drawings by the distributor.
    b. Do not bid or supply any type or gauge of door not having been tested and passed this criteria.

F. Core material.

1. Stiffeners: Provide vertical members spaced not more than 6 inches o.c. with shape standard to manufacturer.
2. Core Fill: Provide fiberglass or mineral standard to manufacturer.

G. Hardware Reinforcements and Preparation:

1. Hardware Reinforcement: Comply with accepted manufacturer's drawings.
2. Hardware preparation.

    a. Drill for hardware according to accepted finish hardware schedule and templates furnished by hardware supplier.
    b. Drilling and tapping for surface applied hardware shall be done in the field.
    c. Locate finish hardware according to recommended locations for hardware as shown on drawings.
    d. Through bolts for exit devices and locksets shall be by manufacturer.
    e. Lock reinforcement shall be located as height required for standard and disabled users as shown on drawings and as specified.

H. Security Switch Preparation: Refer to Drawings.

I. Exterior Door Louvers:

1. Zee profile weather resistant type equal to thickness of door, with center rail and of sizes indicated.
2. Fabricate frames and louvers of 18-gauge bonderized electro zinc coated sheet steel.
3. Weld or secure frame and louvers into doors without use of screws or through bolts visible from the secured side.
4. Provide security grille as specified on inside of louvers.
5. At louver opening cutout, provide minimum of 20-gauge zinc coated steel channel closure welded at opening perimeter.

J. Interior Door Louvers:

1. Inverted "Y" profile sightproof type equal to thickness of door, of sizes indicated.
2. Fabricate frames and louvers of 18-gauge bonderized electro zinc coated sheet steel.
3. Weld frame and louvers into doors without use of screws or through bolts visible from the secured side.
4. Provide security grille as specified on inside of louvers.
5. At louver opening cutout, provide minimum of 20-gauge zinc coated steel channel closure welded at opening perimeter.

K. Fire Door Louvers: Provide UL or FM labeled assemblies of sizes indicated, subject to the following:

1. Louver maximum size limited to 24 inches height and width.
2. Louver minimum size limited to 6 inches high and 12 inches wide.
3. Secure double louver frames to doors with sex bolts through door at 12 inches o.c. maximum.
4. Provide security grille as specified on inside of louvers.

L. Security Grilles:

1. Able to withstand a 200-pound force applied to any point from any direction.
2. A60 galvanized steel, minimum 1/16” thick, with 0.125” dia. holes stagger 0.1875” to provide 40 percent open area. Powder coat finish. Color to be selected by A/E.
3. Manufacturers:

    a. Crime Shield Barriers by Exeter, Wyoming, PA.
    b. Security Barrier Screens by Phoenix, Lawrenceville, GA.
    c. Securiperf Security Screens by Security Sales Company, Miami, FL.

M. Security Grilles - Missile Impact Resistant:

1. Certified missile impact resistant.
2. 14-gauge A40 galvannealed steel, with 50 percent minimum open area. Powder coat finish. Color to be selected by A/E.
3. Manufacturers:

    a. Storm Shield Barriers by Exeter, Wyoming, PA.
    b. SureGuard Hurricane Barriers by Phoenix, Lawrenceville, GA.

N. Insect Screens for Exterior Door Louvers:

1. 18 x 16 mesh aluminum screen on rewireable extruded aluminum frame.
2. Mount screen on interior of exterior doors with zinc plated sheet metal screws at 12 inches o.c.

O. Rat Screens for Exterior Door Louvers:

1. 1/4" mesh hot dipped galvanized steel hardware cloth secured in 16-gauge bonderized hot dipped zinc coated steel "U" frames.
2. Mount screens on interior of exterior doors with zinc plated sheet metal screws at 12 inches o.c.

P. Interior Lightproof Door Louvers:

1. Interlocking channel lightproof type, equal to thickness of door, of sizes indicated.
2. Fabricate frames and louvers of 18-gauge bonderized electro zinc coated sheet steel.
3. Weld or secure frame and louvers into doors without use of screws or through bolts visible from the secured side.

Q. Slip-on Spats: 20-gauge, #4 satin finish.

R. Light Opening in Doors:

1. Provide light openings of sizes indicated.
2. At light opening cut outs, provide 16-gauge zinc coated steel channel closures welded into opening perimeter.

S. Glass light frames in doors fabricated of not less than l8-gauge galvanized steel with attachment screws allowed only on the non-secure side, not visible when viewing door lite frame face.

2.4 FINISHING AND SHOP PAINT

A. After Fabrication: Grind exposed weld marks smooth and flush, clean and degrease surfaces, apply metallic filler, sand smooth, and apply shop coat of manufacturer's standard rust-inhibitive metal primer baked on.

B. Prime Coat: Thoroughly cover all surfaces to provide uniform dry film thickness of not less than 1.0 mil without runs, smears, or bare spots.

C. Primer Coat: Use manufacturer's standard rust inhibiting primer complying with ANSI A-224.1-1990.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Frames:

1. Install plumb, level, and true to line, secured in openings.
2. Install frames according to accepted shop drawings, manufacturer's printed instructions.
3. Grout fill-in-place all doorframes at exterior doors, doors located in masonry, concrete and tilt-wall construction, and at other areas as indicated in the Construction Documents.
4. Install fire-rated frames according to NFPA 80.
5. Install stainless steel slip-on spats at food service doorframes.

B. Doors:

1. Install in openings plumb, level, and true to line.
2. Apply hardware and adjust to achieve smooth and quiet operation.
3. Install insect/rat screens on interior of exterior door louvers.
4. Place fire-rated doors with clearances as specified in NFPA 80.

3.3 ADJUST AND CLEAN

1. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
2. Protection Removal: Immediately before final inspection, remove protective plastic wrappings from prefinished doors.
3. Fill all dents, holes, etc. with metal filler and sand smooth flush with adjacent surfaces-paint to match.
4. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Provide final adjustment as follows:
5. Door Contact with Silencers: Doors shall strike a minimum of two silencers without binding lock or latch bolts in the strike plate.
6. Head, Strike, and Hinge Jamb Margin: 1/8".
7. Meeting Edge Clearance, Pairs of Doors: ± 1/16".
8. Bolts and Screws: Leave tight and firmly seated.
9. Soundseal gasketing.
10. Vermin Protection:

    a. Drop Seal: Full contact with no gaps.
    b. Brush weatherstripping.

END OF SECTION

08210 WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 06100 - Carpentry.
2. 08710 - Door Hardware.
3. 09900 - Painting of Unpainted Surfaces.

1.2 REFERENCES

A. Department of Commerce Commercial Standards (CS).

B. Industry Standards (ISI).

C. "Wood Flush Doors" of National Wood Window and Door Association (NWWDA).

1.3 SUBMITTALS

A. Submit properly identified manufacturer's product data and specifications before starting work.

B. Shop Drawings: Submit complete detailed shop drawings of specified doors.

1.4 QUALITY ASSURANCE

A. Doors shall comply with:

1. National Wood Window and Door Association I.S.1-A-97 (NWWDA) standards.
2. Architectural Woodwork Institute (AWI) 7th edition.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not deliver doors to job site until needed. Coordinate delivery with job progress.

1. Store doors in a flat position elevated a minimum of 4 inches above cured concrete slab.
2. Ship doors individually wrapped/cartoned.
3. Identify each door by number/tag according to accepted shop drawings.

1.6 WARRANTY

A. Provide manufacturer's written guarantee covering defects in materials, quality of work, and warp exceeding 1/4".

B. Guarantee shall be for the life of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wood Doors:

1. Weyerhauser, Marshville, WI.
2. Algoma Hardwoods, Algoma, WI.
3. Eggers Industries, Two Rivers, WI.
4. Buell Doors, Dallas, TX.

2.2 MATERIALS

A. The use of particle board or chip board, of any grade, is not allowed.

B. Solid Core.

1. Type: 5 ply bonded core construction only.
2. Thickness: 1-3/4".
3. Construction:

a. Rails: Manufacturer's option.
b. Stiles: 5/8" minimum, matching sides.
c. Core: Structural composite lumber of low-density hardwood material.
d. Facing:

1) Premium grade birch (for stain).

a) Medium Density Overlay (M.D.O.) (for paint) factory primer finish.
b) Adhesive: Type I waterproof glue.

e. Guarantee: Standard one-year NWWDA. All doors shall carry identification markings.

2.3 FABRICATION

A. Fabricate to sizes and design indicated on Drawings, prefitted for openings and properly beveled.

B. Pre-fit Clearances:
1. 1/8" top and sides and 1/2" above scheduled finished flooring material.

a. Refer to the Door Schedule for additional undercut as specified.

2. Bevel angle 1/8" per 2 inches of door thickness.
3. Cut-Outs:

a. Make cutouts at factory for glass and louver openings to size and shape indicated on Drawings.

1) Allow a minimum of 5 inches from cutout to edges of doors.
2) Provide loose pre-mitered stops to match door face for field application.

b. Metal Louvers: Steel construction, painted, of size, type, and profile shown.

4. Hardware Preparation: Pre-machine at factory for scheduled hardware using templates and directions furnished by Hardware Supplier.

   a. Field installation is optional.

5. Maximum tolerances for doors are as follows:

   a. Size: ± 1/16".
   b. Warp: 1/4" along vertical edge of diagonal.
   c. Squareness: 1/4" length of diagonals.

PART 3 EXECUTION

3.1 PREPARATION

A. Condition doors to average prevailing humidity in installation area before hanging.

3.2 INSTALLATION

A. Install according to manufacturer's written instructions.

B. Job-Fit Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated.
2. Do not trim stiles and rails more than limits set by manufacturer or allowed with fire-rated doors.
3. Machine doors for hardware.
4. Seal cut surfaces after fitting and machining.

C. Fitting Clearances:

1. Non-Rated Doors:

   a. 1/8" at jambs and heads.
   b. 1/16" per leaf at meeting stiles for pairs of doors.
   c. 1/8" from bottom of door to top of decorative floor finish or covering.

2. Threshold: 1/4" clearance from bottom of door to top of threshold.
3. Bevel non-rated doors 1/8" to 2 inches at lock and hinge edges.

3.3 ADJUSTING AND CLEANING

A. Replace or rehang hinge bound doors not swinging or operating freely.

B. Leave installation clean and free from finger marks, dirt, and other substances and ready for painting.

END OF SECTION

08305 ACCESS PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07900 - Joint Sealers.
2. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
3. 09250 - Gypsum Wallboard.
4. 09310 - Ceramic Tile.
5. 09900 - Painting of Unpainted Surfaces.
6. 15430 - Piping Specialties (Plumbing).

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature including manufacturer's specifications and installation instructions before starting work.

B. Shop Drawings: Submit shop drawings for review.

1.3 QUALITY ASSURANCE

A. Provide UL or other Nationally Recognized Testing Laboratory (NRTL) label on each fire-rated access door.

B. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Access Panels:

1. Milcor Limited Partnership, Lima OH.
2. Nystrom Inc., Minneapolis, MN.
3. Elmdor.

2.2 EQUIPMENT

A. Sizes as shown on Drawings or required to provide sufficient access for the proper operation of maintenance. Minimum size shall be 12 inches x 12 inches.

B. Provide 14 gage steel door with 16 gage steel frame with baked enamel prime coat.

C. Provide fire-rated components at fire rated construction.

D. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge. Finish as noted on drawings.

1. For fire-rated units, provide manufacture's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

E. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

1. Coordinate keying with facility

F. Access Panels for Plastered Surfaces:

1. Milcor K.
2. Nystrom Flush PW.
3. Williams Bros. WB-PL.
4. Elmdor.

G. Access Panels for Masonry and Tile Surfaces:

1. Milcor M.
2. Nystrom Flush TM.
3. Elmdor.

H. Access Panels for Gypsum Wallboard.

1. Milcor DW.
2. Nystrom Flush WB.
3. Willaims Bros. WB-DW.
4. Elmdor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Coordinate installation with work of other trades

D. Leave surfaces clean and ready for final painting.

E. Adjust to operate properly and replace damaged units.

F. Finishes: Refer to respective sections of specifications.

END OF SECTION

08332 OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate overhead coiling door work with work before and after, especially wood blocking, sealants, padlocks / keys, electric power and intrusion detectors.

B. Related Sections:

1. 05500 - Metal Fabrications
2. 07900 - Joint Sealers.
3. 09900 - Painting.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition: Specifications for:

1. A653/A653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

1.3 OVERALL STANDARDS

A. American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures.

B. Performance in the Florida High Velocity Hurricane Zone (HVHZ).

1. Each overhead coiling door assembly shall be built to withstand the positive and negative (±) Design Pressures Ratings (DPR) shown in the Contract Documents

1.4 SUBMITTALS

A. Submit properly identified manufacturer's literature including specifications, installation details, applicable NOA, and the following data before starting work:

1. Shop Drawings: Indicate size, construction details, gages, finish, installation details, anchorage, and hardware location.
2. Certification: Provide copy of Monroe County Notice of Acceptance (NOA) or State of Florida Product Approval, demonstrating product compliance with FBC ASCE-7 for High Velocity Hurricane Zones.
3. Producer’s installation instructions.

B. Shop Drawings. Location of each door in the facility, dimensions, operation, power requirements and insulation (if any), needed blocking, fastening of rails, modifications for withstanding the specified wind pressure requirement in each location, method of wiring for electric power and intrusion detection, and details for proper installation.

PART 2 PRODUCTS

2.1 COILING DOOR, ELECTRIC OPERATED, INSULATED

A. Description. Lockable steel slat door, electrically operated, with all safety devices, torsion spring counterbalance in hood, end-locks at each slat, and bottom seal and weather-sealing at head and jambs. Doors shall be without vision panel and mounted on steel brackets and tracks or jambs to the interior face of wall. Galvanize and factory coat all parts of door assembly.
   1. Door Width: As indicated on Contract Documents.
   2. Insulated slats, at doors serving airconditioned post office area: 0.047 in. (20 gage) steel, or thicker, of tensile strength required by NOA, with endlocks. Provide 1/2 in. thick 1.0 lb/ft^3 density polystyrene foam inserts inserted beneath an interior 24 gage steel cover.
   3. Tracks and mounting brackets: Heavy duty steel, designed to resist imparted lateral forces from wind loads on the endlocked slats.
   4. Endlocks: Cast iron or steel, each riveted twice to each end of each slat.
   5. Bottom bar: Steel angles, with weather-sealing EPDM or neoprene safety edge attached.
   6. Weather seal: Extruded EPDM or neoprene, or nylon brush, at head and jambs.
   7. Hood: Round, steel, with EPDM or neoprene air infiltration baffle.
   8. Door locking bar: Steel, with keeper for padlock. Provide lock and keys masterkeyed as described in 08710.
   9. Electric operation and controls. 3-phase motor with electric button operator affixed to wall, requiring constant pressure to open or close. Provide override to allow manual operation by crank or chain when power is not available.
   10. Safety features shall include safety edge and infra-red obstruction sensors / cutoffs.
   11. Warning sign: 2 in. letters in black on yellow acrylic base: REMOVE PADLOCK BEFORE OPERATING ELECTRIC COILING DOOR.
   12. Galvanizing: ASTM A653, G90.
   13. Factory coating: Baked primer coat + powdercoat finish coat, in one of producer's standard colors as selected by A/E; AAMA 2602.

B. Standard. Current Monroe County Notice of Acceptance (NOA) for this product, suitable for opening size and for resisting the wind pressure at each door's location.

   1. NOA shall be for both Large and Small Missile Impact.

C. Product / Producer:

   1. Each of the following products has a Design Pressure Rating as listed in table below. Some producers have products with similar NOAs that may be a basis for design.
   2. These NOAs, and other NOAs for similar products by the same producer, shall be the basis for selecting an overhead coiling door that most nearly meets the required DPR as shown in the Contract Documents at each door location.
   3. If the wind pressure is greater than the product's DPR, modify the selected product to achieve the DPR by strengthening it as described in a shop drawing to be submitted to the A/E. Upon approval, modify the product and adjacent work accordingly.
   4. Table of products tentatively approved before A/E's review of submittals:

	Product	Producer	Monroe NOA	DPR	Contact
a.	Slat Roll-Up Door	Best Rolling Drs	05-0606.03	± 90	305 351-1686
b.	Rolling Steel Door	Cornell Iron Wks	07-0106.02	± 60	305 887-5399
c.	Rolling Steel Door	Overhead Door	05-1003.23	± 65	305 594-1900
d.	DuraCol Optima	Raynor Gar. Drs	04-0303.04	± 66	305 594-3810

e. Equal product in quality and performance as reviewed and approved by A/E and the City of Key Colony Beach.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Before starting door installation, installer shall, with the Contractor, inspect OH coiling door locations to ensure that earlier construction is complete and free of defects.

1. Check opening dimensions.
2. Check to see that each door assembly can be fastened directly to structure using the blocking and anchoring that has been installed as required in the NOA.

B. Do not start installing doors until defective earlier construction and conditions have been completed and corrected in ways that are acceptable to door producer and installer.

3.2 INSTALLATION

A. Delivery and Storage. Store products to protect them from weather and physical damage

B. Installing.

1. Install overhead coiling door assemblies following producer's current published instructions, except as more stringently specified or specified in more detail herein.
2. Secure tracks to structural members only.
3. Erect door assemblies plumb, level, and aligned to ensure smooth door operation.
4. Install weather seals and air baffle so as to keep air intrusion to a minimum.
5. Coordinate electrical aspects of electric-operated door installation with electric power and access control, intrusion-detection, and alarm wiring.
6. Erect specified warning sign at all electric-operated doors.

END OF SECTION

08350 FOLDING CLOSURES FURNISHED AND INSTALLED BY USPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Folding security closures.
   2. Hardware.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Provide Products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.

D. Related Sections:

1.2 SUBMITTALS

A. Section 01770 – Contract Closeout:
   1. Operating and Maintenance Data: Operating and maintenance instructions, parts lists and wiring diagrams.
   2. Submit written special warranty with forms completed in United States Postal Service name and registered with manufacturer as specified in this Section.

B. Section 013300 - Submittal Procedures:
   1. Product Data: Construction, component connections, and details for each door type.
   2. Shop Drawings: Indicate dimensions, anchorage methods, hardware locations, and installation details for each door type.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Factory authorized company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect Products.

1.5 WARRANTY

A. Comply with Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.

B. Manufacturer warranty to cover all material and labor required to repair or replace side folding closures and components for a period of two years from time of acceptance by USPS, within a guaranteed maximum repair response time of ten (10) calendar days.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This Product must be manufactured by a USPS Pre-Approved Vendor. The following vendor contacts must be used:
   1. Dynaflair Corporation, Tampa, FL
      POC: Gerald Pasternak, (813) 248-8100, (800) 624-3667.
   2. Dynamic Closures Corporation, Massena, NY.
      POC: Christine Warner, (800) 663-4599.
   3. Mobilflex Inc., Niagara Falls, NY
      POC: Claire Touzin (800) 216-3539

B. Section 016000 – MATERIAL EQUIPMENT AND APPROVED EQUALS: Product options and substitutions. Substitutions: Not permitted.

2.2 FOLDING CLOSURES

A. Solid curtain for enclosure of Retail Lobby or Full-Service Counters: Constructed of continuous solid panels of a minimum 16 gage (0.050 inch) (1.25 mm) thick aluminum. The maximum panel width is 8 inches. Panels to match curtain finish. The space between the bottom of the curtain and the floor directly below the track is not to exceed 1/2 inch (1.2 cm).
   1. Dynaflair: Elegance with solid insert.
   2. Dynamic: Elite Series EL Opaque.
   3. Mobilflex: Global.

B. Track: Curtain shall be supported by trolley assemblies capable of carrying 120 pounds per linear foot. Curves and track shall be heavy extruded aluminum with a minimum of 14-inch (36 cm) radius for each 90-degree curve, and a minimum of 10-inch (25 cm) radius for curves greater than 90 degrees.

C. Locking:
   1. Lead member, trailing member and bi-part member (if any) to be provided with manufacturer's high security cylinder on the exterior side with metal security ring.
   2. Lead member to engage a full height striker channel with a single hook latch.
   3. Lead bi-part member to engage a full height striker channel member secured with a single hook latch and bottom drop bolt.
   4. Lead member/channel connection and bi-part member connection to include a horizontal solid metal pin 1/2 inch (13 mm) in diameter. Pins to be 18" AFF and seat a minimum of 1 inch (2.6 cm) into the strike channel or lead member so they are not visible.
   5. Trailing end member to be free floating top and bottom post secured outside the storage pocket with top and bottom drop bolts operated on the exterior side.
   6. Intermediate member(s) to be located at all curves and on straight sections at intervals not to exceed 8 feet (2.44 m).

7. Solid Curtains at Full-Service Counters: Intermediate members to be equipped with drop bolt at the bottom, operated by manufacturer's high-security mortise cylinder on the exterior side with a metal security ring.
8. All applications other than those listed in Item 7 above: Intermediate members to be equipped with a concealed locking device, drop bolt at the bottom, and control lever on interior side.
9. Drop bolt to be manufactured with grade 1045 cold roll steel, with the bottom 6 inches (15 cm) of the bolt flame hardened and tempered to 55 Rockwell hardness. Drop bolt to extend not less than 1 inch (2.6 cm) into a dust proof receiver.
10. Keying of cylinders:
    a. Furnish cylinders keyed alike during construction.
    b. Final keying will use specified cylinders, see section 087100.

D. Stacking: Allow 2.1 inches (5 cm) of stacking per linear foot of closure width, plus 3 inches (8 cm) for each post section.

E. Finish: Clear anodized frame with matching clear anodized full height aluminum panels.

F. Installation Details/Instructions: The Vendor shall produce a package of drawings/details and/or instructions which will be provided by the vendor with each folding closure at the time of delivery. This package shall be of sufficient detail to explain the proper installation and adjustment of folding closures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that opening sizes, tolerances, and conditions are as indicated on Drawings.

B. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Installation company must specialize in performing the Work of this Section with documented experience and be approved by the folding closure manufacturer.

B. Install closure unit assembly in accordance with published manufacturer's instructions.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress. Brace and fasten components suspended from structure to be secure and rigid.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.3 CONSTRUCTION

A. Site Tolerances:
   1. Maintain dimensional tolerances and alignment with adjacent work.
   2. Maximum Variation from Plumb: 1/16 inch (1.6 mm).
   3. Maximum Variation from Level: 1/16 inch (1.6 mm).

3.4 ADJUSTING

A. Adjust closure, hardware, and operating assemblies for smooth and quiet operation.

3.5 CLEANING

A. Clean closure and components.

B. Remove labels and visible markings.

USPS CSF Specifications issued: 10/1/2021
Last revised: 07/24/2020

END OF SECTION

08400 ENTRANCES & STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum storefront frames, storefront doors, and vision glass infill panels.

1.2 RELATED SECTIONS

A. 07900 Joint Sealants.

B. 08710-Door Hardware.

C. 08800-Glass and Glazing.

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA).
   1. AAMA 2605-Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.

B. ASTM D1730-Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.

C. Florida Building Code (FBC).

D. International Organization for Standardization (ISO) 14021 – 1999; Environmental Labels and Declarations

E. National Association of Architectural Metal Manufacturers (NAAMM).

F. National Fenestration Rating Council (NFRC)

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer’s specifications and catalog cuts.
   2. Submit the type of finish to be supplied for aluminum in this section, with manufacturer’s name and brand name, along with certification or test report as evidence that the finish has passed the 10-year weathering test and complies with AAMA 2605.

B Shop Drawings
   1. Shop Drawings required, covering each type of door, frame, condition, anchoring detail and finishes. Provide test reports and structural calculations.
      (a) Shop drawings shall conform to maximum allowable design pressures per the Florida Building Code.

C Samples:
1. Aluminum and color finish including metal materials, glass, and glazing gaskets.
2. Sealants: Provide manufacturer color chart and sample for selection by Project Consultant.

D. Manufacture installation instructions: Indicate special procedures and conditions requiring special attention.

E. Warranty.

F. Complete current Florida Building Code (FBC) High Velocity Hurricane Zones (HVHZ) Protocols and required product Notice of Acceptance (NOA).

1.5 QUALITY ASSURANCE

A. Design Requirements: Design exterior storefront systems to conform to the Florida Building Code and meet the design pressures shown on Contract Documents and meet the Impact Standards, in compliance with Florida Building Code (FBC) High Velocity Hurricane Zones (HVHZ) Protocols and required product Notice of Acceptance (NOA) or Florida statewide product approval.

B. Labeling: Each unit shall bear a permanent label with manufacturer's name or logo, city, and state.

C. All work shall be performed in accordance with referenced standards.

1.6 DELIVERY, STORAGE and HANDLING

A. Deliver storefront components to project site in manufacturer's fully identified containers.

B. Store in accordance with manufacturer's published instructions, above grade on dunnage, properly protected from weather and construction activities.

1.7 WARRANTY

A. Submit written warranty, signed jointly by manufacturer, installer and Contractor, agreeing to replace aluminum window units, which fail in materials or installations within 3 years of date of acceptance. The 3 parties jointly and separately are responsible for the installation for the period stated herein.

B. Failure of materials or installation: include, but not be limited to, excessive leakage or air infiltration, excessive deflections, faulty operation, deterioration of finish or metal in excess or normal weathering and defects in hardware and weather-stripped.

C.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with specified requirements, provide storefronts from the following:
   1. Kawneer, Series: IR500 Frames, IR350 Doors.
   2. United States Aluminum, Series: IG 500.
   3. Vistawall Architectural Products, Series: 5000.
   4. YKK Architectural Products, Series: YHS 50 FS.

B. Substitutions:
   1. Will be considered by the A/E and City of Key Colony Beach when submitted per requirements of Division-0, Division-1.

2.2 MATERIALS

A. All entrance and storefront materials to contain recycled materials.

B. Aluminum framed storefront frames and doors (impact rated system for exterior use): Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage, and attachment devices. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Basic Materials:
   1. Extrusions: AA-6063 T-6 aluminum alloy.
   2. Surface: Free of scratches and blemishes.

D. Frames:
   1. Storefront: Flush glazed, aluminum storefront sections; 2-1/2-inch-wide x 5 inches deep. Provide sections as detailed on Drawings.

E. Doors:
   1. Type: Wide Stile, modified as follows:
      (a) Stiles: 5 inch (nominal) minimum width.
      (b) Top rail: 5 inches (nominal) minimum.
      (c) Center rail (optional only when center rail is not part of the NOA).
      (d) Bottom rail: 6-1/2 inches nominal.
   2. Corners: Weld or mechanically fasten.

F. Glass:
   1. At Exterior Conditions: Refer to Section 08800 – Glass and Glazing

   2. At Interior Conditions: Clear glass, tempered in compliance with FBC.

G. Glazing Stops:
   1. Snap-in type with neoprene bulb-type glazing gasket. No exposed screws allowed.
   2. Stops: As shown on drawings.

H. Fasteners: Aluminum, stainless steel or zinc plated steel. Properly insolate steel anchors from aluminum.

I. Hardware:

J. Hardware for aluminum entrance doors must comply with current Florida Building Code (FBC) High Velocity Hurricane Zones (HVHZ) Protocols and required product Notice of Acceptance (NOA), furnish hardware to the door manufacturer for installation at the factory.
   1. Finish Hardware Supplier: Responsible for furnishing physical hardware, and templates of all specialty hardware, to the entrance manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer, the contractor and the entrance manufacturer.
   2. Provide manufacturer's standard aluminum reinforcing back-up plates for all hinges and hardware as required.

K. Accessories:
   1. Provide all fasteners, anchors, sections, etc. for a complete installation of all items specified herein.

2.3 FINISH ON ALUMINUM

A. Liquid-Applied Fluoropolymer Organic Paint Coating:
   1. Description: Factory-applied prime coat and topcoat, electrostatically applied and thermally cured.
      (a) Weathering: Pass 10-year test.
      (b) Chemical Composition: At least 70 percent polyvinylidene fluoride.
      (c) Prime Coat: At least 0.3 mil dry thickness (DFT).
      (d) Topcoat: At least 1.0 mil DFT.
      (e) Texture: Gloss
      (f) Reference Standard: AAMA 2605 with a chrome phosphate pretreatment, Superior Performance Organic Coating.
      (g) Color: As selected by Project Consultant w/City of Key Colony Beach approval.
      (h) Product: Subject to compliance with the specified requirements, provide products by one of the following manufacturers:
         (1) Hylar 5000, by Austimont USA.
         (2) Kynar 500, by Atochem North America.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean aluminum surfaces and treat following ASTM D1730, Type B, Method 5 or 7.

B. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface and are under provisions of approved shop drawings.

3.2 INSTALLATION

A. Install windows under provisions of Section 08800-Glass and Glazing and manufacturer's printed instructions, accepted shop drawings, under direct supervision of manufacturer's representative(s), and current Florida Building Code (FBC) High Velocity Hurricane Zones (HVHZ) Protocols and required product Notice of Acceptance (NOA).

B. Use only skilled tradesmen, erect all storefront components to all building bench marks and column centerlines.

C. Plumb and align storefront faces in a single plane for each wall plane and erect materials square and true adequately anchored to maintain positions permanently when subjected to normal thermal and building movement and specified wind loads.

D. Separate aluminum from masonry and ferrous metals by use of bituminous coating or gasketing to eliminate possibility of corrosion from electrolytic action.

E. Protect work from corrosion, prime coat concealed steel stiffeners, anchors, brackets, fasteners and the like prior to installation and seal joints between window frames and building tightly and continuously.

F. Furnish and apply sealants to provide a weathertight installation at all joints and intersections and at opening perimeters. Wipe off excess material; leave all exposed surfaces and joints clean and smooth.

G. Cleaning:
   1. Clean surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes.
   2. Remove excess glazing and sealant compounds, dirt and other substances.
   3. Lubricate hardware and moving parts.
   4. Clean glass of pre-glazed units promptly after installation of windows.

H. Protection:

1. Provide protection to prevent damage to window units.
2. Protect all adjacent finished surfaces from scratches and damage.

I. After completion of storefront installation: Inspect, adjust, put into working order and leave clean, free of labels, dirt, etc. Protection from this point: Shall be the responsibility of the Contractor.

END OF SECTION

08520 ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install aluminum windows complete with hardware and related components as shown on drawings and as specified in this section.

B. Related Sections:

1. 03300 - Cast-In-Place Concrete
2. 07900 - Joint Sealers.
3. 08800 - Glass and Glazing

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)/NWWDA 101/IS2 (Latest Edition) - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors, latest edition.

B. AAMA 902 – Voluntary Specifications for Sash Balances.

C. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site, latest edition.

D. American Society for Testing and Materials (ASTM) - latest edition of the following:

1. A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
4. D2000 - Standard Classification System for Rubber Products in Automotive Applications.
5. E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
6. E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylight and Curtain Walls by Uniform Static Air Pressure Difference.
7. E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
8. E 1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
9. F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

E. Florida Building Code (FBC), latest edition.

F. American Society of Civil Engineers (ASCE) 7, latest edition.

G. National Fire Protection Association (NFPA), latest edition.

H. Florida Fire Prevention Code (FFPC), latest edition.

I. Federal Specifications and Standards - FS L-S-125 - Screening, Insect, Nonmetallic; Revision B, latest edition.

J. Society for Protective Coatings: SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 DEFINITIONS

A. Exposed: Any fasteners, anchors, clips, accessories, sealants, etc., visible on the exterior or interior side of a window when in the maximum open position.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Before starting work in this section, the Contractor shall convene a meeting that includes the Project A/E, CITY OF KEY COLONY BEACH Project Manager, Contractor's representative and window installer. Agenda shall include review of the following items:

1. Review NOA or Florida Product Approval submittals.
2. Review surface preparation and window installation procedures.
3. Review shop drawing submittals.
4. Review special details and field conditions.
5. Discuss sequence of construction, responsibilities and schedule for subsequent operations.
6. Review "Window Field Leak Test" procedures and requirements.

1.5 SUBMITTALS

A. Product Data: Manufacturer's specifications and catalog cuts. This information shall include but not be limited to all component dimensions, information on glass and glazing, internal drainage details, descriptions of hardware and accessories, fabrication methods, dimensions of individual components and profiles, hardware, and finishes for each type of product indicated.

B. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

C. Shop Drawings:

1. Signed and sealed by a Florida Registered Professional Engineer. Submit to A/E and the Building Code Consultant (BCC).
2. Indicate elevations, sections, details, locations, markings, quantities, materials, jamb conditions, metal thicknesses, sizes, shapes, dimensions and finishes.
3. Indicate locations for installing frames.
4. Indicate methods of assembling, connecting, anchoring, fastening, and bracing.
5. Indicate types, material, finishes, sizes, and locations of hardware.

6. Indicate operable and fixed panels of each window unit.
7. Identify each type of mullion and anchorage system.

D. Missile Impact Certification:

1. Provide current Monroe County Notice of Acceptance (NOA) or Florida Product Approval, demonstrating compliance with FBC missile impact criteria for High Velocity Hurricane Zone (HVHZ), for window type, size, and configuration indicated on drawings.
2. Comply with calculations, signed and sealed by a Florida registered Professional Engineer, establishing wind velocity pressure values for the specific project, according to FBC and ASCE 7-16, using Classification of Buildings Category IV, Exposure Category “D” and Importance Factor of 1.15.

E. Calculations/Test Results/Details:

1. Provide wind pressure test results by a nationally recognized testing laboratory (NRTL) demonstrating compliance with applicable HVHZ requirements for supplied window units.
2. Provide Installation details, signed and sealed by a Florida registered Professional Engineer, detailing anchorage system noted and specified to comply with ASCE 7.

F. Samples:

1. Submit two samples, 12 x 12 inch in size, illustrating typical corner construction and accessories, including locks and color finishes.
2. 12" x 12" glass.
3. Sealants: Manufacturer color chart.

G. Maintenance Data: For operable window sash, operating hardware, weather stripping, window system operators, and finishes to include in maintenance manuals.

H. Forced Entry: Comply with AAMA 1302.5.

I. Warranty certification.

1.6 SYSTEM DESCRIPTION

A. Performance Requirements: Fabricate units to comply with:

1. Design Wind Velocity Pressures: According to ASCE 7, latest edition.
2. Requirements of testing and certification by AAMA/NWWDA 101 for commercial or higher rated windows complying with AAMA/NWWDA 101, Table 2.1 Gateway Performance listed values as determined by ASCE 7, latest edition.
3. Provide double glazed windows with 45 condensation resistance factor according to AAMA 1502.6.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in fabrication of commercial aluminum windows of types required, with no fewer than five years of experience.

B. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer. Minimum of five years of experience in the installation of specified assemblies.

1. Engineering Responsibility: Preparation of data for aluminum windows including the following:

a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

C. Notify inspector within 24-hours after completion of windows to arrange for inspection.

D. Do not conceal anchors and connections until inspection is complete.

E. Exposed fasteners, when the window is in a closed or opened position, shall be tamperproof.

F. Coordination of Fabrication:

1. Check actual window openings in construction work by accurate field measurement before fabrication. Show recorded measurements on final shop drawings.
2. Coordinate fabrication schedule with construction progress as directed by Contractor to avoid delay of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAWA CW-10.

B. Deliver packaged materials in manufacturer's original, unopened, labeled containers.

C. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

D. Store items to prevent damage to materials or structure and in approximate order of use to avoid excessive re-handling.

E. Repair damaged materials and replace materials that cannot be repaired to original condition. Replace warped materials.

F. Protect exposed surfaces of metal with removable covering to prevent damage to finish. Protect metal while adjacent painting and caulking are being performed.

1.9 WARRANTY

A. Submit written warranty, signed jointly by manufacturer, installer, and Contractor, agreeing to replace aluminum window units that fail in materials or installations within 3 years after substantial completion. The 3 parties jointly and separately are responsible for the installation for the warranty period.

B. Failure of materials or installation shall include, but not be limited to, excessive leakage or air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess or normal weathering, and defects in hardware and weather-stripping, failure of glass seal, including interpane dusting or misting.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Missile Impact Resistant Windows, as indicated on the Plans, using certified missile impact resistant glass.

1. YKK AP America, Inc. (Basis of Design)
2. Sol-A-Trol - Series 540-IMP.
3. Kawneer Company, Inc.
4. Construction Glass Industries (CGI).
5. PGT
6. Other A/E Accepted equivalent.

2.2 MANUFACTURED UNITS

A. Missile Impact Resistant Windows:

1. Impact resistant windows shall comply with Monroe County NOA or Florida Product Approval requirements.

2.3 COMPONENTS

A. Aluminum Extrusions: 6063-T5, commercial alloy, minimum 22,000 psi ultimate tensile strength and minimum 0.062" thickness at any location for main frame and sash members.

B. Assembly shall have current Monroe County NOA for impact resistance (both large and small missile impact) and comply with wind pressures as required by drawings, FBC, and ASCE 7. Assembly shall bear a permanent label affixed to the product according to FBC.

C. Air Infiltration: System shall have an air intrusion less than 0.3 cf/min/sq. ft. @ an inward test pressure of 6.24 PSF (300 Pa), when tested according to AAMA/WDMA 101/I.S.2/NAFS.

D. Locks shall be of compatible materials that are corrosion resistant and sufficient strength to pass AAMA 1302.5 forced entry test. Locks shall be readily accessible for service.

E. Unit shall have minimum 3/4” wide aluminum flange around 100% of the perimeter. Unit shall be set in a full bed of sealant against the 3/4” lip in the masonry opening.

F. Windows:

1. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.

    a. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
    b. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
    c. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
    d. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2. Sizes and Profiles:

    a. Fabricate to sizes and profiles indicated on final shop drawings.
    b. Details in drawings are based upon standard details by one or more manufacturers.
    c. Similar details by other manufacturers will be acceptable, provided they comply with size requirements, minimum/maximum profile requirements, and referenced performance standards and are approved by the A/E and CITY OF KEY COLONY BEACH.

3. Glass and Glazing:

    a. Windows shall be factory glazed.
    b. Glass color to be determined by A/E from contractor’s submitted samples.
    c. Glass assembly shall comply with Monroe County NOA and/or Florida Product Approval, as necessary to meet specified Design Pressures and Missile Impact requirements.
    d. Comply with requirements of Section 08800, in addition to requirements of ANSI/AAMA 101.
    e. Glazing compound shall be structural silicone as recommended by window manufacturer.

4. Provide subframes with anchors for window units as shown, of profile and dimensions indicated (minimum 0.062" thickness extruded aluminum) with mitered or coped corners, welded and dressed smooth or with concealed mechanical joint fasteners. Finish to match window units. Seal joints on inside with sealant.
5. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
6. Provide internal drainage of glazing spaces to exterior through weep holes.

G. Fasteners:

1. Aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

2. Reinforcement: Fasteners screw-anchored into aluminum less than 0.125" thick, shall have interior reinforced with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
3. Exposed fasteners, when the window is in a closed or opened position, shall be tamperproof.
4. Do not use exposed fasteners except for application of hardware.
5. Exposed fasteners shall match finish of adjoining metal.

H. Anchors, Clips and Window Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate units of aluminum, nonmagnetic stainless steel, or hot-dip zinc coated steel complying with ASTM A123. Exposed items shall match the window frame color.

I. Compression Glazing Strips and Weather-stripping: Molded neoprene gaskets complying with ASTM D2000 designation 2BC415 to 3VC620, or molded expanded neoprene gaskets complying with ASTM C509, Grade 4.

J. Sealant:

1. Seal frame joints, completely filling voids, flush with exposed surfaces. Provide type recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking, and non-migrating.
2. Comply with Section 07900 for materials and installation of sealants.
3. Color shall be as selected by A/E.

K. Friction Shoes: Nylon or other non-abrasive, nonmetallic, non-staining, non-corrosive durable material.

L. Balance Mechanism:

1. Spring loaded, with adjustable tension control.
2. Balances shall be high performance balances, of appropriate size and capacity to hold sash in position in accordance with AAMA 101 and AAMA 902.
3. Balances shall meet all minimum AAMA 902 Class 5 requirements.
4. Balances shall be attached to a locking carrier that slides on extruded rails in the jamb channels.

M. Mullions:

1. Provide mullions and cover plates as shown, matching window units, and complete with anchors for support and installation.
2. Allow for erection tolerances and provide for movements of window units due to thermal expansion and building deflections.

N. Finish for Windows and Window Components:

1. AAMA 2605 PVDF (polyvinylidene fluoride) coating with 70 percent resin, such as Kynar 500, or Hylar 5000. Color to be as selected by A/E.

PART 3 EXECUTION

3.1 MOCK-UP

A. Prior to fabrication of windows and as early in the Project as possible, agree with CITY OF KEY COLONY BEACH and A/E on a location to provide a full-window Mock-up. Window Mock-up shall include windows and components of one full opening from block wall to block wall and include Mid Mullions, sills and all other components required for a full installation.

3.2 INSPECTION

A. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface, and are in accordance with approved shop drawings.

3.3 INSTALLATION

A. Install windows according to manufacturer's printed instructions, Monroe County NOA or Florida Product Approval and accepted shop drawings, under direct supervision of manufacturer's representative.

B. Bed windows with sealants, mastic, or glazing tapes to masonry lip, concrete/precast lip, or wood buck as applicable and secure according to Monroe County NOA or Florida Product Approvals.

C. Separate aluminum from masonry and ferrous metals by use of bituminous coating or gasketing to eliminate possibility of corrosion from electrolytic action.

D. Erect windows plumb, level, and true.

1. Do not distort windows by erection screws or fittings.
2. After window erection, apply an even spray coat of liquid wax to window surfaces for protection against stains and scratches.

E. Protect work from corrosion. Prime coat concealed steel stiffeners, anchors, brackets, fasteners, and the like before installation and seal joints between window frames and building tightly and continuously.

F. Maintain wire or clips holding ventilators closed in place until windows are completely erected, and hardware is attached.

G. Touch-up nicks and scratches on window frames, using manufacturer’s approved touch-up coating matching finish color of frame.

3.4 FIELD QUALITY CONTROL

A. A “Window Field Leak Test” shall be conducted by the Contractor at no cost to CITY OF KEY COLONY BEACH. Leak test shall be performed by a qualified testing agency certified in the State of Florida. Contractor shall notify the A/E and the CITY OF KEY

COLONY BEACH Project Manager present. The “Window Field Leak Test” sequence that shall be conducted as follows:

1. The initial test series shall be performed after the first factory-glazed operable window assembly has been installed at the site. The window assembly and its installation shall follow all of the requirements in the Contract Documents. After the assembly and installation have met all of the requirements for the “Window Field Leak Test” and been approved, it shall be used as the “standard” window mock-up.
2. The goal shall be to determine, as early as possible, if the installation is being done correctly and to let the installer apply what is learned to succeeding window installations. The test will identify leaking within the window and leaking between the window and the surrounding construction. An outside consultant or the CITY OF KEY COLONY BEACH Test Lab are not required to conduct the test. The Contractor and the installer shall conduct the Window Field Leak Test. The A/E and CITY OF KEY COLONY BEACH Project Manager will witness and report the test results. A hose and a nozzle shall be utilized to conduct the test.
3. The Contractor shall conduct the initial test and as many re-tests of the initial window assembly as needed, until a leak-free assembly and installation is attained. After the second failed test, the Contractor may be backcharged for all CITY OF KEY COLONY BEACH expenses generated by further tests, at the discretion of CITY OF KEY COLONY BEACH Project Manager.
4. At the start of the initial test the glazed window assembly shall have been shimmed and fastened in the opening over blocking bedded in sealant as required by the window specifications. The flange at the perimeter of the window frame shall be set in a full bed of sealant. All interior finishes, such as the gypsum board and window stool, shall not yet have been installed against the window frame so that all water intrusions can be identified.
5. A representative from the Contractor, window installer, window producer, CITY OF KEY COLONY BEACH Project Manager, and the A/E shall be present during the testing. The Contractor or window installer shall operate the hose nozzle for the testing.
6. The test will be performed in two 5-minute phases with a brief conference between phases. A 5/8-inch garden hose and straight, adjustable brass nozzle shall be used for the test. Set the nozzle to produce an 8 in. to 10 in. diameter pattern at an 8 ft to 10 ft distance from the window. Ascertain and note the water pressure where water from a public source enters the hose, preferably 45 PSI to 55 PSI. If a permanent water source is not available at the time that the test needs to be conducted the contractor shall supply equipment to achieve the required 45 PSI to 55 PSI. The contractor shall spray water against the window while the CITY OF KEY COLONY BEACH PM instructs the nozzle holder. The A/E shall observe and note any leaks or other signs of water intrusion at the interior side of the window. Other parties may observe the testing.

    a. For two minutes, spray the perimeter of the window opening, moving slowly, for 2 circuits, directing slightly more than half of the hose stream just within the window perimeter.
    b. For one minute, spray the joints within the window opening, moving slowly along the vent joints, and the mullion joints.
    c. For one minute make another circuit around the perimeter and along all joints.
    d. Shut off the nozzle while the CITY OF KEY COLONY BEACH PM and the A/E confer in presence of other parties to review what the test has revealed. If the test is inconclusive, it shall be repeated.

7. The test shall be adjusted to meet the actual window size. The test procedure above is designed for window assemblies/units that are 24 sf to 40 sf. When the window is less than 24 sf, reduce the 2 minutes to 1-1/2 minutes, and 1 minute to 45 seconds. If the window is 40 sf to 70 sf, expand 2 minutes to 3 minutes, and 1 minute to 1-1/2 minutes. If the window is 70 sf to 120 sf, expand the time to 3-1/2 minutes, and 1-3/4 minutes.
8. If the mock-up window unit allows any water penetration the contractor shall remove the unit completely and re-install the entire window assembly again at no cost to CITY OF KEY COLONY BEACH. The Window Field Leak Test shall be repeated as many times as required to produce a result that is free of any water intrusion as determined by all parties.
9. The mock-up must prevent any and all water intrusion before the installation of the remaining windows is permitted.
10. The “Window Field Leak Test” shall continue when all of the window installations have been completed for a building elevation or section of a building. The A/E shall select 10% of the total window area from each building section or elevation to conduct the Window Field Leak Test. The 10% selected shall represent window assemblies from all of the floors and locations within the test zone. All of the procedures detailed above shall be followed when testing each window assembly selected by the A/E. If during the window leak-testing, the windows that are tested fail to keep water from entering the building, the A/E may direct the Contractor, at the Contractor’s own expense, to perform the window field leak-test on additional windows beyond the 10% of the windows originally selected by the A/E, until all installations are free from any water intrusion.
11. Comply with Section 08800 for cleaning and maintenance.

B. Protection: Provide protection to prevent damage to window units.

3.5 ADJUSTING AND CLEANING

A. Adjust operating sash and hardware to provide tight fit at contact points and at weather-stripping, and to ensure smooth operation and weather-tight closure.

B. Cleaning:

1. Clean surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes.
2. Remove excess glazing and sealant compounds, dirt, and other substances.
3. Lubricate hardware and moving parts.
4. Clean glass of pre-glazed units promptly after installation of windows, using methods acceptable to sealant and window manufacturer.
5. Comply with Section 08800 for cleaning and maintenance.

C. Protection: Provide protection to prevent damage to window units.

END OF SECTION

08710 DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Related Sections:

1. Division 06 Section Carpentry
2. Division 06 Section Architectural Woodwork
3. Division 07 Section Joint Sealants for sealant requirements applicable to threshold installation specified in this section.
4. Division 08 Sections:

a. Steel Doors and Frames
b. Wood Doors
c. Aluminum Windows
d. Entrances and Storefronts

5. Division 16 "Electrical" sections for connections to electrical power system and for low-voltage wiring.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code

4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

    a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.

3. Samples for Verification: If requested by A/E, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier. Units that are acceptable to A/E may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

    a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
    b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
    c. Indicate complete designations of each item required for each opening, include:
        1) Door Index: door number, heading number, and A/E's hardware set number.
        2) Quantity, type, style, function, size, and finish of each hardware item.
        3) Name and manufacturer of each item.
        4) Fastenings and other pertinent information.
        5) Location of each hardware set cross-referenced to indications on Drawings.
        6) Explanation of all abbreviations, symbols, and codes contained in schedule.
        7) Mounting locations for hardware.
        8) Door and frame sizes and materials.
        9) Degree of door swing and handing.
        10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to City of Key Colony Beach, by means as directed by City of Key Colony Beach.
    f. Prepare key schedule by or under supervision of supplier, detailing City of Key Colony Beach's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.

2. Provide Product Data:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

3. Florida Building Code; Wind load: Submit certified independent lab test or NOA report on each type of exterior opening. All exterior opening submittals shall include door number, door and frame elevations and all finish hardware as tested as an assembly. These reports are to be forwarded to the building department.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule
    e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
    f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the City and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

    a. Fire door assemblies, in compliance with NFPA 80.
    b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized Architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to City of Key Colony Beach, A/E, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to A/E and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with A/E and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    2) Preliminary key system schematic diagram.
    3) Requirements for key control system.
    4) Requirements for access control.
    5) Address for delivery of keys.

2. Pre-installation Conference

    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.
    e. Review required testing, inspecting, and certifying procedures.
    f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

    a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

4. Hurricane and Wind Load Assemblies:

    a. Provide hardware that meets the hurricane and wind load test requirements in accordance with the Florida Building code and in compliance with the local authority having jurisdiction.
    b. All openings required to meet either the impact test or wind load test as indicated by the A/E shall be tested as systems with the finish hardware, hollow metal doors, and frames.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
F. Deliver keys to manufacturer of key control system for subsequent delivery to City of Key Colony Beach.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Security: Coordinate installation of door hardware, keying, and access control with City of Key Colony Beach's security consultant.
D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

    1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
    2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
B. Turn over unused materials to City of Key Colony Beach for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to A/E's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Steel Doors and Frames”, and “Wood Doors”, to ensure proper reinforcements. Advise the A/E where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Ives 5BB series

2. Acceptable Manufacturers and Products:

a. Hager BB1191/1279 series
b. McKinney TB series
c. Stanley FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

    a. Select
    b. Stanley
    c. Roton
    d. ABH
    e. Hager

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:

    a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:

    a. ABH PT1000
    b. Securitron CEPT-10
    c. Security Door Controls PTM
    d. Precision EPT-12C

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage L9000 series

2. Acceptable Manufacturers and Products:

a. Sargent 8200 series
b. Best 45H series
c. Corbin-Russwin ML2000 series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:

a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

a. Lever Design: 06

2.07 THREE POINT LOCK

A. Manufacturer and Product:

1. Scheduled Manufacturer and Product:

a. Schlage LM9300

2. Acceptable Manufacturers and Products:

a. Corbin-Russwin 6600 series
b. Sargent 7300 series

B. Requirements:

1. Provide three-point locking system as part of integrated assembly including door, frame, and hardware.
2. Tornado Applications: Provide assembly UL approved to FEMA 361 and FEMA 320 guidelines for inswing and outswing single or pair doors. Must be used with tested and approved door and frame system.
3. Security Applications: Provide inswing and outswing single or pair doors. Must be used with tested and approved door.
4. Units to comply with life safety requirements outlined in NFPA 80 and NFPA 101 and approved for use on up to 3-hour fire rated openings.
5. Latchbolt Construction:

a. Top Bolt: 5/8-inch (16 mm) Stainless Steel square bolt with 3/4-inch (19 mm) projection. 1/2 inch (13 mm) thick steel top plate. Stainless steel sill strike and fasteners.
b. Mortised Center Latchbolt: Stainless Steel latch. Fully wrapped, 12-gauge plated steel lock case. 2-3/4 inches (70 mm) backset. ANSI/BHMA curved lip strike 1-1/4 inches (32 mm) x 4-7/8 inches (124 mm) with dust box, non-handed.
c. Bottom Bolt: 5/8-inch (16 mm) Stainless Steel square bolt with 5/8-inch (16 mm) projection. Stainless steel sill strike and fasteners.

6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses or escutcheon as scheduled and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

a. Lever Design: 06

2.08 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage ND series

2. Acceptable Manufacturers and Products:

a. Sargent 11-Line
b. Corbin-Russwin CL3100 series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Lever Design: RHO

2.09 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Von Duprin 99/33A series

2. Acceptable Manufacturers and Products:

a. Detex Advantex series
b. Precision APEX 2000 series
c. Sargent 19-43-GL-80 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard Architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.

6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by A/E.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non-fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
17. Special Options:

    a. WS
        1) Provide wind and impact rated hurricane exit devices and mullions certified to comply with Florida Building Code (FBC)

2.10 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:

    a. Sargent 3500 series
    b. Securitron BPS series
    c. Security Door Controls 600 series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.

2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by A/E.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:

    a. 12/24 VDC Output, field selectable.
    b. Class 2 Rated power limited output.
    c. Universal 120-240 VAC input.
    d. Low voltage DC regulated and filtered.
    e. Polarized connector for distribution boards.
    f. Fused primary input.
    g. AC input and DC output monitoring circuit w/LED indicators.
    h. Cover mounted AC Input indication.
    i. Tested and certified to meet UL294.
    j. NEMA 1 enclosure.
    k. Hinged cover w/lock down screws.
    l. High voltage protective cover.

2.11 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Schlage Everest 29 Primus XP

2. Acceptable Manufacturers and Products:

    a. ASSA V10
    b. Corbin-Russwin Pyramid High Security
    c. Medeco 3
    d. Sargent DG3
    e. Yale High Security
    f. Medeco 4
    g. Mul-T-Lok MT5
    h. Abloy Protec2
    i. Sargent Keso

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

a. High Security: dual-locking cylinder with permanent core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.12 KEYING

A. Scheduled System:

1. New factory registered system:

a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:

a. Replaceable Construction Cores.
1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
a) 3 construction control keys
b) 12 construction change (day) keys.
2) City of Key Colony Beach or City of Key Colony Beach's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1) Master Keying system as directed by the City of Key Colony Beach.

b. Forward bitting list and keys separately from cylinders, by means as directed by City of Key Colony Beach. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to City of Key Colony Beach.
c. Provide keys with the following features:
1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).

d. Identification:
1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the A/E and City of Key Colony Beach.

3) Stamp cylinders/cores and keys with City of Key Colony Beach's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to City of Key Colony Beach.
5) Forward permanent cylinders/cores to City of Key Colony Beach, separately from keys, by means as directed by City of Key Colony Beach.

e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core.
2) Permanent Control Keys: 3.
3) Master Keys: 6.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. LCN 4040XP series

2. Acceptable Manufacturers and Products:

a. Corbin-Russwin DC8000 series
b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.

7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117 or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Trimco
b. Burns
c. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco
c. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.

2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

a. Glynn-Johnson

2. Acceptable Manufacturers:

a. Rixson
b. Sargent
c. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Trimco
b. Burns
c. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumb turn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other, and overhead stop cannot be used.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Zero International

2. Acceptable Manufacturers:

    a. National Guard
    b. Reese
    c. Legacy
    d. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per Architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.19 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Ives

2. Acceptable Manufacturers:

    a. Burns
    b. Rockwood
    c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Schlage

2. Acceptable Manufacturers:

a. GE-Interlogix
b. Sargent

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
   4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
I. Lock Cylinders:

   1. Install construction cores to secure building and areas during construction period.
   2. Replace construction cores with permanent cores as indicated in keying section.
   3. Furnish permanent cores to City of Key Colony Beach for installation.

J. Wiring: Coordinate with Division 16, ELECTRICAL sections for:

   1. Conduit, junction boxes and wire pulls.
   2. Connections to and from power supplies to electrified hardware.
   3. Connections to fire/smoke alarm system and smoke evacuation system.
   4. Connection of wire to door position switches and wire runs to central room or area, as directed by A/E.
   5. Connections to panel interface modules, controllers, and gateways.
   6. Testing and labeling wires with A/E's opening number.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by A/E.
L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by A/E.

N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

    1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
    2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
    3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items per manufacturer's instructions to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the A/E with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
D. Hardware Sets:

Hardware Group No. 01

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CYLINDER	AS REQUIRED		626	SCH

BALANCE OF HARDWARE BY STOREFRONT DOOR MANUFACTURER

INSTALLED PER FLORIDA PRODUCT APPROVAL LEVEL E IMPACT

Hardware Group No. 02 – Not Used

Hardware Group No. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-WS-9927-L-06 24 VDC		626	VON
1	EA	ROD AND LATCH GUARD	WS-LGO-3-		US32D	VON
1	EA	RIM HOUSING	20-079		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	RAIN DRIP	11A		A	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	566A		A	ZER
1	EA	MULTITECH READER	BY DIV. 28		BLK	SCE
1	EA	DOOR CONTACT	BY DIV. 28		BLK	SCE
1	EA	POWER SUPPLY	BY DIV. 28		LGR	SCE

INSTALLED PER FLORIDA PRODUCT APPROVAL LEVEL E IMPACT
ACCESS CONTROL BY DIVISION 13
DOOR IS CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
KEY LOCKS AND UNLOCKS THE LEVER FROM THE EXTERIOR,
DOOR MOMENTARILY UNLOCKED FROM REMOTE MONITORING STATION AND RETRACTS LATCH
LOCK IS FAIL SECURE
REQUEST TO EXIT SWITCH AND DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	224XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10			689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-WS-9927-L-F-06			626	VON
1	EA	ROD AND LATCH GUARD	WS-LGO-3-			US32D	VON
1	EA	RIM HOUSING	20-079			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH			689	LCN
1	EA	RAIN DRIP	11A			A	ZER
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	DOOR SWEEP	39A			A	ZER
1	EA	THRESHOLD	566A			A	ZER
1	EA	DOOR CONTACT	BY DIV. 28			BLK	SCE

INSTALLED PER FLORIDA PRODUCT APPROVAL LEVEL E IMPACT
REQUEST TO EXIT SWITCH AND DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	224XY			628	IVE
1	EA	MULT PT STOREROOM	LM9380T 06A			626	SCH
1	EA	ROD AND LATCH GUARD	WS-LGO-3-			US32D	VON
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH			689	LCN
1	EA	RAIN DRIP	11A			A	ZER
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	DOOR SWEEP	39A			A	ZER
1	EA	THRESHOLD	566A			A	ZER
1	EA	DOOR CONTACT	BY DIV. 28			BLK	SCE

INSTALLED PER FLORIDA PRODUCT APPROVAL LEVEL E IMPACT
DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU STOREROOM LOCK	ND80TDEU RHO RX 12V/24V DC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULTITECH READER	BY DIV. 28		BLK	SCE
1	EA	DOOR CONTACT	BY DIV. 28		BLK	SCE

ACCESS CONTROL AND POWER SUPPLY BY DIVISION 13
OUTSIDE LEVER UNLOCKED BY 12-24VDC.
EU IS FAIL SECURE
KEY OUTSIDE SERVES AS MECHANICAL OVERRIDE
INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EGRESS.
REQUEST TO EXIT SWITCH AND DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU STOREROOM LOCK	ND80TDEU RHO RX 12V/24V DC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULTITECH READER	BY DIV. 28		BLK	SCE
1	EA	DOOR CONTACT	BY DIV. 28		BLK	SCE

ACCESS CONTROL AND POWER SUPPLY BY DIVISION 13
OUTSIDE LEVER UNLOCKED BY 12-24VDC.
EU IS FAIL SECURE
KEY OUTSIDE SERVES AS MECHANICAL OVERRIDE
INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EGRESS.
REQUEST TO EXIT SWITCH AND DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 08

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU STOREROOM LOCK	ND80TDEU RHO RX 12V/24V DC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULTITECH READER	BY DIV. 28		BLK	SCE
1	EA	DOOR CONTACT	BY DIV. 28		BLK	SCE

ACCESS CONTROL AND POWER SUPPLY BY DIVISION 13
OUTSIDE LEVER UNLOCKED BY 12-24VDC.
EU IS FAIL SECURE
KEY OUTSIDE SERVES AS MECHANICAL OVERRIDE
INSIDE LEVER ALWAYS FREE FOR IMMEDIATE EGRESS.
REQUEST TO EXIT SWITCH AND DOOR CONTACT SIGNALS THE APPROPRIATE PARTY

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

RECOMMEND NDE LOCK FOR FUTURE COMBO/CARD READER

Hardware Group No. 10 – Not Used

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 13

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 14

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	450S		630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 15

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	L9040 06A 09-544 L283-722		626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 16

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 17

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 18

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 19 – Not Used

Hardware Group No. 20

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 4" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 21

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 4" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 22

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 23

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PRIVACY LOCK	ND40S RHO		626	SCH

BALANCE OF HARDWARE BY DOOR MANUFACTURER

Hardware Group No. 24 – Not Used

Hardware Group No. 25 – Not Used

Hardware Group No. 26

Provide each CO door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

CASED OPEN FRAME

Hardware Group No. 27 – Not Used

END OF SECTION

08711 PO POST OFFICE DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finish Hardware items which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.
2. Hinges.
3. Locks and latches.
4. Operating trim.
5. Accessories for pairs of doors and exit devices.
6. Closing devices.
7. Door controls.
8. Stops and holders.
9. Miscellaneous hardware.

B. Related Sections:

1. Section 083500 - Folding Doors and Grilles: Lockable closures.
2. Section 084113 - Aluminum-Framed Entrances and Storefronts: Hardware for same, and coordination.
3. Section 016000, Material Equipment and Approved Systems.

1.2 REFERENCES

A. American National Standards Institute (ANSI);
1. ANSI A156.3 - National Standard for Exit devices.
2. ANSI A156.4 - National Standard for Door Controls - Closers.
3. ANSI A156.6 - National Standard for Architectural Door Trim.
4. ANSI A156.13 - National Standard for Mortise Locks & Latches.

B. National Fire Protection Association (NFPA):
1. NFPA 80 - Fire Doors and Windows.
2. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
3. NFPA 252 - Fire Tests of Door Assemblies.

C. Underwriters Laboratories (UL):
1. UL 10B - Fire Tests of Door Assemblies.
2. UL 305 - Panic Hardware.

1.3 SUBMITTALS

A. Section 013300 - Submittals Procedures.

B. Product Data: Submit manufacturers' technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finishes.

C. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
   1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
      a. Type, style, function, size and finish of each hardware item.
      b. Name and manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
      e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.
      h. Keying information.
   2. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

D. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, as selected by the Contracting Officer, finished as required, and tagged with full description for coordination with schedule.
   1. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

E. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:
   1. ANSI A117.1
   2. NFPA 101.
   3. NFPA 80.
   4. NFPA 252.
   5. UL 10B.
   6. UL 305.

B. Regulatory Requirements:
   1. Conform to applicable code for requirements applicable to fire rated doors and frames.

2. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., and acceptable to the public authority as suitable for the purpose specified and indicated.
3. Conform to United States Postal Service "Standards for Facility Accessibility by the Physically Handicapped" Handbook RE-4 for mounting heights and locations of accessories.

C. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware to similar projects for a period of not less than 2 years, and who employs an experienced architectural hardware consultant (AHC) who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements.

E. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Within each Article in Part 2 hardware products from a few manufacturers are specified to establish a standard of quality and minimum functional requirements.

B. All items of a particular hardware category i.e. locksets, closers, hinges shall be of the same manufacturer.

C. Hardware Manufacturers:

1.	Adams Rite / ASSA ABLOY, Phoenix, AZ	(800) 872-3267
2.	Alarm Lock Systems, Amityville, NY	(800) 252-5625
3.	Best Access Systems, Indianapolis, IN	(800) 311-1705
4.	Corbin Russwin, Berlin, CT	(800) 543-3658
5.	Detex Corporation, New Brannfels, TX	(800) 729-3839
6.	Door Controls International, Dexter, MI	(800) 742-3634
7.	Folger Adam Company, Lemont, IL	(800) 260-9001
8.	Glynn-Johnson, Indianapolis, IN	(877) 613-8766
9.	Hager Companies, St. Louis, MO	(800) 255-3590
10.	Hiawatha, Inc., Bloomington, MN	(800) 777-1686
11.	H. B. Ives, Wallingford, CT	(888) 371-7331
12.	Knape & Vogt Manufacturing Co., Grand Rapids, MI	(800) 253-1561
13.	LCN Closers, Princeton, IL	(800) 526-2400
14.	McKinney Hinge, Scranton, PA	(800) 346-7707
15.	National Guard Products, Incorporated, Memphis, TN	(800) 647-7874
16.	Norton, Charlotte, NC	(800) 393-1097
17.	Pemko, Ventura, CA	(800) 824-3018
18.	Precision Hardware, Romulus, MI	(317) 849-2250
19.	Reese Enterprises, Incorporated, Rosemount, MN	(800) 328-0953

20.	Rixson-Firemark, Franklin Park, IL	(866) 474-9766
21.	Rockwood Manufacturing, Rockwood, PA	(800) 458-2424
22.	Sargent, New Haven, CT	(800) 727-5477
23.	Sargent & Greenleaf, Nicholasville, KY	(800) 826-7652
24.	Schlage, Colorado Springs, CO	(800) 847-1864
25.	Securitech Group Incorporated, Maspeth, NY	(800) 622-5625
26.	Simplex Access Controls	(800) 746-7539
27.	Soss, Pioneer, OH	(800) 922-6957
28.	Stanley, New Britain, CT	(877) 334-6791
29.	Trimco, Los Angeles, CA	(323) 262-4191
30.	Von Duprin, Indianapolis, IN	(317) 613-8302
31.	Wooster Products Incorporated, Wooster, OH	(800) 321-4936
32.	Yale, Charlotte, NC	(800) 438-1951
33.	Zero International (Allegion), Indianapolis, IN	(877) 671-7011

D. Section 016000 - Product Requirements: Unless noted otherwise, substitution of specified products with equivalent products from the above approved manufacturers is permitted in accordance with Product Options and Substitutions in Section 016000.

2.2 HINGES

A. Subject to compliance with requirements, provide hinges of one of the following manufacturers and as specified below:
1. Hager.
2. McKinney.
3. Stanley.
4. Soss.

B. Material:
1. For interior doors, provide full mortise-type steel hinges with steel pins; non-rising for non-security exposure, flat button with matching plugs.
2. For exterior doors, provide full mortise-type stainless steel hinges with stainless steel pins; non-removable, flat button with matching plugs.
3. Ball-bearing Type: Swaged, inner leaf beveled, square corners.

C. Hinges/pivots by types:
1. Type H-1: Medium weight door, average frequency, steel.

a.	Hinge	FBB179	4-1/2 x 4-1/2	652	Stanley
b.	Hinge	BB1279	4-1/2 x 4-1/2	652	Hager
c.	Hinge	TA2714	4-1/2 x 4-1/2	652	McKinney

2. Type H-2: Medium weight door, average frequency, steel, non-removable pins. Hinges on interior doors shall be satin chrome plated finish 652. Hinges on exterior doors shall be completely stainless-steel finish 630.

a.	Hinge	FBB179	4-1/2 x 4-1/2 NRP	652	Stanley
b.	Hinge	BB1279	4-1/2 x 4-1/2 NRP	652	Hager
c.	Hinge	TA2714	4-1/2 x 4-1/2 NRP	652	McKinney

3. Type H-3: Concealed, medium weight door, average frequency, steel.

a.	Hinge	216		626	Soss
b.	Hinge	MK80		626	McKinney

4. Type H-4: Medium weight door, average frequency, steel. (Continuous Piano hinge)

a.	Hinge	STS314 1/4		626	Stanley

5. Type H-5: Medium weight door, average frequency, steel, 5-inch high, non-removable pins. Hinges on interior doors shall be satin chrome plated finish 652. Hinges on exterior doors shall be completely stainless-steel finish 630.

a.	Hinge	FBB179	4-1/2 x 5 NRP	652	Stanley
b.	Hinge	BB1279	4-1/2 x 5 NRP	652	Hager
c.	Hinge	TA2714	4-1/2 x 5 NRP	652	McKinney

2.3 LOCKS, LATCHES, AND BOLTS

A. Subject to compliance with requirements, provide locks, latches and bolts of one of the following manufacturers and as specified below:
   1. Best.
   2. Corbin Russwin.
   3. Sargent.
   4. Schlage.
   5. Yale.

B. Materials:
   1. Mortise Locks: ANSI A156.13, Grade 1, equipped with 6-pin tumbler. Provide 2-3/4-inch backset. Provide three keys per cylinder.
   2. Latch Sets: Provide release by turning lever, closing door, or turning emergency release key through hole in outside knob.
   3. Strikes: ANSI Strikes, 1-1/4 x 4-7/8 inches, with curved lip. Wrought box strikes, with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.
   4. Tactile Warning: Provide lever handles with manufacturer's standard tactile warning per handicapped codes when required by local authority.

C. Keying
   1. General:
      a. Incorporate a security system to ensure that keys used during construction do not open doors after United States Postal Service occupancy.
      b. Key side of locks shall be on the public side.
      c. Master and submaster key system shall conform to United States Postal Service criteria. Doors at exterior of facility, from public area to workroom, and Stamped Envelope Storage areas shall not be on the master/submaster keying schedule. Other areas, based on need or local preference, may be excluded from master/submaster keying schedule.

   2. Construction Keying:
      a. Furnish exterior door lock sets with keyed alike removable construction core cylinders for use during construction.
      b. Restrict distribution of construction keys. Maintain record of persons who have received keys and deliver copies of record to Contracting Officer upon request.
      c. Provide permanent cores to Postmaster prior to substantial completion. Postmaster shall store them securely until needed. At substantial completion and at Contracting Officer direction, remove construction cores and replace with permanent cores in presence of Postmaster. Provide keys to Postmaster and return construction cores to manufacturer.

3. Permanent Keying:
   a. Master locks and cylinders are to match the United States Postal Service existing keying system if a system exists.
   b. Master to open all doors, except entrance doors to facility, doors from public area to workroom, and Stamped Envelope Storage shall not be on any master key system.

D. Cylinders and Thumbturns by types:

1.	Type B-1: Rim Cylinder.			
a.	Cylinder	1109	626	Yale
b.	Cylinder	20-022	626	Schlage
c.	Cylinder	3000-200	626	Corbin Russwin
2.	Type B-2: Mortise Cylinder.			
a.	Cylinder	2153 w/ 1161 series cam	626	Yale
b.	Cylinder	20-013	626	Schlage
c.	Cylinder	1000-A03	626	Corbin Russwin
3.	Type B-3: Cylinder Guard			
a.	Cylinder Guard	MS4043	630	Adams Rite

E. Locks and Latches by types:

1.	Type L-1 Hotel Lock (similar to ANSI F15)		
a.	AUR 8832FL w/security collar	626	Yale
b.	ML2029 NSA w/security collar	626	Corbin Russwin
c.	L9485P-06 w/security collar	626	Schlage
2.	Type L-2 Classroom Lock (ANSI F84)		
a.	AU 5408LN	626	Yale
b.	CL 3555	626	Corbin Russwin
c.	ND70PD	626	Schlage
3.	Type L-3 Entrance Lock (ANSI F20)		
a.	AUR 8847FL w/security collar	626	Yale
b.	ML2067 w/ security collar	626	Corbin Russwin
c.	L9453P-06A w/ security collar	626	Schlage
4.	Type L-4 Storeroom Lock (ANSI F86)		
a.	AU 5405LN	626	Yale
b.	CL3557	626	Corbin Russwin
c.	ND80PD	626	Schlage
5.	Type L-5 Privacy Lock (ANSI F76)		
a.	AU 5402LN	626	Yale
b.	CL3520	626	Corbin Russwin
c.	ND40S	626	Schlage
6.	Type L-6 Closet Deadbolt (ANSI E2151)		
a.	D111	626	Yale
b.	470	626	Sargent
7.	Type L-7 Passage		
a.	AU 5401LN (F75)	626	Yale
b.	CL3510	626	Corbin Russwin
c.	ND10S	626	Schlage

2.4 PUSH/PULL UNITS

A. Pulls and Pushes Manufacturers: Subject to compliance with requirements, provide from one of the following manufacturers as specified below.
   1. H. B. Ives.
   2. Trimco.
   3. Rockwood.
   4. Baldwin.
   5. Adams Rite

B. Materials: ANSI A156.6 for 0.050-inch thickness.

C. Push and Pulls by types:

1.	Type P-1: Push 4-inch x 16 inch.		
	a. 1001-3	630	Trimco
	b. 70C	630	Rockwood
2.	Type P-2 Pull: 4-inch x 16 inch.		
	a. 1010-3	630	Trimco
	b. 132 x 70C	630	Rockwood
3.	Type P-3 Pull: 2.75-inch x 11.5 inch.		
	a. 3001 fixed pull	629	Adams Rite

2.5 EXIT DEVICES

A. Exit Devices: Subject to compliance with requirements, provide exit devices of one of the following manufacturers and as specified below.
   1. Corbin Russwin.
   2. Yale.
   3. Von Duprin.
   4. Adams Rite.
   5. Sargent.
   6. Securitech Group Inc.

B. Exit Only Door Alarms:
   1. SDA103 SECURITECH

C. Materials:
   1. Provide exposed metal to match hardware.
   2. Size and mount units indicated or, if not indicated, to comply with manufacturer's recommendations for exposure condition. Reinforce substrate as recommended.

D. Exit Devices by types:

1.	Type E-1: Exit Device (F01) (for wood and metal doors)		
	a. 8700 w/ security interlock nose guard/strike	628	Adams Rite
2.	Type E-2: Exit Device (F04) (for narrow stile rim for aluminum doors)		
	a. 8800 x cyl. dog w/ security interlock nose guard/strike	630	Adams Rite
3.	Type E-3: Exit Device (F03) (for wood and metal doors)		
	a. 8700 x cyl. dog w/ security interlock nose guard/strike	628	Adams Rite

4. Type E-4EM: Electromechanical Access Control Device (For use at CSFs 6,501 to 60,000 SF, including Carrier Annexes.)

a.	Centurion 8155-DX2 Series			Securitech
b.	Trilogy DL 3500 SERIES		628	Alarm Lock
c.	Yale Nextouch NTB 630 Series		626	Yale

5. Type E-5: Time Lock Exit Device system (For entrance doors)

a.	USPSTL-FA-200 or approved equal (outswing) (Includes exit device, power supply, timer, power transfer)	628	Securitech
b.	USPSTL-FA-300 or approved equal (inswing) (Includes exit device, power supply, timer, power transformer)	628	Securitech

2.6 CLOSERS

A. Closers: Subject to compliance with requirements, provide closers of one of the following manufacturers and as specified below.
   1. LCN.
   2. Norton.
   3. Yale.

B. Materials & Features:
   1. ANSI A156.4, Grade 1.
   2. ADA/ANSI A117.1
   3. U.L. listed. Provide closers for fire rated openings in compliance with NFPA 80, NFPA 101, and local building codes.
   4. Non-Sized; adjustable 1 to 5 pounds.
   5. 180-degree door opening.
   6. Heavy Duty parallel arm.
   7. Standard Cover.
   8. Provide exposed metal to match hardware.
   9. Mounting: Mount closers as follows unless indicated otherwise:
      a. Interior side of exterior doors.
      b. Opposite side of public side.
      c. Workroom side of doors leading to or from the Workroom.
      d. Room side of corridor doors.
   10. Size and mount units indicated or, if not indicated, to comply with manufacturer's recommendations for exposure condition. Reinforce substrate as recommended.
   11. Closers to be installed to allow door swing as shown on drawings.

C. Closers by types:
   1. Type C-1:

a.	4011	689	LCN
b.	P7500	689	Norton
c.	4400	689	Yale

   2. Type C-2: Parallel arm.

a.	4111	689	LCN
b.	P7500	689	Norton
c.	4400	689	Yale

2.7 STOPS, HOLDERS AND BUMPERS

A. Stop and Holder, Floor and Wall Stop, and Bumper Manufacturers: Subject to compliance with requirements, provide from one of the following manufacturers as specified below.
   1. H. B. Ives.
   2. Quality Hardware Manufacturing Co., Inc.
   3. Trimco.
   4. Dor-O-Matic.
   5. Glenn-Johnson.

B. Materials:
   1. Doorstop mounting: Methods to suit substrates encountered (plastic anchor, drywall anchor, expansion shield).
   2. Provide grey rubber exposed resilient parts.
   3. Do not furnish aluminum floor stops.
   4. Where a doorstop is specified in the Hardware Schedule, provide a wall stop type (S-1). However, if circumstances prevent a wall stop installation (door too far from perpendicular wall, door swing into adjacent glass, etc.) then substitute a type (S-2) or (S-3) floor stop as indicated for use intended.
   5. Adjust height of floor stops to suit undercut of adjacent door.

C. D. Stops, Holders and Bumpers by types:
   1. Type S-1: Wall Stop - Install with appropriate anchors for substrate encountered.

a.	1270W	630	Trimco
b.	407 1/2C	630	Ives
c.	409	630	Rockwood

   2. Type S-2: Floor Stop - Install with appropriate anchors for substrate encountered.

a.	1201	626	Trimco
b.	FS444	626	Ives
c.	471	626	Rockwood

   3. Type S-3: Floor Stop - Install with appropriate anchors for substrate encountered.

a.	W1211	630	Trimco
b.	FS436	630	Ives
c.	440/442	626	Rockwood

2.8 THRESHOLDS

A. Threshold Manufacturers: Subject to compliance with requirements, provide from one of the following manufacturers as specified below.
   1. Pemko.
   2. National Guard.
   3. Reese.
   4. Zero.

B. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

C. Thresholds by types:
   1. Type T-2:

Saddle threshold for floor finish at doors (either VCT to VCT or VCT to tile or sealed concrete.)

a. VCT to VCT

271	628	Pemko
HD5A	628	Reese
425E	628	National

b. VCT to Tile/Concrete

158	628	Pemko
S514A	628	Reese
653	628	National

2. Type T-3 (with weather seal):

a. S483AV	628	Reese
b. 2005AT	628	Pemko
c. 896V	628	National

2.9 WEATHERSTRIPPING

A. Weatherstripping Manufacturers: Subject to compliance with requirements, provide from one of the following manufacturers as specified below.
1. Pemko.
2. Reese.
3. Zero.
4. National Guard.

B. Weatherstripping by types:
1. Type W-1: Door Gaskets.

a. 807A	Reese
b. 303AS	Pemko
c. 160VS	NGP

2.10 MISCELLANEOUS HARDWARE

A. Miscellaneous Hardware Manufacturers: Subject to compliance with requirements, provide from the manufacturers specified below.

B. Provide door silencers for all doors unless indicated otherwise.

C. Miscellaneous Hardware by types:
1. Type M-1: Acoustical Perimeter Door Seal

a. 379 APK	628	Pemko

2. Type M-2: Dead Lock, (ANSI E0191) - w/ No exposed trim on lobby side.

a. D200 series 630	Yale

3. Type M-3: Security Viewer. Mounted/installed, centered at 5'-0" AFF.

a. 1756	630	Hager
b. 627	626	Rockwood

4. Type M-4: Astragal

a. 184A	628	Reese
b. 359A	628	Pemko

5. Type M-5: Silencers

a. 1229A	Gray	Trimco

b.	SR64		Ives
c.	608	Gray	Rockwood

6. Type M-6: Flushbolts

a.	3917	626	Trimco
b.	555	626	Rockwood

7. Type M-7: Astragal

a.	276C	628	Reese
b.	355CS	628	Pemko

8. Type M-8: Kick Plates

a.	K0050 8 x 34	630	Trimco
b.	KP1050 8 x 34	630	Rockwood

9. Type M-9: Armor Plate; 40” H x 46” W (both sides of door) 630
   a. Trimco or Rockwood
10. Type M-10: Emergency Exit Alarm w/ Contacts:
    a. SDA103 Securitech Group Incorporated
        1) Provide concealed door contacts and a separate alarm unit with keyed reset switch. Alarm unit will have local 110 db (min) audible alarm and a 75-cd visual alarm (strobe light) and shall be fed from an independent 120 Volt power supply equipped with backup battery to power the alarm for one hour in the event of a loss of power, and to continually charge the battery. Battery operated door or panic bar mounted alarms are not allowed.
        2) Exit alarm shall be equipped with a keyed reset station mounted top at 60 inches AFF.
        3) Alarm to be located directly above the door 10 ft. above the finished floor. Provide door sign indicating alarm will sound when opened and labeled, “EMERGENCY EXIT ONLY - RE-ENTRY PROHIBITED”.
        4) In facilities equipped with an Enterprise Physical Access Control System (ePACS), the exit door alarm is to be rated at 12 VDC and provided as part of the ePACS system.

11. Type M-11: Reinforcing Pivot Hinges

a.	253	652	Hager
b.	B1923	652	McKinney

12. Type M-12: Bumper (Install on push side of door at same height as lockset, in line with lever handle of lockset and approximately 2 inches away from the handle.)

a.	170-19	630	Bommer

13. Type M-13: Door Bottom Shoe

a.	DES-3C, 1 ¼” x 1 ¾” width	630	Hiawatha

2.11 FABRICATION

A. Finish and Base Material Designations: Number indicate BHMA Code or nearest traditional U.S. commercial finish.

B. Where base material and quality of finish are not otherwise indicated, provide at least commercially recognized quality specified in applicable Federal Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify that doors and frames are ready to receive Work and dimensions are as instructed by the manufacturer.
   2. Verify that electric power is available to power operated devices and of the correct characteristics.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Where not specified under other sections to be performed by manufacturer or suppliers, machine, fit and drill wood and metal doors.

B. Prepare doors of various types to receive hardware, using templates and instructions provided with the hardware items for jobsite work.

C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Contracting Officer.
   1. Conform to requirements United States Postal Service "Standards for Facility Accessibility by the Physically Handicapped" Handbook RE-4.

D. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

E. Installer of security hardware is to be trained and familiar with product.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

H. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.3 ADJUSTING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct United States Postal Service Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct United States Postal Service personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE SCHEDULE

A. General requirements, see respective paragraphs above for details:
   1. Ensure that keys used during construction cannot open doors after United States Postal Service occupancy.
   2. Provide door silencers for all doors unless indicated otherwise.

SET PHW-001

3 ea.		Hinges – by Storefront Manufacturer
1 ea.		Exit Device – by Storefront Manufacturer
1 ea.	(B-1)	Rim Cylinder
1 ea.	(B-3)	Cylinder Guard
1 ea.		Threshold – by Storefront Manufacturer
1 ea.		Closer – by Storefront Manufacturer
1 ea.		Weatherstripping – by Storefront Manufacturer
1 ea.		Pulls – by Storefront Manufacturer

SET PHW-004

3 ea.	(H-2)	Hinges
1 ea.	(L-1)	Hotel Lock (Similar to F15)
1 ea.	(T-2)	Threshold
1 ea.	(M-3)	Security Viewer
1 ea.	(M-13)	Door Bottom Shoe
1 ea.		Doorstop
1 ea.		Closer

SET PHW-005

3 ea.	(H-1)	Hinges
1 ea.	(L-5)	Privacy Lock (F76)
1 ea.	(T-1)	Threshold
1 ea.		Doorstop
1 ea.		Closer

SET PHW-012

3 ea.	(H-1)	Hinges
1 ea.	(L-4)	Storeroom Lock (F86)
1 ea.		Door Stop
1 ea.		Closer

SET PHW-014

Folding Closure Pocket (204B and C) (205B)
Each set to have:

4 ea.	(H-3)	Hinges
1 ea.	(L-6)	Closet Deadbolt

SET PHW-017

Door:

3 ea.	(H-2)	Hinges
1 ea.	(L-1)	Hotel Lock (Similar to F15)
1 ea.	(T-2)	Threshold
1 ea.	(M-13)	Door Bottom Shoe
1 ea.		Doorstop
1 ea.		Closer

Wicket Panel:

1 ea.	(H-4)	Continuous Piano Hinge
1 ea.	(M-2)	Deadlock (ANSI E0191)
1 ea.	(M-3)	Security Viewer
1 ea.	(M-4)	Astragal

SET PHW-029

3 ea.	(H-1)	Hinges
1 ea.	(L-7)	Passage Set
1 ea.		Doorstop
1 ea.		Closer

USPS CSF Specifications issued: 10/01/2021
Last revised: 8/9/2021

END OF SECTION

08800 GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 08110 - Steel Doors and Frames.
2. 08210 - Wood Doors.
3. 08520 - Aluminum Windows.

1.2 REFERENCES

A. Florida Building Code (FBC), latest edition.

B. American Society of Civil Engineering (ASCE) 7 – latest edition.

C. Flat Glass Marketing Association (FGMA): Glazing Manual, latest edition.

D. CPSC Standard 16CFR 1201 Category II.

E. American Society for Testing and Materials (ASTM) – latest edition of the following:

1. C1036 - Standard Specification for Flat Glass.
2. C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
3. C1172 - Standard Specifications for Laminated Architectural Flat Glass.
4. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
5. E163 - Standard Methods of Fire Tests of Window Assemblies.

F. ANSI Z97.1 - Safety Performance and Methods of Test for Safety Glazing Materials Used in Buildings.

1.3 SUBMITTALS

A. Product Data: Manufacturer's specifications, recommendations for setting blocks, spacers and edge clearance, and installation instructions.

B. Color Charts: For preformed glazing materials and glazing sealant.

C. Samples: For the indicated products, in the form of 12-inch square samples for glass and of 12-inch (300-mm) long samples for sealants. Install sealant samples between two strips of material representative in color of the adjoining framing system.

D. Certification:

1. Certification of tempered and laminated glass complying with Consumer Product Safety Commission 16CFR 1201-CII.
2. Certification of Monroe County Notice of Acceptance (NOA) or Florida Product Approval demonstrating compliance with FBC missile impact criteria.

a. Comply with calculations, signed and sealed by a Florida registered Professional Engineer, establishing wind velocity pressure values for the specific project according to FBC and American Society of Civil Engineers (ASCE) 7-16, and using Classification of Buildings Category IV, Exposure Category "V", and a wind load Importance Factor of 1.15.

3. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with all requirements.

1.4 QUALITY ASSURANCE

A. Labels:

1. Label each unit of glass with manufacturer's sticker showing quality, grade, thickness, and type of glass.
2. Labels shall remain in place until approval by the A/E.

B. Trademarks: Each panel of tempered glass shall bear the manufacturer's trademark.

C. Glass of each type shall be supplied by the same manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glazing:

1. Guardian.
2. LOF, Libby-Owens-Ford.
3. Pilkington.
4. PPG.
5. St.Gobain Architectural Glass Products.
6. Viracon.

B. Missile Impact Resistant Glazing:

1. Saf-Glas by Security Impact Glass.
2. Accepted equivalent as per NOA or Florida Product Approval.

C. One-way Glass:

1. Mirrorpane E.P. by LOF Company
2. Other A/E accepted equivalent.

2.2 Fire Rated Safety Glazing:

1. Superlite by O'Keefe, San Francisco, CA.
2. Firelight Series, Pyrostop, and Pyro Swiss by Technical Glass Products, Kirkland, WA.

B. Glazing Sealant:

1. Dow Corning 999-A Silicone Building and Glazing Sealant.
2. General Electric Contractors 1000 Sealant.
3. Other A/E accepted equivalent per window manufacturer’s recommendation.

C. Backer Rod: Dow Corning Ethafoam SB polyethelene cord or butyl rubber foam cord.

D. Edge Protection Tape for Laminated Glass: "Scotch Brand Cellopane Tape", manufactured by 3M Company.

E. Moisture-Resistant Paint for Frameless Mirror Glass: Palmer Products Corp., Mirro-Bac Paint.

F. Bond Sealer Coat for Mirrors: Palmer Products Corp., Mirro-Mastic Bond.

G. Mirror Adhesive: Palmer Products Corp., Mirro-Mastic.

2.3 MATERIALS

A. Tempered Glass: Comply with ASTM C1036 and further processed according to ASTM C1048, Kind FT, which has been fully tempered by the manufacturer's standard horizontal process. Minimum thickness of 1/4".

B. Missile Impact Resistant Glazing:

1. Thickness: 0.060" (minimum), but not less than required to meet current FBC missile impact criteria for High Velocity Hurricane Zone (HVHZ), for window type, size, and configuration indicated on drawings.
.
2. Clear interlayer between two heat-strengthened glass, clear inboard, outboard tint to be selected by A/E.

C. Fire Rated Glazing:

1. Wire Glass: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh M2, bearing UL label.
2. Safety Glazing: ASTM E152, ASTM E163, ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, CPSC 16 CFR Part 1201, bearing UL label.

D. Tint Color: To be selected by A/E from manufacture’s full range of custom colors.

E. Summer Daytime U-Value: 95 btu/sq. ft. x h x deg. F.

F. Laminated Glass: Two sheets of equal thickness clear heat strengthened glass according to ASTM C1036, Type I, Class 1, Quality q3 permanently laminated with a 0.060-inch-thick sheet of clear polyvinyl butyral.

G. One-way Glass: ASTM C1036, 1/4" thick clear float glass.

H. Wall Mirrors:

1. 1/4" laminated glass with electrolytic copper plated back, ANSI Z97.1 - Category II backing, and guaranteed for 1 year.
2. Mirrors shall provide distortion-free reflected images and be optically matched for distortion-free reflected images from panel to adjacent panel.

I. Glazing Materials:

1. Glazing Sealant: Curing type gunable elastomeric sealant complying with TT-S-001543A, Type II Class A. Color as selected by A/E.

    a. Glazing sealants for use with insulating glass units shall be approved by the fabricator of the insulating glass units.

2. Unshimmed Glazing Tape: Butyl-polyisobutylene with 20 to 30 "Shore A" hardness, self-sticking; Color as selected by A/E.
3. Pre-Shimmed Glazing Tape: Butyl-polyisobutylene with built-in synthetic rubber spacer; 20 to 30 "Shore A" hardness, self-sticking.
4. Setting Blocks: Solid neoprene, 80 to 90 Shore A durometer hardness; sizes as required.
5. Edge Blocks: Solid neoprene, 60-70 Shore A durometer hardness; sizes as required.
6. Shims: Solid neoprene, 40 to 60 Shore A durometer hardness; sizes as required.
7. Glazing Gaskets: Compression gaskets, closed cell, neoprene, EPDM or silicone rubber composition designed to provide a water-resistant seal between glass and frame.
8. Primers and Cleaning Agents: Type recommended by the sealant, glass, and glazing accessories manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify glazing frames are acceptable for the correct installation of glass and glazing accessories.

3.2 INSTALLATION

A. Glass Cutting: Make cuts clean, only moderately convoluted, with flare or bevel not exceeding 1/8 of glass thickness.

1. Unacceptable defects:

    a. Impact chips, spalls, or nipped edges.
    b. Flake chips or shark teeth deeper than 1/4 of glass thickness.
    c. Serration hackle deeper than 1/8 of glass thickness.

B. Comply with recommendations of FGMA Glazing Manual, glass manufacturer, manufacturer of sealant, and other glazing accessories.

C. Do not attempt to cut, seam, nip, or abrade glass tempered or heat strengthened.

D. Remove and replace glass broken, chipped, cracked, abraded, or damaged during construction.

E. Install wall mirrors and fasten with non-corrosive, theftproof, concealed hangers and plywood backing according to standard practices.

F. Manufacturer's label showing strength, grade, thickness, type, and quality of glass shall remain on each piece of glass until it has been set and inspected.

G. Guarantee work to be waterproof.

3.3 CLEANING

A. After glass has been inspected and approved, remove labels and wash and polish glass on both faces before the City of Key Colony Beach's approval of the project.

1. Comply with glass manufacturer's recommendations for cleaning materials and methods.

END OF SECTION

09120 PLASTERED CEILING SUSPENSION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.

1.2 SUBMITTALS

A. Submit properly identified product data, including materials specifications for each product specified, installation recommendations, and other data as may be required to show compliance with specifications.

B. Samples: Submit 12-inch-long samples of channels, lath, hangers, tie wires, and miscellaneous accessories for review.

1.3 QUALITY ASSURANCE

A. Comply with the applicable requirements of governing codes and authorities and applicable portions of the following:

1. ANSI A42.3 -Lathing and Furring for Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior.
2. Metal Lath and Steel Framing Association Specifications, latest edition.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Suspended Ceilings:

1. Hanger Devices for Concrete: No.SA-1625 self drilling sleeve type concrete expansion anchors with wire eyes, manufactured by Phillips Drill Co., according to Fed. Spec. FF-S-325 (3-1965), Group III, Figure 15(D).
2. Hangers: Galvanized, annealed, pre-straightened steel wire, No.8 gage, where supporting up to 12.5 square feet of ceiling, and No.6 gage where supporting up to 16 square feet of ceiling.
3. Channel Tie Wire: 16 gage galvanized steel wire.
4. Main Runners: Cold-rolled steel channels with black asphaltum paint coating, 1-1/2" x 0.475 lbs. per foot or 2 inches x .59 lbs. per foot as required.
5. Cross Furring: Cold-rolled steel channels with black asphaltum paint coating, 3/4" x 0.3 lbs. per foot.

B. Expanded Metal Lath: Diamond mesh cut from steel according to Federal Specifications QQ-L-101C (latest edition), weighing 3.4 lbs. per square yard.

1. Use galvanized on exterior and black asphaltum paint coating on interior only.

C. Hardware Cloth: Galvanized 4 mesh, 23 gage.

D. Accessories:

1. Casing Beads: No.10 as manufactured by Plastic Components, Inc., with ground depth matching the specified stucco or Portland cement plaster thickness.
2. W-Type Control Joints: No.20 M Joint as manufactured by Plastic Components, Inc., ground depth to match specified Portland cement plaster thickness.

PART 3 EXECUTION

3.1 INSTALLATION

A. Suspended Ceiling:

1. Hangers:

a. Do not exceed maximum allowable ceiling area to be supported by each hanger.
b. Alter spacing of hangers or provide double hangers splayed to avoid overhead obstructions.
c. Provide extra hangers within 6 inches of ends of main runners to support light fixtures and as required to support other items resting in or on the ceiling.

2. Main Runners: Suspend true and level, saddle tie to hanger wires, and locate within 6 inches of parallel walls to provide support for cross furring.
3. Cross Furring: Locate perpendicular to main runners spaced maximum 2 inches from parallel walls and saddle tie to main runners.

B. Metal Lath Application: Tie lath with long dimension of sheet across supports and secure at intervals not exceeding 6 inches, with a tie placed where sides of sheets lap at supports and at side laps between supports.

1. Use tie wires not less than 16 gage galvanized annealed wire.
2. Lap diamond mesh lath 1/2" at sides and 1 inch at ends.

C. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

D. Accessory Installation: Install casing beads at perimeter of suspended furring and lath systems.

E. Finished Installation: Leave suspended furring and lath system true and level ready to receive subsequent finish.

END OF SECTION

09200 METAL STUDS, METAL LATH, SUSPENSION CEILINGS, PLASTER, AND STUCCO

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load bearing steel studs.
2. Metal furring and lath.
3. Ceiling suspension system.
4. Portland cement plaster and stucco.

B. Related Sections:

1. 04221 - Concrete Unit Masonry.
2. 05400 - Light Gage Metal Framing.
3. 06100 - Carpentry.
4. 09900 - Painting.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. A641/A641M Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. A924/A924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4. C150/C150M Specification for Portland Cement.
5. C645 Specification for Nonstructural Steel Framing Members.
6. C754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
7. C841 Specification for Installation of Interior Lathing and Furring.
8. C897 Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
9. C926 Specification for Application of Portland Cement-Based Plaster.
10. C932 Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
11. C1007 Specification for the Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
12. C1063 Specifications for the Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
13. D1784 Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
14. E119 Test Methods for Fire Tests of Building Construction and Materials.

B. Florida Building Code (FBC)

C. Portland Cement Association (PCA), Portland Cement Plaster (Stucco) Manual.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data for cementitious materials, lath, metal support components, and accessories.

B. Material Certificates:

1. Submit producer's certificate for each kind of plaster aggregate indicated materials comply with requirements.
2. Provide detailed shop drawings for metal support systems indicating load calculations, sizing of members, connections and anchorages for review by A/E. Shop drawings and calculations shall be signed and sealed by a Florida registered Professional Engineer and shall show compliance with FBC and ASCE 7.

1.4 QUALITY ASSURANCE

A. Design Criteria:

1. Fire-Resistance Ratings:
   a. Where plaster systems with fire-resistance ratings are indicated, provide materials and installations identical with applicable assemblies tested per ASTM E119 by fire testing laboratories acceptable to authorities having jurisdiction.
   b. Provide plaster for fire-resistance rated systems having same aggregate as specified for similar non-rated work, unless specified aggregate has not been tested by accepted fire testing laboratories.
   c. Portland cement plaster/stucco shall not be used in areas requiring fire-rated construction. Use only accepted listed UL rated materials.

2. Coordinate layout and installation of suspension system components for suspended ceilings with other work supported by or penetrating through ceiling.
3. Clear bonding agents are not allowed.
4. Metal corner beads are not allowed.
5. Provide polyvinylchloride (PVC) trim accessories at corners, control and expansion joints as indicated on the Plans, and as may be required by industry standards and best practices,
6. The use of prefabricated stucco reveals for the purposes of creating decorative score patterns is not allowed. Strike final stucco coat to achieve score patterns, and slope bottom edge of horizontal score lines to dispel water.

B. Mockups:

1. Before installation of plaster work, fabricate mockup panels for each type of finish and application required using materials, including lath and support system, indicated for final work.
2. Build panels 4 feet x 4 feet x full thickness in location indicated, or if not otherwise indicated, as directed by A/E.
3. Demonstrate proposed range of color, texture, and installation to be expected in completed work.
4. Obtain A/E acceptance of panel's visual quality before start of work.
5. Retain panel during construction as standard for judging completed work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Supports:

1. Dale/Incor.
2. Dietrich.
3. Gold Bond Building Products Division.
4. Unimast Inc. (USG Co.)

B. Expanded Metal Lath:

1. Dale/Incor.
2. Gold Bond Building Products Div.
3. South Lath Inc.
4. Unimast Inc. (USG Co.)

C. Accessories:

1. Dietrich.
2. Fry Reglet Corp.
3. Gold Bond Building Products Div.
4. Plastic Components Inc.
5. South Lath Inc.
6. United States Gypsum Co.
7. Vinyl Corp., Miami, FL.

D. Portland Cement Plaster/Stucco:

1. Florida Super Stucco by Vulcan Materials Company
2. Cemex USA
3. United States Gypsum Co.
4. National Gypsum Company
5. Titan America
6. Approved equal

E. One Coat Veneer Plaster Over Cement Board: 3/32" Imperial Finish over 5/8" Durock cement board by US Gypsum Co. over metal framing at 16 inches o.c. maximum or accepted equivalent. UL U407 for 1-hour rating.

2.2 MATERIALS

A. Metal Supports - Suspended and Furred Ceilings or Soffits:
1. Portland Cement Plaster/Stucco Installation: ASTM C926.
2. Wire for Hangers and Ties: ASTM A641, 16 gage monel.
3. Rod Hangers: Mild steel, zinc, or cadmium coated.
4. Flat Hangers: Mild steel, zinc, or cadmium coated or protected with rust inhibitive paint.
5. Channels:

a. Cold-rolled steel, minimum 0.0598" thickness of uncoated base metal, allowable bending stress of 18,000 psi. Protect with rust inhibitive paint or galvanizing complying with ASTM A924 for G60 coating designation.
b. Carrying Channels: 1-1/2" deep x 7/16" wide flanges, 475 lbs. per 1,000 feet painted, 508 lbs. per 1,000 feet galvanized.
c. Furring Channels: 3/4" deep x 7/16" wide flanges, 300 lbs. per 1,000 feet painted, 316 lbs. per 1,000 feet galvanized.
d. Provide galvanized channels for exterior installations.

6. Hanger Anchorage Devices:
   a. Screws, cast-in-place concrete inserts, or other devices appropriate for anchorage to the form of structural framing indicated and whose suitability for use intended has been proven through standard construction practices or certified test data.
   b. Size devices to develop full strength of hanger minimum 3 times calculated hanger loading, except size direct pullout concrete inserts for 5 x calculated hanger loading.

B. Steel Studs and Runners/Tracks:

1. Non-Load (Axial) Bearing Studs and Runners:

   a. ASTM C645 and complying with following requirements for minimum thickness of uncoated base metal and other characteristics:
   b. Stud Thickness: 0.0179", unless otherwise indicated.
   c. Stud Depth: As indicated on the drawings.

2. Load Bearing (Transverse and Axial) Studs and Runners:

   a. ASTM C955 and complying with following requirements for quality, grade, finish of steel sheet, design thickness of uncoated base metal, and other dimensional characteristics:
   b. Metal Quality: Zinc-coated steel sheet complying with ASTM A653, Coating Designation G60.
   c. Grade A - 33,000 psi Yield Point: Maximum 0.0359" design thicknesses.
   d. Grade D - 50,000 PSI Yield Point: Minimum 0.0598" design thicknesses.
   e. Stud Thickness: 0.0359", unless otherwise indicated.
   f. Stud Flange Width: 1-3/8".
   g. Stud Lip Depth: 1/4".
   h. Stud Depth: 3-1/2" minimum unless otherwise indicated.

C. Vertical Metal Furring:

1. Channel Furring and Braces:

   a. Cold-rolled steel, minimum 0.0598" thickness of uncoated base metal.
   b. Allowable Bending Stress: 18,000 psi.
   c. Protected with rust inhibitive paint finish or galvanizing.
   d. 3/4" deep x 7/16" wide flanges.
   e. 300 lbs. per 1,000 feet with painted finish.
   f. 316 lbs. per 1,000 feet with galvanized finish.

2. Z-Furring Member:

a. Manufacturer's standard screw-type zee-shaped furring members formed from zinc-coated steel sheet.
b. Minimum 0.0179" uncoated base metal thickness, complying with ASTM A924, Coating G60.
c. Design for mechanical attachment of insulation boards or blankets to monolithic concrete and masonry walls.

3. Furring Brackets: Serrated-arm type, minimum 0.0329" thickness of base (uncoated) metal, adjustable from 1/4" to 2-1/4" wall clearance for channel furring.

D. Metal Lath:

1. Diamond Mesh Lath:
   a. Flat: 2.5 lbs. per sq.yd.
   b. Self-Furring: 2.5 lbs. per sq.yd.
   c. Paper Backing: Provide asphalt-impregnated paper factory-bonded to back and complying with Fed. Spec UU-B-790, Type I, Grade D vapor permeable, Style 2.
   d. Lath Attachment Devices:

      1) Devices of material and type required by referenced standards and recommended by lath manufacturer for secure attachment of lath to framing members and of lath to lath.
      2) Provide resilient clips for attachment of gypsum lath to steel at locations indicated.

2. Welded Wire Fabric Lath:

   a. Weather Protected Exterior Horizontal Surfaces (Soffits, Ceilings, and Other Decorative Elements): Pyro K-Lath, Gun Lath, or other A/E accepted equivalent.
   b. Back of Ceramic Tile (Interior Usage Only): Aqua Lath or other A/E accepted equivalent.
   c. Fire Resistance and Waterproofing (Interior Usage Only): Pyro K-Lath or other A/E accepted equivalent.

E. PVC Accessories:

1. Accessories shall have perforated flanges and be fabricated from high impact PVC in conformance with ASTM D1784.
2. Accessories shall be provided in accordance with materials provisions of ASTM C926.
3. Size: minimum 0.050-inch-thick x 10-feet long. Coordinate depth of accessories with thickness and number of coats required.
4. Install PVC accessories at locations indicated on the Plans or as may be required by industry standards and practices, whichever is more stringent
5. Accessories shall be installed using longest lengths possible to reduce to a minimum, the total number of joints.
6. Provide PVC back plates, connector clips, “┼” and “T” connectors, at all butt joints and intercepting points to ensure proper alignment of all accessories.
7. Accessories shall be fastened to the substrate in accordance with ASTM Standards and as recommended by accessory manufacturer, whichever is more stringent.
8. All joints and ends shall be caulked using an elastomeric sealant in accordance with manufacturer’s recommendation.

F. Portland Cement Plaster Materials:

1. Base Coat Cements: Portland Cement, ASTM C150, Type I or III.
2. Finish Coat Cement: Portland Cement, ASTM C150, Type I, white.
3. Factory-Prepared Finish Coat:
   a. Manufacturer's standard product requiring addition of water only. White in color unless otherwise indicated.
   b. Product: Oriental Exterior Stucco by United States Gypsum Co.

4. Sand Aggregate - Base Coats: ASTM C897.
5. Aggregate - Finish Coats: ASTM C897, manufactured or natural sand, white in color.
6. Fiber - Base Coat:
   a. Alkaline-resistant glass fibers, 1/2" long, free of contaminates, manufactured for use in Portland cement plaster.
   b. Product: Dur-O-Fiber AR Glass by Dur-O-Wal, Inc.

G. Miscellaneous Materials:

1. Water for Mixing and Finishing Plaster: potable, free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
2. Bonding Agent - Portland cement: ASTM C932.

2.3 MIXES

A. Portland Cement Plaster/Stucco Mixes and Compositions - Base Coats:

1. Comply with ASTM C926 for Portland cement plaster base and finish coat mixes as applicable bases, materials, and other requirements indicated.
2. Base Coat:
   a. Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated.
   b. Adjust mix proportions below within limits specified to attain workability.

3. Base Coats for Three-Coat Work Over Metal Lath:

   a. Contractor's Option 1:
      1) Scratch Coat: 1 part Portland cement, 2-1/2 to 4 parts sand.
      2) Brown Coat: 1 part Portland cement, 3 to 5 parts sand.

   b. Contractor's Option 2:
      1) Scratch Coat: 1 part Portland cement, 1 to 2 parts masonry cement, 2-1/2 to 4 parts sand.
      2) Brown Coat: 1 part Portland cement, 1 to 2 parts masonry cement, 3 to 5 parts sand.

   c. Contractor's Option 3:

      1) Scratch Coat: 1 part masonry cement, 2-1/2 to 4 parts sand.
      2) Brown Coat: 1 part Portland cement, 1 parts masonry cement, 3 to 5 parts sand.

4. Two-Coat Work Over Concrete Unit Masonry:

    a. Contractor's Option 1:

        1) Base Coat: 1 part Portland cement, 3 to 4 parts sand.

    b. Contractor's Option 2:

        1) Base Coat: 1 part masonry cement, 3 to 4 parts sand.

5. Fiber Content:

    a. Add fiber to mixes above to comply with fiber manufacturer's directions, maximum 2 lbs. per cu. feet of cementitious materials.
    b. Reduce aggregate quantities accordingly to maintain workability.

B. Portland Cement Plaster/Stucco Mixes and Compositions - Finish Coats:

1. Job-Mixed:

    a. Contractor's Option 1:

        1) 1 part Portland cement, 2-1/4 to 3 parts sand.

    b. Contractor's Option 2:

        1) 1 part Portland cement, 1 part masonry cement, 2-1/4 to 3 parts sand.

    c. Contractor's Option 3:

        1) 1 part masonry cement, 1-1/2 parts sand.

2. Factory-Prepared Portland Cement Plaster/Stucco Finish Coats:

    a. Add water only.
    b. Comply with finish coat manufacturer's directions.

C. Mixing: Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Lath and Furring:

1. Interior Lath and Furring Installation Standard: Install lath and furring materials indicated for gypsum plaster to comply with ASTM C841.
2. Portland Cement Plaster/Stucco Lath and Furring Installation Standard: Install lath and furring materials indicated for Portland cement plaster to comply with ASTM C926.

3. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable published recommendations of gypsum plaster manufacturer or, if not available, of Gypsum Construction Handbook, latest edition, published by United States Gypsum Co.
4. Isolation:
    a. Where lath and metal support system abuts building structure horizontally, and where partition/wall work abuts overhead structure, isolate work from structural movement sufficiently to prevent transfer of loading into work from building structure.
    b. Install slip or cushion type joints to absorb deflection but maintain lateral support.
    c. Frame both sides of control and expansion joints independently.
    d. Do not bridge joints with furring and lath or accessories.

B. Ceiling Suspension Systems:

1. Preparation and Coordination:

    a. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure inserts and other structural anchorage provisions have been installed to receive ceiling hangers to allow development of their full strength and at spacings required to support ceiling.
    b. Furnish concrete inserts and other devices indicated, to other trades for installations before time needed for coordination with other work.
    c. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

2. Hanger: Attach hangers to structure above ceiling to comply with Metal Lath/Steel Framing Association (ML/SFA) Specifications for Metal Lath and Furring and with referenced standards.
3. Ceiling Suspension System:

    a. Install components of sizes and spacings indicated but not in smaller sizes or greater spacings than required by referenced lath and furring installation standards.
    b. Wire Hangers: Space maximum 48 inches o.c. parallel with, and maximum 36 inches perpendicular to, direction of carrying channels, unless otherwise indicated, and within 6 inches of carrying channel ends.
    c. Carrying Channels: Space carrying channels maximum 36 inches o.c. with 48 inches o.c. hanger spacing.
    d. Furring Channels to Receive Metal Lath: Space furring channels maximum 16 inches o.c. for 3.4 lb. diamond mesh lath or 24 inches o.c. for 3.4 flat rib lath.

C. Steel Stud Wall/Partition Support System:

1. Install components for steel stud wall/partition support systems to comply with directions of steel stud manufacturer for application indicated.
2. Non-Load (axial) Bearing Stud Systems: Comply with ASTM C754.
3. Loadbearing (axial and transverse) Stud Systems: Comply with ASTM C1007 and as indicated.

4. Steel Stud Systems to Receive Metal Lath: Comply with requirements of ML/SFA Specifications for Metal Lath and Furring applicable to each installation condition and type of metal system indicated.
5. Extend partition support systems to finish ceiling and attach to ceiling suspension members, unless otherwise indicated.

D. Vertical Metal Furring:

1. Metal Furring to Receive Metal Lath: Comply with requirements of ML/SFA Specification for Metal Lath and Furring applicable to each installation condition indicated.

E. Metal Lath:

1. Install expanded metal lath for following applications where plaster base coats are required.
2. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated which comply with referenced lath installation standards.
3. Suspended and Furred Ceilings: Minimum weight of diamond mesh lath, 3.4 lbs. per sq.yd.
4. Exterior Sheathed Wall Surfaces: Minimum weight of self-furring diamond mesh lath, 3.4 lbs. per sq. yd.

F. PVC Accessories:

1. Comply with referenced lath and furring installation standards for provision and location of all required accessories.
2. Miter or cope accessories at corners and install with tight joints and in proper alignment.
3. Attach accessories securely to substrate to maintain placement and alignment during plastering/stuccoing process.
4. Provide trim accessories as follows:

    a. Corner Reinforcement: Install at external corners.
    b. Corner Bead: Install at external corners.
    c. Casing Beads: Install at termination of plaster work unless otherwise indicated.
    d. Control and Expansion Joints shall be provided:
        1) Where an expansion or control joint occurs in surface of construction directly behind plaster membrane.
        2) Where distance between control joints in plastered/stucco surfaces exceeds 10 feet in either direction.
        3) Where area within plastered/stucco panels exceed 100 square feet.
        4) Where indicated on the Plans.
        5) Where recommended by industry standards and best practices.

G. Plaster Application:

1. Two-coat plaster over gypsum lath or paper-backed welded wire fabric.
2. Prepare monolithic surfaces for bonded base coats and used bonding compound or agent to comply with requirements of referenced plaster application standards for conditioning of monolithic surfaces.
3. Tolerances: Maximum 1/8" in 10'- 0" from a true plane in finished plaster surfaces, as measured by 10'- 0" straightedge placed at any location on surface.

4. Sequence plaster application with installation and protection of other work, so neither will be damaged by installation of other.
5. Plaster flush with metal frames and other built-in metal items or accessories that act as plaster ground, unless otherwise indicated.
6. Where plaster is not terminated at metal by casing beads, cut base coat free from metal before plaster sets and groove finish coat at junctures with metal.

H. Portland Cement Plaster/Stucco Application:

1. Portland Cement Plaster Application Standard: Apply Portland cement plaster materials, compositions, and mixes to comply with ASTM C926.
2. Number of Coats: Apply Portland cement plaster, of composition indicated.
3. Finish Coat: Floated finish unless otherwise indicated; match A/E's sample for texture and color.
4. Moist cure Portland cement plaster base and finish coats to comply with ASTM C926, including recommendations for time between coats and curing in ASTM C926 Annex A2 - Design Considerations.

3.2 ADJUSTING, CLEANING, AND PROTECTION

A. Cutting and Patching:

1. Cut, patch, point-up, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections.
2. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dryouts, efflorescence, sweat-out and similar defect, and where bond to substrate has failed.
3. Sand smooth-troweled finishes lightly to remove trowel marks and arises.

B. Cleaning:

1. Remove temporary protection and enclosure of other work.
2. Promptly remove plaster from door frames, windows, and other surfaces that are not to be plastered.
3. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering work.
4. When plastering is completed, remove unused materials, containers, and equipment, and clean floors of plaster debris.

C. Protection: Provide final protection and maintain conditions, in manner suitable to Installer, that ensures plaster work being without damage or deterioration at time of Substantial Completion.

END OF SECTION

09250 GYPSUM WALLBOARD

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
2. 09310 - Ceramic Tile.

1.2 REFERENCES

A. American Society for Testing and Standards (ASTM), latest edition:

1. C11 Terminology Relating to Gypsum and Related Building Materials and Systems.
2. C36 Specification for Gypsum Wallboard.

1.3 SUBMITTALS

A. Before starting work, provide product data and samples as directed by A/E.

1.4 QUALITY ASSURANCE

A. Finish work shall be subject to inspection using a lighting level of not less than 50-foot candles at the surface of the gypsum board. Surfaces judged to be unsuitable for finishing, even if finish has been applied, shall be rejected.

B. The A/E will direct repair or replacement of rejected work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original unopened packages. Provide protection from damage and exposure to the elements.

B. Prevent damage to edges and surfaces. Do not bend or damage corner beads and trim.

1.6 PROJECT CONDITIONS

A. Environmental Requirements: Proceed with installation of gypsum board materials only after building is weather tight.

1. Maintain temperature in areas receiving gypsum board materials between 55 degrees and 90 degrees F. during and after installation and provide adequate ventilation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Wallboard:

1. Gold Bond.
2. National Gypsum.
3. Georgia Pacific.
4. United States Gypsum Company (USG).

B. Accessories shall be by gypsum wallboard manufacturer.

2.2 MATERIALS

A. Gypsum Wallboard:

1. Fire Rated Gypsum Board: USG SA 927, 1/2" or 5/8" thick x 48 inches wide x longest stock length, Type "C" or Type "X", with tapered edges or other A/E accepted equivalent.
2. Gypsum Board: ASTM C36, tapered edge, 5/8" thick x 48 inches wide x longest stock length.

B. Fasteners: Type S Bugle Head by USG or accepted equivalent, with lengths as specified by manufacturer.

C. Joint Treatment: Reinforcing tape, taping, or embedding and topping materials as recommended and manufactured by gypsum wallboard manufacturer.

D. Accessories:

1. Use internal and external corner beads, casing beads, and control joints, to provide a finished job with true, straight edges against adjoining work.
2. Provide expansion joints as required for conditions and according to manufacturer’s recommendations.

E. Tile Backer Boards:

1. Aggregated Portland cement board with vinyl-coated, woven glass fiber embedded on both surfaces.
2. Joint Reinforcement, Fasteners, Adhesives, and Grout: According to manufacturer's recommendation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Place panels with long dimension parallel to the framing members and abutting edges occurring over stud flanges.

1. Fit ends and edges closely (maximum 1/16" between boards), but not forced together.
2. Stagger end joints in successive courses. Place end or edge joints on opposite sides of framing in different locations to avoid creating joints of panels ending on the same stud.
3. Panel edge above floor shall be 1/2" clear.

B. Panel Attachment:

1. Drive fasteners in field of panel first, working toward ends and edges.
2. Hold panel in firm contact with framing while driving fasteners.
3. Install perimeter fasteners at 3/8" from ends or edges and spaced a maximum of 8 inches on center.
4. Attach gypsum panels in field of panel with fasteners spaced a maximum of 12 inches on center.

C. Accessories: Apply accessories according to manufacturer's instructions. Sand after application of final joint treatment coat and leave surface smooth and ready for work by other trades.

1. Metal corner beads are not allowed. Use vinyl trim accessories only.
2. Treat trim accessories with not less than 2 coats of joint compound in the same manner as joints. Feather joint compound out from 8 to 10 inches on both sides of corners.
3. Apply trim at intersections where gypsum board abuts other materials, unless detailed otherwise, and at all other locations indicated. Neatly fit and secure corner beads over external corners.
4. Install expansion joints as detailed.
5. Install control joints as detailed.

D. Joint Treatment Application:

1. Taping and Embedding:

    a. Apply taping or embedding compound in a thin, uniform layer to joints and angles.
    b. Immediately apply reinforcing tape centered over joint or angle and firmly seat into compound. Sufficient compound (approximately 1/64" to 1/32") shall remain under tape to provide proper bond.
    c. Immediately follow with a thin skim coat to embed tape but not to function as a second coat.
    d. Fold and embed tape properly at interior angles to provide a true angle.
    e. Tape or embedding coat shall be thoroughly dry before application of second coat.

2. Second Coat Embedding:

    a. Apply a second coat of joint compound over embedding coat, filling panel taper flush with surface.
    b. Cover tape and feather out at least 2 inches on each side beyond first coat.
    c. On joints with no taper, cover tape and feather out at least 4 inches on either side of tape.
    d. Allow second coat to dry thoroughly before application of finish coat.

3. Topping:

    a. Spread a finish coat evenly over and extend at least 2 inches on each side beyond second coat on joints and feather to a smooth uniform finish.
    b. Over tapered edges do not allow finished joint to protrude beyond plane of surface.

c. Apply finish coat to cover tape and taping compound at taped angles and provide a true angle.
d. Where necessary, sand between coats and following final application of compound to provide a smooth surface ready for painting.

E. Finishing Fasteners:

1. Apply a taping or all-purpose type compound to fastener depressions as the first coat.
2. Follow with minimum of 2 additional coats of topping compound, leaving depressions level with plane of surface.

END OF SECTION

09310 CERAMIC TILE

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 07900 - Joint Sealers.
3. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
4. 09250 - Gypsum Wallboard.
5. 10800 - Toilet Room Accessories.
6. 15421 - Drains and Cleanouts.
7. 15440 - Plumbing Fixtures, Trim, and Supports.

1.2 REFERENCES

A. American National Standards Institute, Inc. (ANSI) latest edition:

1. A108.1 Installation of Glazed Wall Tile, Ceramic Mosaic Tile, Quarry and Paver Tile with Portland Cement Mortar.
2. A108.5 Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
3. A108.10 Installation of Grout in Tilework.
4. A118.1 Dry-Set Portland Cement Mortar.
5. A118.6 Ceramic Tile Grouts for Tile Installation.
6. A137.1 Specifications for Ceramic Tile.

B. Tile Council of North America, Inc. (TCNA): Handbook or Ceramic Tile Installation, latest edition.

1.3 SUBMITTALS

A. Product Data: Submit material specifications, printed installation and mixing instructions, and maintenance recommendations for ceramic tile and accessories.

B. Samples: Submit the following:

1. Panels: 12 inches square of each type, color, and pattern of tile required.
2. Tile manufacturer's full color and pattern range for each type of tile required.
3. Grout manufacturer's full color range samples.
4. Each type of trim shape and special shape required, if requested.

1.4 QUALITY ASSURANCE

A. Tile shall conform to requirements of ANSI A137.1, Standard Grade.

1.5 MAINTENANCE

A. Attic Stock/Maintenance Materials: At the job site, provide 2 unopened boxes of each color and type of tile installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Ceramic Tile:

1. American Olean Tile Company.
2. Dal-Tile.
3. Florida Tile Industries.
4. Interceramic USA.
5. Mannington Ceramic Tile Company.
6. Mosa USA
7. US Ceramic Tile Company.

2.2 MATERIALS

A. Slip-Resistant Ceramic Mosaic Floor Tile: 2 inches x 2 inches x 1/4" thick, unglazed, plain face, cushioned edges, having a minimum of 0.42 Dynamic Coefficient of Friction (DCOF) factor, when wet, without use of abrasive impregnation.

B. Glazed Wall Tile: Nominal 4" x 4" x 5/16" thick, matte or crystalline face, cushioned edges.

C. Color and Pattern:

1. As shown on the drawings, and approved color board.
2. Any preselected colors and patterns shown on the drawings or in the specifications shall govern. Substitutions to colors or patterns shown in the finish schedule are not allowed.
3. Where colors or patterns are not shown, tile equivalent in cost to standard solid colors shall be bid upon, assuming not more than 10 colors.
4. A/E’s range of color selection shall not be limited to colors stocked locally but by entire color line of specific manufacturer as determined by samples in A/E’s office.

D. Trim and Special Shapes: Provide the following trim units and special shapes of same material and finish as ceramic wall tile:

1. Base: Cove base units, width and height to match wall tile.
2. External Corners: Bullnose shapes with round out base and top trim special shapes.
3. Internal Corners: Field-butted square with square in-corner base and top trim special shapes.

E. Marble Thresholds: 2-1/4" wide, 3/4" thick, White Georgia or Madre Cream Alabama marble with exposed edges beveled and honed finish on exposed surfaces.

F. Setting Materials:

1. Modified Dry-Set Mortar (Thinset) in accordance with ANSI A118.4.
2. Basis of Design - Laticrete 254 Platinum or approved equivalent certified by tile manufacturer licensed by TCNA, indicating product is suitable for the type of tile and application.

G. Grout:

1. High-Performance Tile Grout in accordance with ANSI A118.7.

    a. Basis of Design: Laticrete Permacolor Dry-Set Grout or approved equivalent certified by tile manufacturer licensed by TCNA, indicating product is suitable for the type of tile and application.

2. Water-Cleanable Epoxy Grout in accordance with ANSI A118.3**,** with a VOC content of 65 g/L or less.

    a. Basis of Design: Laticrete SpectraLock Pro Series Epoxy Grout or approved equivalent certified by tile manufacturer licensed by TCNA, indicating product is suitable for the type of tile and application.

3. For Kitchens Food-Prep Areas: Water-Cleanable Epoxy Grout, in accordance with ANSI A118.3**,** with a VOC content of 65 g/L or less.

    a. Basis of Design: Laticrete SpectraLock 2000 IG Epoxy Grout or approved equivalent certified by tile manufacturer licensed by TCNA, indicating product is suitable for the type of tile and application.

4. Colors as selected by A/E.

H. Tile Cleaner: Biscayne Chemical Laboratories, Inc.,"Blue Boy" or other A/E accepted equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

A. Tile Setting Requirements:

1. Examine surfaces for foreign matter, unevenness, flatness, plumb planes, and damage. Make repairs if necessary to substrate to be in the proper condition to receive tile. Verify waterproofing at shower receptors will not affect tile installation adversely.
2. Construct sloped mortar beds using mortar consisting of 1 part Portland cement, 4 parts damp sand by volume, and gauged with mortar additive according to ANSI A108.5.
3. Secure tile firmly in place with uniform joints well filled and lines straight and true.

    a. Bring finished surfaces to true and flat planes, plumb on walls.
    b. Completed work shall be free of cracked or broken tiles.

4. Form intersections and returns perfectly and perform cutting and drilling of tile neatly without marring tile face.

    a. Carefully grind and joint cut edges of tile against any trim, finish, and built-in fixtures.
    b. Fit tile close around plumbing pipes, fixtures and fittings so usual plates, collars, or coverings will overlap tile.

5. Where borders, lines, patterns, panels, or other effects are a part of the work, properly space tiles and accurately reproduce required designs.
6. Where acoustic tile ceilings occur, install ceramic wall tile to a line 2 to 4 inches above plane of exposed surface of ceiling.
7. Layout tile work on floors or walls so, wherever possible, no tiles less than half full size will occur unless indicated.
8. Movement Joints:

    a. Provide control, isolation, expansion, and contraction joints according to movement joint designs and install according to the TCA Handbook for Ceramic Tile Installation.
    b. Locate movement joints:

        1) At 20 to 25 feet on center and at all interior locations as required in A108.108.01-3.7.2. Interior areas exposed to direct sunlight shall have expansion joints spaced at 8 to 12 feet in each direction.
        2) At tile abutting perimeter walls, dissimilar floors, pipes, and columns.
        3) Over cold joints and saw-cuts in the slab.

    c. Extend joints through the setting bed to the concrete substrate equal in width to the tile grout joints.
    d. Provide approved solid neoprene filler and approved polysulfide caulking.

9. Where tile abuts restraining surfaces, cut tile to match contour of that surface.
10. At shower receptors continue slip-resistant ceramic mosaic floor tile up and over curbs to meet floor tile in adjoining areas using special shapes where necessary.
11. At floor drains, slope floor tile from high points at walls around perimeter of rooms down to floor drains.

B. Setting Ceramic Tile with Modified Dry-Set Mortar (Thinset):

    1. Concrete Substrate:

        a. Set ceramic tile according to applicable requirements of ANSI A108.5.
        b. Set tile with modified dry-set mortar, 3/32" to 1/8" thick.
        c. Provide latex mortar additive in setting mortar per manufacturer's directions.

C. Grouting: Comply with ANSI A108.10.

    1. Ceramic mosaic floor tile: Use commercial latex Portland cement grout.
    2. Glazed ceramic wall tile - Non-Kitchen Food Prep Areas: Use dry-set grout.
    3. Glazed ceramic wall tile - Kitchen Food Prep Areas): Use epoxy grout.
    4. Force grout into joints to fill solid.

        a. Remove and re-grout discolored joints. Fill voids in joint grout.

D. Thresholds: Set marble thresholds where indicated or at dissimilar floor finishes with the same material used for setting ceramic mosaic floor tile.

E. Tolerances: Finished installation shall be trued to a tolerance of ±1/8" in a 10-foot radius and +1/16" within any given running foot.

3.2 CLEANING

A. Apply tile cleaner according to cleaner manufacturer's printed instructions.

B. Leave finished installation clean and free of cracked, chipped, broken, and unbonded or otherwise defective tile.

END OF SECTION

09510 ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceilings, Plaster, and Stucco.
2. 09310 - Ceramic Tile.
3. Divisions 15 and 16: Items of Mechanical and Electrical work to be installed in acoustical ceiling grids.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1.	A653	Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-iron Alloy-coated (Galvannealed) by the Hot-dip Process.
2.	C635	Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
3.	C636	Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
4.	E84	Standard Test Method for Surface Burning Characteristics of Building Materials
5.	E1264	Standard Classification for Acoustical Ceiling Products.

B. Ceiling and Interior Systems Contractors Association (CISCA) publication (latest edition): Acoustical Ceilings - Use and Practice.

C. Underwriters Laboratories (UL) fire rating listings and classifications.

D. Florida Building Code (FBC).

1.3 SUBMITTALS

A. Submit properly identified product data, including properties of lay-in panels, fire tests, details of suspension grid system, and installation instructions for review before starting work.

B. Shop Drawings: As may be required by A/E. Coordinate grid erection drawings with lighting fixtures, air-conditioning outlets, access panels, sound system, and other openings and irregularities.

C. Samples: Submit two identified samples of each of the following for review and selection by A/E:

1. Exposed grid suspension system, including main runners, cross runners, and edge trim.
2. Acoustical lay-in panel, 12 inches square piece.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units and suspension system components to Project site in original, unopened packages.

   1. Store in a clean dry fully enclosed space and protect against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.5 QUALITY ASSURANCE

A. Installer: Company with three years minimum documented experience.

B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by the UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

C. Surface Burning Characteristics: As follows, tested per ASTM E84.

   1. Flame Spread: 25 or less.
   2. Smoke Developed: 50 or less.

D. Tolerances for Ceiling Grid Installation:

   1. Free of irregularities and level to within 1/8 inch in 12 feet.
   2. Maximum deflection: 1/360 of span.

E. Installation of Acoustical Ceiling Suspension Systems: ASTM C635.

1.6 SEQUENCING and SCHEDULING

A. Do not install acoustical ceilings until building is enclosed, air conditioning is working, dust-generating activities have terminated, and overhead work is completed, tested and approved.

B. Schedule installation of acoustic units after interior wet work is dry.

1.7 EXTRA STOCK

A. Furnish extra materials described below matching installed products, packaged with protective covering for storage, and are identified with labels describing contents.

   1. Acoustical Ceiling Units: Full size units equal to 1% of amount installed.

1.8 WARRANTY

A. Provide manufacturer's warranty against sagging, warping, and the growth of mold and mildew, for a minimum of ten (10) years from the date of substantial completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. High Humidity Resistant Acoustical Lay-in Panels, Mineral Fiber Type:

1. 24 inches x 24 inches.
2. Complying with ASTM E1264, Class A, Type III, Form 2, square edged.
3. Minimum Thickness: 5/8".
4. Finish: Factory applied, white, mold/mildew resistant.
5. Manufacturers:

a. Non-directional Panels:

1) Armstrong: Fine Fissured #1728 lay-in panels.
2) CertainTeed: Fine Fissured #HHF-157 lay-in panels.
3) USG Interiors: Radar ClimaPlus #2110 lay-in panel.

B. Acoustical Lay-in Panels, Fire Rated Mineral Fiber Type:

1. 24 inches x 24 inches.
2. Complying with ASTM E1264, Fire Rated, Class A, Type III, Form 2, square edged.
3. Minimum Thickness: 5/8".
4. Finish: Factory applied, white. mold/mildew resistant.
5. Weight: 1 pound per square foot minimum.
6. Manufacturers:

a. Non-directional:

1) Armstrong: Fine Fissured #1831 Fire Guard lay-in panels.
2) CertainTeed: Fine Fissured #PFF-157 Protectone lay-in panels.
3) USG Interiors: Radar ClimaPlus #2215 Fire Code lay-in panels.

C. Vinyl Faced Lay-in Panels, Gypsum Type:

1. 24 inches x 24 inches.
2. Gypsum, complying with ASTM E1264, Class A, Type III, Form 2.
3. Minimum Thickness: 1/2".
4. Finish: Factory applied 0.002" vinyl, washable white.
5. Manufacturers:

a. CertainTeed: Performa Vinylrock 1142-CRF-1 lay-in panels.
b. USG Interiors: Clean Room #3260 Stipple pattern lay-in panels.

D. Acoustical Lay-in Panels, Wood Fiber Type:

1. Wood fiber, complying with ASTM E1264, Class A, Type XX, square edge.

2. Minimum Thickness: 1-1/2".
3. Size: 23-3/4" x 47-3/4".
4. Finish: Factory applied, white.
5. Manufacturers:

    a. Tectum Inc. "Tectum".
    b. Or other A/E accepted equivalent.

E. Hangers: 12 gauge (0.109" diameter) annealed steel wire, galvanized.

F. Exposed Suspension Grids for Acoustical Lay-in Panels:

1. 2 feet x 2 feet grid pattern with steel caps for exposed grid tee and angle members complying with ASTM C635, zinc-coated or hot-dipped galvanized complying with A653, factory painted steel parts with factory applied white baked enamel or polyester finish.
2. Manufacturers:

    a. Armstrong.
    b. CertainTeed.
    c. ROCKFON, LLC.
    d. USG Donn, by USG Interiors, Inc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.

1. Coordinate and provide inserts, anchors, bolts, hangers, or other means to support ceilings suspended from structure.
2. If inserts have been omitted from the concrete structure, drill structure as needed to support equipment only with A/E's prior approval for drilling locations.

B. Install specified suspension system and acoustical lay-in panels according to ASTM C636 and CISCA Publication "Acoustical Ceilings - Use and Practice", and applicable manufacturer's printed instructions.

1. Complete partitions indicated to be extended to overhead construction with finishes applied before installation of ceilings abutting such partitions.
2. Provide one hanger minimum for each 16 square feet of ceiling.

    a. Locate hanger wire not more than 1 foot away from main runners resting on wall trim.

C. Acoustical Lay-in Panels:

1. Fit acoustical lay-in panels to grid accurately, without dented, broken, cracked, chipped, or soiled surfaces.
2. A cut panel shall be a size that will not expose an edge when the panel is slid to the opposite side.

D. Light Fixtures:

1. Fit acoustical lay-in panels accurately around surface mounted and stem mounted electrical fixture outlets.
2. Adequately support tees supporting light fixtures by hanger wires so grid is level after light fixture installation.

    a. Provide a hanger wire within 3 inches of each recessed lay-in light fixture corner.

E. Alignment:

1. Align suspension members for true level surfaces and straight lines. Run joints and exposed grid members parallel to the room axis in both directions.
2. Install exposed suspension grids per installers accepted grid layout drawings, properly coordinated with air conditioning and electrical trades.

F. Border Balance:

1. Balance border areas to avoid acoustical units less than 1/2 unit wide.

G. Textured or Patterned Acoustical Panels: Install in pattern in one direction including grain of panels with alternating grain, unless otherwise directed in writing by A/E.

3.2 ADJUSTING AND CLEANING

A. Replace dirty or discolored acoustical panel surfaces following erection and leave free from defects.

B. Remove damaged or improperly installed acoustical panels and replace.

END OF SECTION

09652 RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes provision for the installation of resilient tile flooring, including accessories and resilient base molding, and the preparation of the substrate surfaces over which these materials will be installed.

1.2 RELATED SECTIONS

A. Coordinate resilient tile flooring with the following:

1. 03300 Cast-in-Place Concrete.
2. 15421 Drains and Cleanouts.
3. 16132 Floor Boxes.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM). Latest publication for:

1. D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces, as Measured by the James Machine.
2. E84 - Standard Test Method for the Surface Burning Characteristics of Building Materials.
3. E648 - Critical Radiant Flux of Floor-Coverings Systems Using a Radiant Heat Energy Source.
4. E662 - Standards Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
5. F510 - Standards Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grid Feed Method.
6. F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
7. F1066 - Standard Specifications for Vinyl Composition Floor Tile (VCT).
8. F1700 - Standard Specifications for Solid Vinyl Tile.
9. F1861 - Standard Specifications for Resilient Wall Base.
10. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subflooring Using Anhydrous Calcium Chloride.
11. F1914 - Standard Test Method Short-Term Indentation and Residual Indentation of Resilient Floor Covering.
12. F2170 - Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
13. F2195 - Standard Specification for Linoleum Tile Floor Covering.
14. F2199 - Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat.
15. F2420 - Standard Test Method for Determining Relative Humidity on the Surface of Concrete Floor Slabs Using Relative Humidity Probe Measurement.

B. Florida Building Code (FBC).

C. Americans with Disabilities Act (ADA).

D. Resilient Floor Covering Institute (RFCI) - Recommended Installation Practice for Resilient Flooring.

E. All references indicating to follow manufacturer’s instructions shall imply using the latest manufacturer’s published information.

1.4 SUBMITTALS

A. Initial Submittals: Submit and obtain approval from A/E and CITY OF KEY COLONY BEACH, before making other submittals:

1. Text of Special Warranties, on manufacturer’s and installer’s corporate letterheads, as will be signed at completion, including warranty duration.
2. Certification of Installer: Submit resilient tile manufacturer’s certification of its installer.

B. Product Data: Submit manufacturer’s technical data for each type of product to be used, including resilient tile, flooring adhesives, sealers, accessories, etc., describing physical and performance characteristics, sizes, patterns and colors available for each.

C. Provide manufacturer's printed documentation indicating compliance with slip-resistant (Static Coefficient of Friction) required by ADA and applicable Codes, for the area of intended use.

D. Shop Drawings: Indicate tile layout, borders and patterns.

E. Submit manufacturer’s Material Safety Data Sheet (MSDS) indicating VOC content of all products.

F. Certification for Fire Test and Smoke Performance: Submit to A/E and CITY OF KEY COLONY BEACH, certification from an independent testing laboratory acceptable to authorities having jurisdiction that resilient flooring complies with fire test and smoke performance requirements.

G. Samples for Initial Selection Purposes: Submit manufacturer’s standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

H. Samples: Submit two full size tile samples, illustrating color and pattern for each color selected by A/E.

I. Submit two 12" long samples of base and edge trim material for each color specified.

J. Manufacturer’s Adhesives Certification: Submit certification that adhesives are compatible with flooring and substrate and are recommended for intended use.

K. Provider manufacturer's installation instructions, including special procedures and perimeter conditions requiring special attention.

L. Closeout Submittals: Submit the following:

1. Executed Special Warranties described below.
2. Manufacturer’s written verification that installer has followed manufacturer’s installation instructions.

3. Maintenance Manuals (at closeout): Two copies of the manufacturer's recommended maintenance practices for each type of resilient tile flooring that is installed. Include methods for maintaining installed products, recommended maintenance materials, suggested schedule for cleaning and refinishing, and precautions against cleaning material and methods detrimental to finishes and performance.
4. Copy of transmittal letter signed by the CITY OF KEY COLONY BEACH Project Manager, indicating receipt of all extra stock materials called for in this document.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Have at least 15 years production experience with resilient tile flooring and accessories similar to type specified.

B. Installer Qualifications: Certified, or trained and approved by the flooring manufacturer, having at least 5 years of experience in the installation of the specified products. Installer shall have completed at least three projects of similar magnitude, complexity and materials, and provide A/E and CITY OF KEY COLONY BEACH with references including contact names and telephone numbers.

C. Prior to commencing any resilient tile work, maintain ambient temperature as required by product manufacturers for a minimum of 72 hours prior to, during and 96 hours after installation of materials.

D. Do not commence work until concrete slabs are sufficiently dry to achieve bond with adhesive. Follow resilient tile manufacturer's instructions and perform Bond test, Moisture tests, pH tests and Vapor Emission tests in accordance with ASTM Standards indicated. Submit test results to A/E and CITY OF KEY COLONY BEACH for review prior to the start of work.

E. Install resilient flooring and accessories after other work, including painting, have been completed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Resilient tile flooring, and all related accessories, shall be stored in weather protected, clean, dry areas, containing constant ambient conditions within limits specified by product manufacturers. Storage conditions must prevent product distortion.

B. Store resilient tile, and all related accessories, 3 days prior to installation, in area of installation to achieve temperature stability.

1.7 PERFORMANCE REQUIREMENTS

A. Meet or exceed minimum static coefficients of friction (SCoF) in compliance with ADA, following ASTM D2047.

B. Through-Pattern: The colors and pattern appearing on the tile surface shall extend homogeneously through the entire thickness of the tile in a reasonably uniform pattern visible at each depth to which the tile is abraded.

1.8 SPECIAL WARRANTIES

A. By Manufacturer: In addition to the warranty and the correction of work requirements of the General Conditions, provide a written and signed Special Warranty from the resilient flooring manufacturer, endorsed by Contractor, to provide all labor and materials necessary to correct manufacturing defects in resilient tile and base work as follows:

   1. Non-prorated, for 5 years after date of Substantial Completion of the Work.
   2. Agreeing to correct by replacing with new material, any flooring having manufacturing defects such as tile or base that changes color, chalks, shrinks, crumbles or exhibits brittleness or excessive indentation due to manufacturing defect.

B. By Installer: In addition to the warranty and correction of work requirements of the General Conditions, provide a written and signed Special Warranty from the resilient flooring and base installer, endorsed by Contractor, to correct defects in the installation of the resilient tile and base work as follows:

   1. For 2 years after date of Substantial Completion of the Work.
   2. Agree to correct, by replacing using new material, all work showing defects such as loss of adhesion of flooring to concrete, or of base to floor and wall surfaces; adhesive squeeze-up; or any opening-up of the initial tight fit of flooring joints. This shall include, at no additional cost to CITY OF KEY COLONY BEACH, the labor necessary to move any furniture, equipment, etc. to access areas that require correction, and then placing back to their original locations, all items that were moved.

1.9 EXTRA STOCK

A. Provide extra stock in manufacturer un-opened boxes of each tile and base that match the products installed for future repairs by the City of Key Colony Beach staff. Provide a minimum of 1% or one full un-opened box, whichever is greater of all products (type, color, and pattern).

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Radiant panel fire test: Class I Rating per NFPA 253; Critical radiant flux of at least 0.45 W/cm sq.; ASTM E648.

B. Smoke density test: Optical density <450 per NFPA; ASTM E662.

C. Dimensional stability: <0.2% change; ASTM F2199.

D. Compliance with ASTM F1066, Class 2, Through-Pattern.

E. Indentation Limit: 0.0006 - 0.0015 in. at 77° for 1 minute; ASTM F1914.

F. Static Coefficient of Friction (SCoF): Shall comply with ADA and applicable Code requirements for intended area of use.

2.2 MATERIALS - VINYL COMPOSITION TILE (VCT)

A. Description: Vinyl composition tile comprised of resins with fillers and pigments, formed into homogeneous tile in a marbled or speckled through-pattern.

1. Size: 12 in. x 12 in.
2. Gauge: 0.125 in.
3. Finish: Prepped and polished as called for in this document.

B. Product / Manufacturer:

1. UPOFLOOR
2. Excelon Imperial Texture, by Armstrong.
3. Azrock VCT, by Tarkett.
4. Equal product in quality and performance as approved by A/E and CITY OF KEY COLONY BEACH.

2.3 MATERIALS - RESILIENT BASE

A. Description: Rubber (not vinyl). Provide in long rolls and cut as needed.

1. Height: 4 in. unless 6 in. is shown on the Drawings.
2. Profile: Per ASTM F1861, Type TP, Group 1, Style A - Basis of Design: “”Burkebase” as manufactured by Mannington Commercial. (cove bottom) where VCT is shown on drawings.
3. Profile: Per ASTM F1861, Co-extruded Thermoplastic Rubber Type TP, Group 1, Style B – Basis of Design: “Edge Effects”, Iconic EEICO as manufactured by Mannington Commercial. Provide wherever LVT is shown on drawings.
4. Outside and inside corners: Do not use pre-molded corner pieces. Instead follow resilient base installation instructions.
5. Color: As selected by A/E from the base manufacturer’s full palette of colors.

B. Base adhesive: Waterproof, non-toxic, low-VOC, light colored, formulated for maximum adhesion of rubber base and in compliance with manufacturer’s requirements.

C. Manufacturer: Burke, Roppe or Mannington.

2.4 LUXURY VINYL TILE (LVT)

A. Description: LVT with micro-bevel edges
   1. Size: 6” x 36”
   2. Thickness: .098”
   3. Color: Provide manufacturers full spectrum.

B. Product / Manufacturer:

   1. Mannington

2.5 STAIR TREAD WITH ABRASIVE NOSINGS (For use in tower staircase)

C. Description: Thermoset Vulcanized Rubber – Type TS
   1. Size: 3’ x 13” (.91 m x .33 m), 4’ x 13” (1.22 m x .33 m)
   2. Thickness: 1/8”
   3. Color: Provide manufacturers full spectrum.

D. Product / Manufacturer:

   2. Mannington

2.6 ACCESSORIES

A. Leveling Compound: Polymer-fortified cementitious compound with low VOC and as recommended by flooring manufacturer.

B. Primers and Tile Adhesive: Waterproof, antimicrobial, non-toxic low-VOC, non-staining, as recommended by tile manufacturer.

C. Rubber Transition and Edge Strips: Per manufacturer’s instructions, gently tapered profile, at least 2 in. wide, matching resilient tile thickness. Color as selected by A/E from manufacturer’s standard colors. Provide units of maximum length to minimize number of joints. Manufactured by Burke Mercer, Flexco, Johnsonite, Roppe or Mannington.

D. Metal Edge Strips: Of width shown on Plans and of required thickness to protect edge of resilient flooring. Provide units of maximum length available lengths to minimize number of joints, as produced by Pemko, Schluter or Zero.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions and lower wall surfaces are free from debris and are acceptable for product installation in accordance with manufacturer’s instructions.

B. Visually inspect all materials prior to installation. Material with visual defects shall not be installed.

3.2 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during product installation.

B. Prepare floor substrate in accordance with manufacturer's instructions.

C. Substrates shall be sound, smooth, flat, permanently dry, clean and free of all foreign materials including, but not limited to, dust, paint, grease, oils and solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue. Vacuum substrate to ensure surface is clean and meets manufacturer’s instructions.

D. Perform Concrete Moisture tests, Alkalinity pH tests, and Hydrostatic Pressure tests in accordance with manufacturer’s instructions and applicable ASTM Standards referenced in this document. All tests shall be performed by a certified testing firm at no additional cost to CITY OF KEY COLONY BEACH. Conduct a minimum of one test of each type for every 1,000 square feet of building area, or more frequently if required by the manufacturer’s instructions. These tests shall be conducted on all concrete floors regardless of their age, grade level or the presence of existing flooring. A diagram of the areas showing the location and results of each test shall be submitted to the A/E and CITY OF KEY COLONY BEACH for their review. Installation of the resilient tile shall commence only after all test results indicate that conditions of the substrate comply with manufacturer’s written instructions.

E. Perform Bond tests of substrate in accordance with manufacturer’s instructions.

F. Remove ridges and bumps from sub floors and, using a patching compound recommended by the resilient tile manufacturer, fill minor low spots, cracks, holes or other defects, to achieve a smooth, flat and hard surface.

G. Prior to application, apply a concrete slab primer if recommended by resilient tile manufacturer. Apply adhesive in compliance with manufacturer’s written instructions.

3.3 INSTALLATION

A. Install resilient tile and base following manufacturer’s instructions, except as more stringently specified herein.

B. Installing resilient tile:

1. Install tile flooring with joints parallel to building lines. Lay out so that there is no less than a half tile width at sides of room. Scribe flooring to produce tight joints at items penetrating flooring. Use chalk or other non-permanent marking devices.
2. Mix tile from separate boxes to ensure shade variations are consistent in tile placement.
3. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
4. Tightly cement resilient flooring to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand-roll all resilient flooring areas with heavy roller in compliance with manufacturer’s instructions, to attain full adhesion to substrate.
5. Install edge strips where flooring terminates and at unprotected or exposed edges. Secure resilient strips with adhesive.
6. At movable partitions, install flooring under partitions without interrupting floor pattern.

C. Installing resilient base:

1. Install base in lengths as long as practicable.

2. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.
3. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
4. Fit joints tightly and make vertical. Miter internal corners. At external corners, V-cut back of base, strip to 2/3 of its thickness and fold. Permanently form corners with no joint within 4 in. of corner.
5. Scribe and fit to door frames and other interruptions.
6. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material. Color of adhesive filler material is to match wall base color.

3.4 CLEANING AND PROTECTION

A. Remove excess adhesive from floor, base and wall surfaces without damage using methods and cleaners recommended by resilient tile and base manufacturers.

B. Sweep and vacuum floor after installation.

C. Protect resilient tile from damage by fully covering with an appropriate clean durable material. The durability of the material shall be appropriate to the anticipated level of activity remaining in the area. Contractor is responsible for any damage to the floors and will be required to replace areas damaged prior to work completion. Floor protection shall remain in place until Substantial Completion, or all work in the area is completed, whichever occurs last. Upon approval of CITY OF KEY COLONY BEACH Project Manager, the protective covering shall be removed by the Contractor and properly disposed.

D. Linoleum Tile Flooring: Perform initial maintenance "Starter Kit" procedures after completing flooring installation as recommended by linoleum flooring manufacturer.

E. VCT Floor Polishing: Allow newly installed VCT flooring a minimum of 96 hours for setting and drying of the adhesive, prior to polishing. Clean and prep VCT flooring and apply 4 coats of 24-7® Extended Performance Floor Finish by National Chemical Laboratories (NCL) Inc., or other high-quality commercial grade floor polish, following the manufacturer's published instructions. Floor polish shall meet ADA slip resistance coefficient for intended areas of application. Prior to application, provide A/E and CITY OF KEY COLONY BEACH the manufacturer's documentation indicating compliance with these requirements.

END OF SECTION

09900 PAINTING

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Painting of new interior and exterior surfaces.
2. Field painting of exposed and covered pipes, ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
3. Six (6) year warranty for labor and materials from the paint manufacturer.

B. Related Section:

1. 07900 - Joint Sealers.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition:

1. D3359 - Test Methods for Rating Adhesion by Tape Test.
2. D4262 - Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.

B. OSHA Workers Environmental Conditions.

C. National Fire Protection Association (NFPA): NFPA 30 - Flammable and Combustible Liquids Code.

D. Master Painters Institute (MPI) - “Architectural Painting Specifications Manual”, latest edition.

1.3 SUBMITTALS

A. General Requirements:

1. Paint Submittals shall comply with Section 01330 - “Submittal Procedures” and all the requirements stated in this document.
2. Provide five (5) complete copies of Submittals to the A/E.
3. One complete copy of each approved Submittal shall be kept at the job site, easily available for use by the A/E and CITY OF KEY COLONY BEACH.

B. Paint Submittals shall follow the following FORMAT:

Date: _____

General Contractor:

_____

Painting Sub-Contractor:

_____

Project Number:

_____

Project Name:

_____

Project Address:

_____

For each SUBSTRATE TYPE and LOCATION (i.e., Exterior Stucco, Interior Drywall, Interior Ceiling, Interior Metal Hand-Railings, etc.) provide the following:

SUBSTRATE TYPE and LOCATION):

Prime Coat:

Tradename: _____

Manufacturer: _____

Identification Number: _____

Intermediate Coat:

Trade name: _____

Manufacturer: _____

Identification Number: _____

Final (Finish) Coat:

Tradename: _____

Manufacturer: _____

Identification Number: _____

Provide trade name, and manufacturer of other paint work related materials:

Caulking Compound (gun grade):

Tradename: _____

Manufacturer: _____

Patching Compound:

Tradename: _____

Manufacturer: _____

This is to certify the previously listed paint materials have been accepted by the A/E and CITY OF KEY COLONY BEACH for use on the specified project as designated.

SIGNED: _____DATE: _____
Painting Contractor

SIGNED: _____DATE: _____
General Contractor

Five signed copies are required. All five copies shall be returned to the A/E's office for acceptance and distribution.

C. Product Data: Submit Manufacturer Safety Data Sheet (MSDS), manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.

D. Samples:

1. Color Chips:

a. Before starting work, furnish the A/E color chips from approved manufacturer’s color fan. Color chips shall comply with approved colors selected by the A/E.
b. Use representative colors when preparing samples for review.

E. Warranty:

1. Submit paint manufacturer's proposed 6-year warranty document.
2. Submit paint manufacturer's proposed program of inspection and approval before and during the Work as required by paint manufacturer to implement the submitted 6-year warranty.
3. Warranties require acceptance by A/E and CITY OF KEY COLONY BEACH.

1.4 QUALITY ASSURANCE

A. Qualifications: Paint applicator shall be licensed in the State of Florida or in Monroe County and use state or county-certified journeymen. Provide a legible copy of license and, when applicable, a journeyman's certification attesting to required qualifications.

B. Certifications: Paint applicator shall provide a certification attesting to having worked on projects similar in scope to this project for a minimum of 5 years. Paint applicator not providing such documentation or not having the required experience will be removed from the project and replaced by the Contractor.

C. Only paint materials approved by the A/E and CITY OF KEY COLONY BEACH are allowed at the worksite. Any Deviation from this requirement will be sufficient grounds, at the discretion of the A/E or CITY OF KEY COLONY BEACH, for the rejection of all completed paint work. In such cases the Contractor shall properly prepare and repaint surfaces previously painted, to the satisfaction of A/E and CITY OF KEY COLONY BEACH, at no additional cost to the City.

D. Quality assurance issues, including but not limited to, material selection, surface integrity and other tests, surface preparation, painting procedures, workmanship, and

warrantability require review and acceptance by the A/E and CITY OF KEY COLONY BEACH.

E. Mockups:

1. After coordinating and receiving approval for application onto designated mockup sample walls, apply the approved paint samples.
2. Duplicate painted finishes of prepared samples on actual wall surfaces and other exterior and interior building components.
3. Provide full coat finish samples on at least 100 sqft. of surface, as directed, until required sheen, color, and texture are obtained. Simulate finished lighting conditions for review of in-place Work. Final acceptance of colors will be from samples applied on mockup
4. The contractor will test the mockup sample according to MPI standards to determine if the mockups meet the requirements of these specifications. If the test fails, any retesting by A/E and CITY OF KEY COLONY BEACH shall be at the Contractor's expense.

F. Surfaces to be Painted:

1. Except where natural finish of material is specifically noted as surface not to be painted, paint exposed surfaces with colors as designated in schedules.
2. If color or finish is not designated, coordinate with A/E for selection.
3. Paint (red), using stencils, identifications and warnings, following text specified in other sections.

G. The following categories of Work are not included as part of field-applied finish work, unless otherwise specified:

1. Pre-Finished Items: Do not include painting of factory-finished or installer-finished specified items such as, but not limited to, pre-finished partition systems, acoustic materials, laminated doors and cabinetry, architectural woodwork and casework, elevator entrance doors and frames, attached signs, elevator equipment, finished mechanical and electrical equipment, light fixtures, switchgear, and distribution cabinets.
2. Concealed Surfaces: Painting is not required, unless noted otherwise on the Drawings, of concrete or masonry surfaces such as walls or ceilings in concealed and areas of limited access, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and elevator shafts.
3. Finished Metal Surfaces: Painting is not required at metal surfaces of anodized or enameled aluminum, stainless steel, chromium plate, bare copper, bare bronze, and metals of similar finish.
4. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts are not required to be painted.

H. Shop Priming:

1. Shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work, and similar items.
2. Shop priming of fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories are included under other sections of these specifications.

I. Do not paint over code-required labels such as Underwriters Laboratories (UL) and Factory Mutual (FM), name, equipment identification, performance rating, or nomenclature plates, or at piping or circuit identifiers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material.
2. Federal Specification number.
3. Manufacturer's stock number and date of manufacture.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Application instructions.
7. Color name and number.
8. Indicate if paint is for interior or exterior use.

B. Storage:

1. Store all paint material per manufacturer written recommendations.
2. Store materials that are not in actual use, in tightly covered containers.
3. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
4. Protect from freezing or extreme heat.
5. Keep storage area neat and orderly.
6. When flammable materials are to be left on-site during the Work, store the tightly covered materials in cabinets meeting the requirements of NFPA 30 and have FM and UL labeling.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50- and 90-degrees F, unless otherwise allowed by paint manufacturer's printed instructions.
2. Do not apply paint in rain, fog, or mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise allowed by paint manufacturer's printed instructions.
3. Do not apply paint in areas that are not broom clean and free of dust and debris.
4. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
5. Do not perform work where plaster or cement is being applied or is in the curing process.
6. Do not apply paint unless minimum lighting level, as recommended by MPI, is provided on surfaces to be painted.
7. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

B. Workers Environmental Conditions:

1. Comply with the standards established in OSHA Workers Environmental Conditions.
2. Take precautions to ensure that personnel and work areas are adequately protected from fire and health hazards resulting from handling, mixing, and application of paints.
3. Illumination: Provide lighting equal to the permanent lighting planned for designated space.
4. Ventilation: Provide adequate ventilation to prevent buildup of fumes.
5. Contain and prevent vapors or dust generated by the Work from polluting adjacent occupied space.

1.7 SEQUENCING AND SCHEDULING

A. Phase the project to allow reasonable time for the inspection and written approval at each phase of the work by all relevant personnel including but not limited to the A/E, CITY OF KEY COLONY BEACH, and the Paint Manufacturer's Representative.

1.8 WARRANTY

A. Provide a written warranty, co-signed jointly and severally by the Painting Subcontractor and Materials Manufacturers, against, but not limited to, cracking, peeling, flaking, chalking, and mildew on interior painted surfaces, and additionally against erosion and unreasonable fading on exterior surfaces, for 6 years from the date of Substantial Completion; agreeing to repair and repaint surfaces affected by such defects, at no cost to CITY OF KEY COLONY BEACH including necessary removal or protection of other work, without limit, within 30 days after notification by CITY OF KEY COLONY BEACH, and to perform such work based on the provisions of this section.

1.9 ADDED STOCK

A. Provide two 5-gallon containers, properly labeled and sealed, of each type and color of finished paint used on the project. If less than 10 gallons of a particular type and color was used, then provide 1 one-gallon container.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. All paint materials shall be listed in the latest edition of the *MPI "*Approved Product List" and shall be from a single manufacturer for each system used.

B. All materials, preparation and workmanship shall conform to the standards contained in the latest edition of the Master Painters Institute (*MPI).*

2.2 MATERIALS

A. Paint systems used for the project shall be selected by the Painting Sub-contractor with collaboration from the paint manufacturer and shall meet all the performance criteria and Warranty requirements specified in this document.

B. Primers, Undercoats, Intermediate and Finish Coats: Use materials from same manufacturer when such materials are applied on same surface.

C. Color Selection:

1. Color selection made by A/E is to determine basic color required for surface.
2. Select colors from approved finish schedule and/or color board.
3. If color is not listed for a specific area or item, Contractor is not relieved of responsibility for providing colors subsequently selected.
4. Colors with same designation but produced from two or more sources shall match when viewed from distance of 24 inches or more.
5. Final application of colors shall match mock-up approved by A/E.

D. Storage Cabinets and Disposal Containers for Flammable Materials:

1. Meet the requirements of NFPA 30.
2. Contain Factory Mutual (FM) label and Underwriters Laboratories label.

PART 3 EXECUTION

3.1 INSPECTIONS and TESTING

A. Prior to bidding, the Contractor, the Painting Subcontractor and the Paint Manufacturer's Representative shall assess, examine, and test as required, all surfaces scheduled to be painted, and perform the following:

1. Evaluate surface conditions of areas to be painted.
2. Determine the Degree of Surface Deterioration (DSD) of existing area to be repainted, using assessment criteria indicated in MPI manual.
3. Develop corrective and surface preparatory work necessary to ensure that selected paint systems meet the performance criteria and Warranty requirements specified in this document.
4. Provide a copy of all findings and test results to the A/E and CITY OF KEY COLONY BEACH during the Pre-Painting Coordination Meeting indicated in Part 1 of this document.

B. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in a manner acceptable to the A/E and CITY OF KEY COLONY BEACH.

C. Start of painting operations implies contractor's acceptance of the surface conditions and responsibility for required standards of quality and appearance.

3.2 PREPARATORY WORK –

A. Prepare all surfaces scheduled to be painted in accordance with MPI requirements.

B. Remove electrical outlet and switch cover plates, finish hardware escutcheons and cover plates, air-conditioning registers, and other finished items installed on surfaces to be painted and replace afterwards or provide protection as approved by A/E. Protect items and surfaces that cannot be removed or that do not interfere with the painting and leave clean and completely free of paint.

C. Clean surfaces of all dirt, dust, or other contaminants that affect adhesion of paint or appearance of paint. Clean grease and oil from metal surfaces with turpentine or mineral

spirits and wipe dry before priming. Wire brush or sand metal surfaces to remove rust and scale. Touch-up factory primed surfaces with compatible factory primers. Schedule the cleaning so that contaminants from the cleaning process will not fall onto the wet painted surfaces.

D. Fill nail holes, route-out and fill cracks, open joints, and other defects to match existing surface areas.

E. Allow all coats to dry thoroughly before applying succeeding coats. Comply with paint manufacturer's recommendations.

F. Prime un-finished metal not shop-coated when delivered to the job or as soon as possible after delivery. Back prime all woodwork to be erected against masonry or concrete before erection. Protect the tops and bottoms of all wood doors with a heavy coat of varnish before installation.

G. Clean surfaces between coats as recommended by the paint manufacturer.

3.3 APPLICATION

A. General:

1. Perform work in a thorough and professional manner in conformance with accepted good practices and requirements of authorities having jurisdiction.
2. Protect finished materials and areas not to be painted by using drop cloths, masking, or other accepted methods.
3. Provide adequate ventilation for proper drying of surfaces before and after painting.
4. Drying Period: Allow each coat to dry thoroughly before succeeding coats are applied. Minimum drying time shall be according to manufacturer's recommendations.

B. Apply materials, as they come from manufacturer to dry surfaces according to manufacturer's directions as printed on container. Any mixing on site requires specific and special approval from CITY OF KEY COLONY BEACH and the A/E.

C. Apply finish coat to give an even, solid color. For deep tone finish colors, use deep base or monochromatic gray primers recommended by manufacturer.

D. Apply paint materials by brush, roller, or spray method.

1. Select method best suited to profile, texture, and finish of existing surface, subject to suitability regarding safety and conditions in existing or occupied areas, and subject to approval by paint manufacturer, A/E and CITY OF KEY COLONY BEACH.
2. Apply materials evenly, smoothly flowed on and cut in neatly, without runs, sags, wrinkles, shiners, streaks, and brush marks; drying uniformly to color and sheen selected. Make dividing lines straight and clean cut.

E. Dry Film Thickness:

1. Comply with manufacturer's specifications for minimum and maximum dry film thickness.

3.4 FIELD QUALITY CONTROL

A. Notify A/E, material manufacturer's representatives, and CITY OF KEY COLONY BEACH when critical points in the painting and repainting work are reached, to allow timely inspection and approvals. Critical points include during and after the operation, plus other points designated by CITY OF KEY COLONY BEACH, A/E, or material manufacturer representatives:

1. Surface patching and preparation.
2. Sealing of surfaces.
3. Application of primer and transition coats. Adhesion testing of transition coats may be required.
4. Intermediate and finish coats.

3.5 ADJUSTING AND CLEANING

A. Remove construction debris, material containers, equipment, and other trash resulting from work of project.

B. Upon completion of work, remove stains and paint spots from floors, wall, woodwork, electric trim, hardware, fixtures, and other items of CITY OF KEY COLONY BEACH's property.

3.6 IDENTIFICATION OF SURFACES AND PAINTING SCHEDULE

A. Material designations shall follow format established by MPI "Approved Products List" and "Listing Manufacturers".

1. Submit requests for substitutions originating from the materials manufacturers at the Pre-Construction meeting specified in Part 1 of this section.
2. Such substitutions will be considered only to allow manufacturers to meet the terms of the warranty requirements and will be subject to approval by the A/E and CITY OF KEY COLONY BEACH.
3. Substitutions from other sources will be considered as provided in Instructions to Bidders and General Conditions.

B. Special Notes:

1. Sand surfaces normally smooth before application of paint materials.
2. Preparation not completed or overlooked before application of first coat of paint shall be accomplished between coats of paint, regardless of acceptance on original preparation.

C. INTERIOR AND EXTERIOR SURFACES PAINT SCHEDULE

1. Follow the Paint Schedule indicated on the Contract Documents.

END OF SECTION

10170 SOLID PLASTIC TOILET PARTITIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Toilet partitions and urinal screens, complete with hardware.

1.2 REFERENCES

1. National Fire Protection Association: NFPA 286 – Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 SUBMITTALS

A. Product Data:

1. Show details of construction, assembly and anchorage to building construction, manufacturer's specifications including description of hardware, and maintenance instructions.
2. Include test reports confirming Class C and toxicity requirements.

B. Shop Drawings:

1. Provide dimensioned partition plans, elevations, details, swing of doors, color, and location of hardware items and required wall blocking.
2. Label components and fully describe anchorage devices and substrates.
3. Show relationship to plumbing fixtures.

C. Samples:

1. 6-inch by 6-inch samples of panel material in both stock and custom colors.
2. Include sample of fastener and shield for wall bracket anchorage.

D. Copy of manufacturer's standard 15-year warranty (minimum) submitted with shop drawings, guaranteeing against material defects or faulty fabrication, assembly, and installation.

1.4 QUALITY ASSURANCE

A. Installer Certification: Provide documentation from the toilet partition manufacturer that installers have been factory-trained in the installation of these partitions.

B. Mock-Up: If required by A/E, install mockup of stall in area designated by A/E. Approval by A/E is required before ordering, production, or delivery of remaining partitions.

C. Gravity cam or integral hinges are not allowed.

1.5 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. Ship components with protective wrap. Store and handle according to manufacturer's printed instructions.

1.6 WARRANTY

A. Upon completion of installation, submit warranty for 15-years starting at date of substantial completion, stating that failed products or installation shall be replaced at no additional cost to the City of Key Colony Beach.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Solid Plastic Toilet Partitions:

1. ASI Accurate Partitions (Burr Ridge, IL)
2. ASI Global Partitions (Eastanolle, GA)
3. Metpar Corp, - High Density Polyethylene.
4. Scranton Products, Scranton PA: Hiny-Hiders - High Density Polyethylene.
5. Other product of equal quality and performance as approved by the A/E.

2.2 MATERIALS

A. Panels, pilasters, and doors of 1-inch-thick seamless high-density polyethylene (HDPE) resin compound. A/E shall select color from manufacturer's stock or custom colors. All edges shall be machined to a 0.250" radius. Phenolic resin construction is not acceptable.

1. Plastic material shall comply with the following:

a. Flame Spread of less than 200 and Smoke Developed of less than 450 when tested according to ASTM E84.
b. National Fire Protection Association (NFPA) 286: PASS
c. Products of combustion of "no more toxic" than those from burning wood when tested according to NBS-TOX, 48.1.
d. Integral color shall be uniform throughout panel and all panels shall match.

B. Toilet partitions, privacy screens and urinal screens shall have pilasters floor mounted and overhead braced, with full length wall brackets.

C. Wall bracing shall have a metal anti-grip design.

D. Hardware:

1. Headrails: Extruded aluminum alloy with a clear anodized finish; anti-grip design, with stainless steel headrail brackets.
2. Hinges: Continuous hinge 54 inches long, aluminum, mounted at doors and pilasters with tamper resistant sex bolts placed 8 inches on center, Self-closing spring-loaded barrel, snap-on covers, gravity/cam or integral hinges are not allowed.

a. Model A19 by Santana.
b. 400 Series by Markar Products, Lancaster NY.
c. Continuous Stainless Steel Cam Action Hinges - ASI
d. Or Other A/E accepted equivalent.

3. Brackets: Stainless steel, continuous (full length of panel - 54” long), used to connect panels to panels, panels to wall, and panel to pilasters. Through-bolt brackets to panels and pilasters using tamper resistant stainless steel sex bolts.
4. Pilasters: Solid plastic to match type and color of plastic panels with leveling bolts.
5. Shoes and Fasteners: Stainless steel. Use tamper resistant sex bolts.
6. Door Pulls, Door Strikes, and Doorstops: Heavy chrome plated Zamac or stainless steel.
7. Door Latches: Stainless steel or heavy-duty aluminum housing, slide bolt, and button. Use tamper resistant sex bolts.
8. Provide clear anodized aluminum bars fastened to bottom edge of panels and doors with theft-proof countersunk screws. Bars shall be flush with faces of panels.
9. Finish of exposed portion of screws, bolts, and nuts shall match finish of attached hardware item. Sex bolts shall be stainless steel barrel nut and shoulder screw design with tamperproof head. Color to match bracket.

E. Anchorages:

1. Connection to wall shall provide a rigid and durable anchorage to wall construction. Use expansion bolts or "butterfly" type bolts. Finish of exposed portions shall match finish of wall brackets.
2. Plastic shields will not be accepted unless partition manufacturer can demonstrate that they will not work loose in wall or cause a less than rigid and durable anchorage and be guaranteed by the partition manufacturer and the partition installer against pullout or loosening.

2.3 FABRICATION

A. Fabricate compartments to the following configuration. Dividing panels and doors shall be minimum 55 inches high x length required and with bottom edge of panels 14 inches above the floor. Top of pilasters shall be 82 inches above finish floor and fastened to 3-inch-high shoes of same material as pilaster.

B. Fabricate urinal screens to the following configuration. Dividing panels shall be 42 inches high x 24 inches wide and with bottom edge of panels 18 inches from the floor. Provide ceiling support and fasten to floor shoes.

C. Using template provided by toilet accessories manufacturer, provide cutouts for recessed items.

D. Compartments for handicapped use shall be fabricated according to the latest accessibility code requirements.

E. Stall doors shall be self-closing.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify dimensions at areas to receive partitions and plumbness of walls and soundness of wall surfaces that would affect installation of holding brackets. Verify blocking is installed in stud walls to receive partition anchorages.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of partitions.

C. Do not begin installation of partitions until conditions are satisfactory.

3.2 ERECTION

A. Install partitions rigid, straight, plumb, and level. Follow partition manufacturer's printed installation instructions and final approved shop drawings.

B. Provide uniform clearance of not more than 1 inch between panels and walls, and clearance of not more than 1/4" at vertical edges of doors uniform from top and bottom.

C. Locate wall brackets with holes for wall anchorages occurring in masonry or tile joints wherever possible.

D. Conceal evidence of drilling, cutting, and fitting.

3.3 ADJUSTING AND CLEANING

3.4 Perform final adjustments to leveling devices and hardware.

3.5 Clean exposed surfaces of partitions, hardware, fittings, and accessories.

1. Avoid soiling other adjacent finishes.
2. Follow partition manufacturer's printed cleaning instructions.

END OF SECTION

10200 WALL LOUVERS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install louvers, insect screens, structural supports, attachment brackets, hardware and related components, as shown on drawings, as specified, and as needed for a complete and proper installation.

B. Related Sections:

1. 07900 - Joint Sealers.

C. References: Latest edition of the following:

1. Florida Building Code (FBC).
2. American Society of Civil Engineers (ASCE) 7.

a. Minimum Design Loads for Buildings and Other Structures.

3. Monroe County Protocols:

a. TAS 201-94 Impact Test Procedure.
b. TAS 202-94 Criteria for Testing Impact and Non-Impact Resistant Building. Envelope Components Using Uniform Static Air Pressure.
c. TAS 203-94 Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

4. American Society for Testing and Materials:

a. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
b. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finish Bar, Rod, and Wire.
c. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profile, and Tubes.
d. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

5. The Aluminum Association Incorporated:

a. Aluminum Standards and Data.
b. Specifications and Guidelines for Aluminum Structures.

6. Architectural Aluminum Manufacturers Association (AAMA):

a. AAMA TIR Metal Curtain Wall Fasteners.
b. AAMA 2605 - Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

1.2 SUBMITTALS

A. Product Data: Include material specifications and printed installation instructions before starting work.

B. Shop Drawings:

1. Indicating louver locations and elevations, opening clearance dimensions and tolerances, head, jamb, and sill details, blade configurations, screens, frames, gage of metal, stiffeners, clips, fastening and anchor gage devices, and color standard selections.
2. Anchorage detail and connections for all component parts.
3. Provide structural calculations signed and sealed by a Professional Engineer registered in the state of Florida

C. Performance Requirements: Provide AMCA and/or BSRIA test data as required to confirm that the louvers have the specified air and water performance characteristics.

D. Submit color chips from manufacturer's available color selection.

E. Sample section of louvers.

1.3 QUALITY ASSURANCE

A. Louver assembly, including louvers, louver frames, mullions, and fastenings shall be designed to meet applicable requirements established by FBC and (ASCE) 7, for High Velocity Hurricane Zone (HVHZ).

B. Certification: Submit manufacturer's certification that louvers and fastenings conform to applicable codes and have a current Monroe County Product Approval Notice of Acceptance (NOA) or Florida Product Approval certification.

C. Louvers shall be tested and certified to be "Class "A" rated (99 percent effective against water penetration) according to Building Services and Research Information Services (BSRIA). Deflection shall not exceed 1/180th of member span.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wall Louvers, rated for High Velocity Hurricane Zone (HVHZ):

1. Manufacturers:

a. Vertical aluminum louvers.

1) Model DCV-5704, by Construction Specialties, Inc., Cranford, NJ.
2) Model SCV501MD by Airolite, Schofield, WI
3) or other A/E accepted equivalent.

b. Horizontal aluminum louvers:

1) Basis of Design: Model DCH-5704 by Construction Specialties, Inc., Cranford, NJ., or other A/E accepted equivalent.

2. Sizes: As indicated on drawings.
3. Fabrication:

a. Materials: Fabricate blades, jamb frames, and mullions from extruded 6063-T5, 6063-T6 or 6063-T52 aluminum alloy.
b. Insect Screens: Removable type, 18x16 aluminum mesh 0.011" diameter wire insect screens, secured within 0.05” thick extruded aluminum frames. Frames to have mitered corners and corner locks.
c. Fasteners: Approved stainless-steel fasteners for securing louver frames to wall construction.
d. Sealant: As specified in Section 07900.
e. Color: As selected by A/E.
f. Finish: Comply with NAAMM "Metal Finishes Manual" for finish designations and application. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Finish shall be as follows:

1) Polyvinylidene coating Kynar 500 or Hylar 5000, minimum 1.4 mil, with manufacturer’s 20-year warranty against peeling, fading, and cracking.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install louvers where indicated on drawings according to manufacturer's printed installation instructions and accepted Shop Drawings.

B. After installation is complete, clean louver assemblies with materials and methods as recommended by manufacturer.

END OF SECTION

10260 WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fiberglass Reinforced Plastic (FRP) Wall Protection.

B. Related Requirements:
   1. Section 01330 - Submittals Procedures.
   2. Section 01600 - Material Equipment and Approved Systems.
   3. Section 06400 – Architectural Woodwork.

1.2 SUBMITTALS

A. Product Data: Data indicating characteristics, available colors, and component dimensions.

B. Samples:
   1. Panels: 12 by 12-inch square, each type and color.
   2. Plastic lumber and corner guards: 12-inch length, each type and color.
   3. Fasteners: One of each type.

1.3 DELIVERY, STORAGE, AND HANDLING

A. In accordance with manufacturer instructions for components.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

A. Product Description:
   1. 0.09-inch thick, white, embossed finish, Class A Fire Rated panels.
   2. Provide Manufacturer’s trim, joining and cap accessories.
   3. Install panels in accordance with Manufacturer’s reccommendations.

B. Manufacturer/Model:
   1. Crane Composites, Channahon,IL (800) 435-0080.
      a. Glasbord FX.
   2. Glasteel, Moscow, TN (800) 238-5546.
      a. Glasliner FRP.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates, and conditions are as required, and ready to receive Work.

3.2 INSTALLATION

A. Fiberglass Reinforced Plastic (FRP) Wall Protection:
   1. Install FRP panels and corner guards in accordance with manufacturers recommendations.

3.3 FIELD QUALITY CONTROL

A. Inspect Products for proper material, color, placement, and alignment.

USPS CSF Specifications issued: 10/1/2021
Last revised: 8/20/21

END OF SECTION

10284 ELECTRIC HAND DRYERS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Coordinate electric hand dryers with work before and after. See especially wall structure and finish sections, and electric power sections.

B. Provide dryers from one producer for this project.

1.2 SUBMITTALS

A. Product Data: Include items such as noise level, motor and sensor data, wiring.

B. Shop Drawings: Show dimensions and method of fastening for maximum vandalism and pull-out resistance

C. Dryer Mockup: Mount and hook up 1 dryer in place at the project site for demonstration and approval before starting the rest of installation. The mockup dryer, if in good condition, may be installed in the work after A/E's approval.

1.3 WARRANTY

A. Replace electric hand dryers that show manufacturing defects, from the time of installation until 5 years after date of Substantial Completion.

PART 2 PRODUCTS

2.1 ELECTRIC HAND DRYERS

A. Description: ADA compliant projection beyond face of wall, blowing hot air in one direction, with outlet not easily accessed for abuse, electric motor activated by sensor only, and with automatic drying cutoff time and high-temperature cutoff.

B. Shape of dryer: Top surface sharply down-sloping or curving down, with no projections from which clothing, bookbags, or persons can hang or be hung.

1. Maximum projection from wall: ADA Compliant.
2. Wall-mount Type: Surface or recess-mounted.
3. Motor / fan / sensor case: Galvanized steel, 18 ga or heavier, with conduit knockouts on opposite sides, back or bottom, and 4 mounting brackets at face for fastening with No.12 toggle bolts or screws to steel framing or to masonry inserts.
4. Internal splash guards: Provide at sensor, switches, heater, and motor to minimize effects of any liquid intrusion.
5. External case: 18 ga stainless steel, brush or satin chrome finish on 18 ga steel, with edges beveled 40° to 50° or curved less than quarter-round, designed to resist prying-off and to not allow effective applying of force vertically or sideways.
6. Case fasteners: Heavy tamper-resistant (TR) screws. Deliver one TR screw bit to CITY OF KEY COLONY BEACHCITY OF KEY COLONY BEACH for each project.

7. Air outlet: Recessed, with sturdy grille or other guard to resist access to sensor, heating element, fan and motor. Outlet shall not be rotatable or adjustable by users.
8. Operation: By automatic infrared sensor only, inconspicuous and located out of view of users; no pushbuttons.
9. Maximum noise level in operation: 75 dB.
10. Sensor: Solid state electronic infrared, without relays or moving parts, turning off 2 sec maximum after hands are removed, or 40 sec after start, whichever is earliest.
11. Airflow: At least 150 ft3/min, at a velocity that effectively dries hands in a maximum of 20 seconds.
12. Motor: Lowest rpm (to reduce noise) that will produce specified airflow, permanent lubrication, with automatic-reset thermal protection, and circuit breaker; no fuses.
13. Motor power consumption: 10 to 18 A at 110/120 V AC.
14. Heater: Nickel/chromium wire to heat without wire glow, thermally protected to cut out at 90 °C / 130 °F., not accessible by users through the air outlet.

C. Standard: Product shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

D. Product / Producer.

1. Xlerator XL, by Excel Dryer, Inc. (Basis of Design)
2. Machflow, by Saniflow, a Mediclinic Company
3. Other product equal in quality and performance as approved by A/E and CITY OF KEY COLONY BEACH.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Coordinate and verify the mounting and opening heights, the size of openings, and the providing of 20 ga steel studs / furring and cats to receive heavy-duty screws or toggle bolts for mounting dryers.

1. If dryers are shown to be placed within 60 in. of plumbing fixtures, notify A/E so that proper protection for users can be accomplished.

B. Verify that field conditions and opening preparation, as well as electric service are acceptable and are ready to receive dryers.

3.2 INSTALLATION OF ELECTRIC HAND DRYERS

A. Install dryers following producer’s current published directions and recommendations, except as more stringently specified herein.

B. Fasten dryer motor cases and room cases so as to be pry-resistant and to withstand a withdrawal force of 200 lb at each fastener.

C. Demonstrate each dryer to be in good working order. Protect dryers until date of Substantial Completion. Leave clean and in good operating condition.

END OF THIS SECTION

10350 FLAGPOLES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 03300 - Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Shop Drawings: Flagpole and base, showing general layout, jointing and complete anchoring, supporting system, details, and sections as required.

B. Submit samples of finished metal for flagpole and accessories as requested.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aluminum Flagpoles:

1. American Flagpoles, Abingdon, VA.
2. Concord Industries, Inc., Addison, TX.
3. Eder Flagpole Company, Inc., Oak Creek, WI.
4. Morgan Francis, Waterbury, CT.

2.2 MATERIALS AND COMPONENTS

A. General:

1. Flagpole and Base: Design and construct to withstand wind velocity pressures determined by FBC and American Society of Civil Engineers (ASCE) 7, latest edition.
2. Height: Exposed height of 30 feet plus required depth in ground for foundation.
3. Standard flash collar design.
4. Halyard:
   a. Internal: Revolving truck, keyed flush access door.
   b. External: Revolving truck, 9" cleat.

B. Aluminum Flagpoles:
1. 6063-T6, continuous taper, and seamless.
2. Finish: Satin brushed.
3. Color: Anodized or duranodic color selected by A/E.
4. Foundation:

   a. Minimum 16-gage galvanized corrugated steel tube, or minimum 12 gage rolled steel tube, sized to suit the flagpole and installation.
   b. Furnish complete with welded steel bottom base and support plate, lightning ground rod to groundwater, and steel centering wedges, all welded construction.

c. Provide loose aluminum wedges at top for plumbing pole after erection. Wood wedges are for temporary use only.

5. Galvanize steel parts after assembly, including foundation tube.

2.3 FITTINGS

A. Aluminum Ball: 6 inches, spun from 14-gauge aluminum, gold anodized, mount on 5/8" rod attached to truck. Screwed fittings are not allowed.

B. Non-Fouling Ballbearing Revolving Truck: Standard, with cast aluminum body, fitted with two, 2-inch diameter aluminum sheaves.

C. Internal Halyards: Swivel snaps.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install flagpole as shown and according to accepted shop drawings and manufacturer's instructions.

B. Paint portions of flagpole below grade with heavy coat of bituminous paint.

C. Provide positive lightning ground.

1. Ground flagpole as indicated in Articles 250-83 and 250-84 of National Electrical Code.
2. Measure resistance from pole to the ground.

D. Excavation:

1. Excavate for foundation concrete to neat, clean lines in undisturbed soil.
2. Provide forms as directed by A/E due to unstable soil conditions.
3. Remove wood, loose soil, rubbish and other foreign matter from within excavation, and wet earth before placing concrete.

E. Concrete:

1. Provide and place 3,000 psi minimum concrete according to Section 03300 - Cast-In-Place Concrete.
2. Slope or dome top surface of concrete setting base to direct water away from pole.
3. Minimum diameter of concrete base shall be equal to length of pole at setting depth.

END OF SECTION

10400 IDENTIFYING DEVICES

1 PART 1- GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section Includes:

1. Unframed signs, tactile lettering and raster Braille on PET acrylic face, for interior applications.

C. Related Sections:

Section 10420 Cast Plaques
Section 10430 Dimensional Letters - Fabricated Metal LF Series
Section 10440 Dimensional Letters - Cut Vinyl LTV Series
Section 10430 Specialty Signs – Simulated stone materials
Section 10430 Specialty Signs – hardened enamel or porcelain materials Porcelande™
Section 10430 Exterior Aluminum Signs - Post and Panel2100 Series
Section 10430 Exterior Aluminum Signs - Post and Panel2300 Series
Section 10430 Exterior Aluminum Signs - Post and Panel2400 Series
Section 10430 Exterior Aluminum Signs - Post and Panel2500 Series
Section 10440 Interior Unframed Signs - Plastic Laminate or Acrylic with Raster Braille InTac

D. [Allowances: Work of this section is affected by allowances. Refer to Division 1 for allowance amounts and requirements.]

1.2 QUALITY ASSURANCE

A. Single Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

B. Design Criteria**:** The Drawings indicate size, profiles, dimensional requirements and graphics layout of signs and are based on the specific type and model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the designer. The burden of proof of equality is on the proposer.

1.3 SUBMITTALS

A. General**:** Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product Data**:** Include Manufacturer’s construction details relative to materials, dimensions

of individual components, profiles, and finishes for each type of sign required.

C. Color Chart: Manufacturer's standard chart.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver components correctly packed to prevent damage.

B. Store in secure areas, out of weather and protected from work of other trades.

C. Handle IAW Manufacturer's instructions.

1.5 WARRANTY

A. Provide Manufacturer's standard one-year limited warranty covering manufacturing defects.
Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.

1. Warranty Period: one (1) year from product ship date.

2 PRODUCTS

2.1 SIGNAGE SYSTEMS

A. Acceptable Manufacturers:

ASI Signage Innovations 20202 NE 15th Court Miami, Florida 33179
(305) 653-1974 ; (305) 653-3660 www.asisignage.com ; carol.grayson@asisignage.com

1. Substitutions: Submit in accordance with Section 01600.

B. Acceptable Product: InTac™ ADA-Ready™ Sign System with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details.

2.2 SIGN MATERIALS

A. Sign Face: Subsurface Painted acrylic, .125 inch thick, matte first surface.

B. Applied Lettering and/or Numerals: LPP Series Individual, Acrylic, Dimensional Characters. Individual cut acrylic letters (1/32" thick) with matte finish.

C. Grade 2 Braille: Clear raster balls.

D. Fastener: VHB Tape - .030-inch-thick double-face tape.

2.3 PLAQUE OPTIONS

A. Manufacturer's standard ASI Intac™ Tactile Plaque construction. To meet requirements indicated for materials, thickness, finish colors designs, shapes, sizes and details of construction. Installed dimensional tolerances to be plus/minus 1/16 inch.

B. Surface Graphics: Sign graphics to be applied to sign face by Manufacturer's standard processes including Rowmark pressure sensitive adhesive. Face of sign graphics to be raised 1/32-inch min. from plaque first surface. Precisely formed, uniformly opaque graphics to comply with relevant ADA regulations and the requirements indicated for size, style, spacing, content, position and colors.

C. Braille Tags: Clear raster balls to be drilled and tapped using ASI's standard Intac procedure and Intac Braille guide.

2.4 FINISHES

A. Colors: As selected from the Manufacturer's standards.
B. Surface Texture: matte, per ASI Intac™ standards.

2.4 INSTALLATION METHOD

A. System VT, vinyl tape.

3 EXECUTION

3.01 INSTALLATION

A. General: Locate letters and graphic elements where indicated, using installation methods IAW the manufacturer's instructions.

B. Cleaning and Protection: Upon completion of the installation clean letter surfaces IAW the manufacturer's instructions. Protect units from damage until acceptance by the City of Key Colony Beach.

3.1 SIGN SCHEDULE

A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

10505 LOCKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Metal lockers and benches as indicated on drawings and specified in this section.

B. Related Sections:

1. 03300 - Cast-In-Place Concrete.
2. 06100 - Carpentry.
3. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
4. 09310 - Ceramic Tile.
5. 09900 - Painting.

1.2 SUBMITTALS

A. Submit manufacturer's specifications and installation instructions for metal locker units.

B. Shop Drawings:

1. Submit shop drawings for metal lockers, verifying dimensions affecting locker installation.
2. Show lockers in detail, method of installation, fillers, trim, base, and accessories.
3. Include locker numbering sequence information.

C. Samples:

1. One full sized group of each type of locker required, demonstrating the quality of the proposed construction and finish, complete with required hardware and latching mechanism.
2. Finish Color and Texture: Submit 3 samples, 6 inches x 6 inches on metal, of each color and finish required for lockers.

D. Closeout Submittals:

1. Submit to the City:

a. Locker model numbers standard to manufacturer with modifications required to comply as specified.
b. Parts list for supplied units with local vendor identified with name, address, and phone number.

1.3 QUALITY ASSURANCE

A. Provide lockers manufactured by one manufacturer, uniform throughout as to method and type of construction used.

B. Sheet Steel: Prime grade, free from scale and imperfections.

C. Installation Hardware: Zinc plated; type approved by A/E.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Lockers:

1. ASI Storage Solutions: Traditional Collection
2. DeBourgh Mfg. Co.
3. List Industries, Inc.
4. Lyon Metal Products, Inc.
5. Penco Products, Inc.
6. Republic Storage Systems Co.

2.2 LOCKER SIZES (nominal)

A. Police - Single tier lockers, 12 inches wide x 72 inches high x 15 inches minimum depth, and each locker with shelf and hooks.

2.3 COMPONENTS

A. Doors:

1. Side hinged, one-piece:

   a. 16 gage minimum cold rolled sheet steel.

2. Rubber Bumpers: Quantity and design standard to the manufacturer. Stick-on type is not acceptable.
3. Door Swing: 180 degrees, side hinged.

4. Door Ventilation:

   a. Louvers as per manufacturer’s standard pattern.

5. Hinges:

   a. Continuous full height 16 gage "piano" hinge, riveted to frame and door for a tamper-proof installation when locker door is closed.

B. Latch Mechanism.

1. Single point latching with no moving parts, with recessed stainless-steel pocket and heavy-duty lock tang designed for padlocking, projecting through the surface of door into recessed pocket.
2. Padlocks are not in contract.

C. Panels:

1. 24 gage minimum cold rolled steel, solid.

D. Shelf: 16 gage minimum cold rolled sheet steel, solid, with a single return bend on all 4 sides.

E. Sloped Tops:

1. Additional to 16 gage minimum integral flat top, 18 gage minimum cold rolled sheet steel, solid, with minimum 25-degree slope, secured to locker frame.

F. Hooks:

1. Provide 1 double prong back hook and 2 single prong wall hooks riveted inside each locker as specified.

G. Number Plates:

1. Provide manufacturer's standard non-ferrous metal number plates, sequence numbered as directed by the A/E.
2. Mount number plates on each locker door in location as recommended by the locker manufacturer and attach with at least 2 aluminum pop-rivets.

H. Metal Filler Panels: 20 gage minimum cold rolled sheet steel with construction, finish, and color to match adjacent locker surfaces.

I. Manufacturer’s Finish Option:

1. Manufacturer’s standard powder coating.
2. ESP over zinc-coated (galvannealed) steel according to ASTM A653/A653M.

J. Color:

1. Provide locker units in colors as selected by A/E from manufacturer's standards.
2. A/E may select a maximum of 6 colors from manufacturer's standard colors.

K. Construction:

1. K.D. lockers using rivets as required for assembly and field connection of locker components, sloped tops to the horizontal top surfaces of locker units, and the attachment of trim and filler pieces as specified in this section and shown on the drawings.
2. Ease all edges of sheared metal surfaces where exposed to possible body contact.

L. Special Trim:

2.4 FABRICATION - BENCHES

A. Pedestals:

1. Tubular steel uprights, 16-1/4" high by 1-1/4" o.d. with 0.86" minimum wall thickness, welded die drawn 10 gage flanges with 4 anchoring holes in each flange, finish to match locker finish. Pedestal spacing shall not exceed 6'-0" on centers.

B. Bench Tops:

1. Laminated maple, 9-1/2" wide by 1-1/4" thick with edges and corners radiused to manufacturer’s standard. Surfaces shall be sanded, sealed, and finished with clear non-toxic lacquer or varnish and cured to proper hardness. Provide lengths of 3 to 12 feet in 1-foot increments as shown on drawings, with bench overhang from pedestal center not exceeding 12 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install metal lockers at locations indicated on the drawings according to manufacturer's instructions for a plumb, level, rigid, and flush installation. Secure to floor and wall blocking.

B. Install trim pieces with concealed fasteners to provide flush, hairline joints against adjacent surfaces.

C. Unless otherwise noted, provide metal filler panels for closure to adjacent surfaces, factory-finished to match adjacent lockers.

D. Touch-up marred finishes, or replace as directed, using materials and finishes as recommended or furnished by locker manufacturer.

E. Adjust doors and latches to operate easily without bind.

F. Verify satisfactory operation of integral locking devices.

G. Special Installation Requirements:

H. Provide manufacturer's recommended wood blocking and wall furring as indicated on the drawings.

I. Repair damage to existing curbs resulting from the work of this contract.

J. Benches shall be securely attached to floors with galvanized bolts and expansion shields or anchored with aluminum drive anchors. Minimum pull-out shall be 100 pounds per fastener.

END OF SECTION

10522 FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Fire extinguishers and cabinets including necessary accessories.

B. Related Sections:

1. 09900 - Painting.
2. 10400 - Identifying Devices
3. 15300 - Fire Protection (General Requirements)

1.2 SUBMITTALS:

A. Product Data: Properly identified product data for fire extinguisher cabinets, mounting brackets and fire extinguishers.

B. Shop Drawings:

1. Shop and erection drawings for review indicating materials, dimensions, fasteners, and installation methods.

1.3 QUALITY ASSURANCE:

A. Comply with applicable standards of:

1. National Fire Protection Association (NFPA).
2. Florida Building Code (FBC)

B. Equipment, accessories, materials, and quality of construction shall have a 5-year warranty against defects.

C. Fire extinguishers for "Low Hazard Areas" shall be in fire extinguisher cabinets.

1.4 SOURCE QUALITY CONTROL:

A. Manufacturer: Provide equipment manufactured by one manufacturer except where otherwise noted, uniform throughout as to method and type of construction used.

B. Nameplates: Identify the manufacturer with appropriate nameplates, UL labels, manufacturer's labels, and model numbers.

C. Pack each extinguisher with a hanging bracket acceptable for wall mounting with a latching metal, retainer strap around the cylinder, ready for installation, in a sturdy cardboard box labeled to identify contents fully when delivered to the site.

D. Store product in manufacturer's original protective packaging in a dry protected space until installed.

E. State Fire Marshall Tag Requirements: Size 2-1/4" x 5 1/4".

1. Notice not to remove.
2. Serial number of extinguisher and type of extinguisher.
3. Name of person who serviced the extinguisher.
4. Permit number of persons who serviced the extinguisher.
5. Type of service performed.
6. Month and year the service was performed.

1.5 WARRANTY

A. Provide a 5-year warranty against defects for equipment, accessories, materials and quality of construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

1. Dry Chemical Type:

a. Larsen's, MP and DC series.
b. Potter Roemer, 3000 and 3300 series.
c. J-L Industries, Cosmic and Galaxy series.

B. Fire Extinguisher Cabinets, aluminum:

1. Larsen's: Architectural series.
2. Potter Roemer: Alta series.
3. J-L Industries: Academy series.

C. Extinguisher Brackets:

1. Potter Roemer “Vehicle Bracket for Fire Extinguishers” - Model 3900 Series
2. Other A/E approved equivalent.

2.2 EQUIPMENT

A. Fire Extinguisher Cabinets and Supports:

1. Fire extinguishers in "Low Hazard Areas" shall be contained in an aluminum, semi-recessed fire extinguisher cabinet.
2. Fire extinguisher brackets for ABC type models shall be provided in places where cabinets are not called for.

B. Fire Extinguishers: Dry chemical and ABC type multi-purpose with fog nozzle attached to a hose.

1. For use where wall brackets are specified (Hazardous Areas):

a. The extinguisher shall be a multi-purpose, dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder with a durable red finish.
b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal having no plastic parts.
c. The extinguisher shall have a valve locking pin with a pull ring at one end of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal. One end of a metal chain shall be fastened to the valve lock pin pull ring with the other end securely attached to the extinguisher.
d. The extinguisher shall have a screw-in type visual pressure gage and discharge hose.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, Inc., a control number, the words "Listed", "Dry Chemical Fire Extinguisher", and the manufacturer's name and extinguisher model number. The classification shall also be indicated on the nameplate or band and shall indicate a minimum UL classification of 4A-60BC.
f. The extinguisher shall not exceed an overall height of 19-1/4", a cylinder diameter of 5-3/4" and an overall width of 9 inches.

2. For use where extinguisher cabinets are specified (Low Hazard Areas):

a. The extinguisher shall be a multi-purpose, dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder of 5-pound capacity with a durable red finish.
b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal having no plastic parts.
c. The extinguisher shall have a valve locking pin with a pull ring at one end of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal.
d. The extinguisher shall have a screw-in type visual pressure gage and a discharge hose.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, a control number, the words "Listed", "Dry Chemical Fire Extinguisher", "Classification 2A-10BC", and the manufacturer's name and extinguisher model number.

3. Each type of extinguisher shall arrive on site, ready for use, charged with non-toxic, multi-purpose, silicon-treated ammonium phosphate type dry chemical and dry nitrogen gas.
4. Cabinet Door: Panel with full tempered glass, catch, and no lock.
5. Each 2A-10BC extinguisher shall also be at least the equal of the Potter Roemer extinguisher Model 3005 fitted with a discharge hose and provided with a Series 3900 hanging bracket.

C. Fire Extinguishers: Alkaline dry chemical with a minimum UL classification of 20BC.

1. For Use with Wall Brackets (Flammable Areas and Warming Kitchen):

a. The extinguisher shall be an alkaline dry chemical stored pressure type with a corrosion-resistant reusable metal cylinder with a durable red finish.
b. The extinguisher shall have a squeeze type valve, handle, and operating lever of corrosion-resistant metal shall have no plastic parts.

c. The valve locking pin with a pull ring at one end shall be of stainless steel or hard aluminum and shall not be removable without breaking the metal or plastic seal. One end of a metal chain shall be fastened to the valve lock pin pull ring with the other end securely attached to the extinguisher.
d. The extinguisher shall have a screw-in type visual pressure gage and discharge hose. Provide a discharge nozzle consisting of a 15-inch minimum hose assembly.
e. Each extinguisher shall have a securely attached nameplate or band bearing complete operating instructions, the name or mark of Underwriters Laboratories, Inc., a control number, the words "Listed", "Dry Chemical Fire Extinguisher", and the manufacturer's name and extinguisher model number. The classification shall also be indicated on the nameplate or band and shall indicate a minimum UL classification of 20BC.
f. The extinguisher shall not exceed an overall height of 19-1/4", a cylinder diameter of 5-3/4" and an overall width of 9".
g. Each extinguisher shall be ready for use, charged with an alkaline dry chemical, such as sodium bicarbonate or potassium bicarbonate, with a hanging bracket acceptable for wall mounting.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install according to manufacturer's installation instructions and with approved shop drawings.

B. Verify rough openings for cabinets are correctly sized and located.

C. Install extinguisher cabinets accurately, without warpage, true to line, plumb and level at a maximum of 4'-6" height to the top of the fire extinguisher in the cabinet.

D. Install extinguishers using wall mount brackets true to line plumb and level at a maximum of 4'-6" height to the top of the fire extinguisher.

3.3 ADJUSTING AND CLEANING

A. Adjust extinguisher cabinets to provide tight fit at contact points and to ensure smooth operation, closure, and locking.

B. Cleaning:

1. Clean aluminum surfaces and glass promptly after installation exercising care to avoid damage to protective coatings and finishes.
2. Remove excess glazing and sealant compounds, dirt, and other substances.
3. Lubricate hardware and moving parts.

3.4 PROTECTION

A. Initiate and maintain protection and other precaution required to ensure that all units will be without damage or deterioration until time of acceptance.

END OF SECTION

10552 PARCEL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Parcel lockers.
   2. Accessories.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Data on locker types, sizes, and accessories.
   2. Shop Drawings: Indicate layout, dimensions, details of fabrication and installation. Include plans, elevations, sections, and attachments to other Work.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Manufacturer's Instructions: Indicate component installation assembly, and installation instructions.

B. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.
   1. Operation and Maintenance Data: Include spare parts data, current unit prices, sources of supply, and maintenance instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect Products.

B. Deliver materials to project site in manufacturer's original unopened protective packaging.

C. Identify contents, manufacturer, brand name, and applicable standards.

D. Store materials in area protected from weather and construction operations.

E. Protect Work from damage during transportation, storage at Project Site, and throughout tenure of work. Protect adjacent Work and materials from damage during progress of specified Work. Damaged Work shall be repaired or replaced at no additional cost to the United States Postal Service. Furnish receipts of all loose or detachable parts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
   1. HSS Industries, Incorporated, Traverse City, MI (800) 330-9701.
   2. Secura Locker, Chatsworth, CA (800) 709-4933.

B. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Not Permitted.

2.2 PARCEL LOCKERS

A. Model:
   1. HSS: PL series. PL-1, PL-2, PL-3, PL-DRD, PL-15, PL-SRD.
   2. Secura: Model #1262, #1563, #1564, #1565.

2.3 MATERIALS

A. Sheet Steel: Zinc-coated steel, nickel bearing, free from buckle, scale, and surface imperfections. Steel to be phosphate-treated, baked-on prime paint with baked enamel finish coat.

B. Finish: Custom finish and color.

1.	Coating Type:	Polyester/Acrylic.
2.	Color of Trim:	Black, as delivered.
3.	Color of Faceplate:	Silver to match finish of P.O. Boxes
4.	Gloss:	35-Ultrahigh.
5.	Edge Coverage:	Good.
6.	Specific Gravity:	1.20 + 1.80.
7.	Average Particle Size:	24-40 Microns (per ASTM-D1921).
8.	Chip Resistance:	Minimum Rating of 5.

C. Fasteners: Cadmium, zinc, nickel plated steel; exposed both heads, slotless type; self-locking nuts or locker washers for nuts on moving parts.

2.4 MANUFACTURED UNITS

A. Select model and quantity of parcel lockers as directed by Contracting Officer from the following (based on USPS approved parcel lockers, manufactured by HSS Industries. Post office box rack ladder system provided by the United States Postal Service.
   1. Model PL-1 (1 compartment), size: 22.5” wide x 15.5” deep x 11.75” high.
   2. Model PL-2 (2 compartment), size: 22.5” wide x 15.5” deep x 11.75” high.
   3. Model PL-3 (1 compartment), size: 22.5” wide x 15.5” deep x 23.5” high.
   4. Model PL-DRD (rear doors), size: 22” wide x 60” high (Required for all installations).
   5. Model PL-15 (1 compartment), size: 14.5” wide x 15.5” deep x 11.75” high.
   6. Model PL-SRD (rear door), size: 13.5” wide x 60” high (Required for all PL-15 installations).

B. Select model and quantity of parcel lockers as directed by Contracting Officer from the following (based on Secura Postal Pas-thru lockers, manufactured by Secure):
   1. Model #1565 (5 compartments), size: 15” wide x 18” deep x 60” high.
   2. Model #1564 (4 compartments), size: 15” wide x 18” deep x 60” high.
   3. Model #1563 (3 compartments), size: 15” wide x 18” deep x 60” high.
   4. Model #1262 (2 compartments), size: 12” wide x 18” deep x 60” high.

2.5 ACCESSORIES

A. Locking: Fabricate lockers to receive the following locking devices.
   1. Locking Mechanism (Customer Side): Each parcel locker module shall be secured with a U.S. Postal Service furnished 306 lock. (Manufacturers providing an installed lock equal to the 306 lock will be acceptable). Upon opening the compartment with a customer key to remove the contents, the customer key shall remain trapped. Three customer keys shall be provided for each compartment lock. The locks shall be so located to allow for easy replacement if they should be damaged or inoperable. Provide proper holes for USPS supplied and installed “Arrow” lock, above the 306 lock. The Arrow lock enables the Postal Service to unlock the trapped customer key with a master key.
   2. Locking Mechanism (Postal Side): Full length door, minimum 16 GA., locked closed by a 12 gage, plated steel latch/strap that forms a three-point latch (top, middle and bottom of door). The latch mechanism and cables shall be covered or enclosed to prevent tampering. The mechanism will be spring loaded to return to the locked position when handle is released, or door is slammed shut. The door may be secured by turning the handle and closing the door or slamming the door shut so that the slam lock bolts engage.

B. Number Plates: Manufacturer's standard stainless steel metal number plates with numerals not less than 3/8 inch (9 mm) high. Number lockers in sequence as directed by Contracting Officer. Attach plates to each locker above keyway with minimum 2 fasteners of same finish as number plate.

C. Trim: Provide black fillers and/or closure panel trim at jambs and head of recessed lockers, consisting of minimum 18 gage cold-rolled steel, 3 inch (8 cm) and 6 inch (15 cm) wide factory-finish trim where indicated to match lockers. Secure trim to lockers with concealed fastening clips.

2.6 FABRICATION

A. Construction: Fabricate lockers square, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections as standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors and frames.

B. Frames: Fabricate of 16 gage channels or 12 gage angles, minimum with continuous stop/strike formed on vertical members.

C. Interior: Side panels to be flush constructed to inside of frames for easy removal of customer packages. Offset frame-to-side panel or protrusions into the opening are not permitted. From

customer side, through compartment - postal floor shall not be visible with postal side door closed and latched. Provisions for attaching lockers together in at least two places front and back.

D. Body: Fabricate top, bottom and sides of minimum 24 gage steel, with double flanged connections extending full height.

E. Front Frame and Doors: One piece, minimum 16 gage sheet steel, without louvers, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing minimum 90 degrees.
   1. Reinforcing: Provide extra bracing or reinforcing on inside of doors over 15 inches (38 cm) wide.
   2. Hinges: Heavy-duty, stainless steel, concealed full loop hinges. Weld to inside of frame and secure to door with minimum 2 factory-installed fasteners which are completely concealed and tamperproof when door is closed. Front door shall have self-closing hinges.

F. Rear Doors: Provide doors without louvers on back of lockers for access by postal employees from space behind public areas. The rear door shall be supported by a continuous hinge on one side. The rear door must be design and fabricated to preclude access from one compartment to another for the purpose of vandalism or unlawful removal of compartment contents and to prevent access to the workroom floor. Opening the rear door shall expose all compartments within a module for easy access and deposit of parcels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work. However, allow for adjustment and fitting of trim and filler panels whenever taking of field measurements before fabrication might delay Work.

3.3 INSTALLATION

A. Install metal lockers at locations indicated on Drawings in accordance with manufacturer's published instructions.

B. Install lockers plumb, level, rigid, and flush.

C. Space fastenings about 48 inches (1.2 m) on center, unless otherwise recommended by manufacturer. Install through back-up reinforcing plates where necessary to avoid metal distortion. Conceal fasteners.

D. Install trim where indicated, use concealed fasteners to provide flush, hairline joints with adjacent surfaces.

E. Provide door with flush fit at cross sill when in closed position to maximize intercompartment security. Gaps not permitted.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field testing and inspection.

B. Inspect installation of lockers, attachment, and alignment with adjacent finishes.

C. Operate locker doors and locking devices.

3.5 ADJUSTING AND CLEANING

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes. Use only materials and procedures recommended or furnished by locker manufacturer. Replace units which cannot be restored to factory-finished appearance.

USPS CSF Specifications issued: 10/1/2021
Last revised: 9/22/2015

END OF SECTION

10800 TOILET ROOM ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 04220 - Concrete Unit Masonry.
2. 06100 - Carpentry.
3. 09310 - Ceramic Tile.
4. 10170 - Solid Plastic Toilet Partition.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory before starting work.

B. Samples:

1. Submit full-size samples of units to A/E for review of design and operation.
2. Acceptable samples will be returned and may be used in work.

C. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.

1.3 QUALITY ASSURANCE

A. Coordination:

1. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
2. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

B. Source Quality Control:

1. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to A/E.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Toilet Room Accessories:

1. Bobrick. (Basis of Design)
2. American Specialties Inc. (ASI).
3. A & J Washroom Accessories
4. No substitutions

2.2 MANUFACTURED UNITS

A. Toilet Paper Dispenser:

1. Surface mounted multi-roll, stainless steel with theft resistant spindles and tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

    a. Bobrick: Model B-2888.
    b. American Specialties Inc. (ASI): Model 0030.

B. Grab Bars:

1. Lengths and configurations as indicated on Construction Documents and as specified in this section.
2. Heavy duty with peened non-slip gripping surface, 1-1/2" diameter, stainless steel, with 1-1/2" wall clearance and with theft-proof concealed fasteners with snap flange cover.
3. Straddle bars, wall to floor with socket and horizontal grab bars according to manufacturer's model/series numbers.
4. Manufacturers:

    a. Bobrick: B-6806 Series.
    b. American Specialties Inc. (ASI): 3800 Series.

C. Paper Towel Dispensers:

1. Surface mounted, battery operated equipped to dispense ABS roll paper towels, stainless steel, with tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

    a. Bobrick: Model B-72974.
    b. A&J Washroom Accessories: Model U199EA.

D. Mirrors: Toilet Rooms:

1. Size: 18" W x 36" H.
2. One-piece roll formed frame of stainless-steel angle with corners heliarc welded, ground and polished smooth, complete with minimum 20 gage galvanized steel back.
3. Tempered glass mirror electrolytically copper plated, No.1 quality, guaranteed against silver spoilage for a minimum 15 years.
4. Mirrors shall be mounted with concealed theft-proof fasteners and appropriate wall-backing according to manufacturer’s requirements.
5. Manufacturers:

    a. Bobrick: Model B-290-1836.
    b. A&J Washroom Accessories: Model U700T-1836.
    c. American Specialties Inc. (ASI): Model 0600-A-1836.

E. Feminine Napkin/Tampon Disposal:

1. Stainless steel, single recessed or partition-mounted dual access, self-closing doors, with tumbler lock keyed like other bathroom accessories.
2. Manufacturers:

    a. Bobrick: Models B-270 (single, surface mounted) or B-354 (partition-mounted, dual access).
    b. A&J Washroom Accessories: Models U581 (single, recessed), or U580 (partition-mounted dual access).
    c. American Specialties Inc. (ASI): Models 0473-1 (single, recessed) or 0472-1 (partition-mounted, dual access).

F. Automatic Soap Dispensers, Wall-Mounted:

1. Contractor shall use appropriate screws and wall anchors as recommended by the soap dispenser manufacturer.
2. Soap dispensers shall be installed at locations indicated on the Contract Documents.
3. Manufacturer:

    a. Bobrick B-2012

G. Shower and Entrance Doorway Curtains:

1. Heavy white vinyl shower curtains complete with curtain rod for surface mounting with exposed fasteners, in widths and heights as indicated on the Construction Documents.
2. Provide chrome plated roller type curtain hooks.
3. Provide matching tiebacks, one for each curtain, according to manufacturer's recommendations.
4. Manufacturers:

    a. Acorn: 3895-001-000 with 1193-1 curtain hooks with rollers.
    b. Gamco: Model 100SC with 100CHNR hooks with rollers.

H. Towel/Robe Hooks:

1. Heavy-duty, chrome plated brass for surface mounting with exposed fasteners.
2. Manufacturers:

    a. Bobrick: Model B-233.
    b. A&J Washroom Accessories: Model UB15.
    c. American Specialties Inc. (ASI): Model 0751A.

I. Folding Shower Seat:

1. No.4 finish, stainless steel with vinyl covered padding over marine-grade plywood.
2. Manufacturers:

    a. Bobrick: Model B-5191.
    b. American Specialties Inc. (ASI): Model 8250.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install toilet room accessories at locations shown on the Construction Documents, according to manufacturers' printed installation instructions.

B. Secure toilet room accessories to supporting substrate with fasteners and anchors of types necessary for rigid anchorage to substrate construction.

C. Install toilet room accessories plumb and true with horizontal lines level.

1. Conceal evidence of drilling or fitting in adjacent surfaces.

D. Special Tools or Keys:

1. Deliver properly identified special tools or keys of each type required for theftproof fasteners and for refilling dispensers or emptying receptacles.

E. Cleaning:

1. After installation, clean toilet room accessories in a manner not to damage finish and leave in conditions satisfactory to A/E.

END OF SECTION

11130 DOCK LIFT (SCISSORS TYPE)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pit mounted scissors type dock lift.
   2. Rodent blocking seal – for enclosed platform locations.
   3. Structure and operating characteristics.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:

   1. Section08360, Sectional Overhead Doors: for interlock switch coordination.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI MH29.1 - Safety Requirements for Industrial Scissors Lifts.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Indicate materials and finish, installation details, roughing-in measurements, and operation of unit.
   2. Shop Drawings: Indicate required opening dimensions, tolerances of opening dimensions, perimeter conditions of construction, and electrical connections.
   3. Assurance/Control Submittals:
      a. Test Reports: Report from approved Independent Testing Agency indicating compliance of Dock Lift with requirements of ANSI MH29.1.
      b. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      c. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

B. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.
   1. Operating and Maintenance Data:
      a. Manufacturer's operating and maintenance instructions.
      b. Name, address, and telephone number of nearest authorized service representative.
      c. Complete parts list.
   2. Operation Instruction: Document training by furnishing a sign-in sheet with a description of the training provided, instructors name and organization and those who received training. Refer to 017704 1.3, 1.4 and 1.5 for more specific training requirements.

1.4 QUALITY ASSURANCE

A. Conform to requirements of ANSI MH29.1.

B. Qualifications:
   1. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Transport, handle, store, and protect Products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This product must be manufactured by a USPS Direct Vendor and is subject to a USPS price and requirements purchasing agreement. The order must be placed using the vendor's web-based ordering system: https://www.uspslifts.com .
   1. Advance Lifts Model 2500K (pit mounted).

B. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Not permitted.

2.2 PIT MOUNTED SCISSORS TYPE DOCK LIFT

A. Description:
   1. Type: Stationary single-scissor-type hydraulic dock lift designed for permanent, recessed, installation in preformed concrete pit as indicated on Drawings.
   2. Rated Lifting Capacity: ANSI MH29.1, 5,000 pounds.
   3. Roll-Over Capacity: 10,000 pounds.
   4. Vertical Travel: Minimum 58 inches.
   5. Travel Speed: 12 feet per minute up or down.
   6. Lowered Height: Maximum 10 inches.
   7. Platform Size: 6 feet wide x 8 feet long.
   8. Audible travel warning device with adjustable volume control that operates in up and down travel motion.
   9. Flashing travel lights that that operates in up and down travel motion.
   10. Installation Kit to be included with each dock lift. Kit must include 20' of hydraulic hose, 20' of limit switch wire and low-temperature hydraulic oil.
   11. Supply power unit with [wall mounting brackets] [pedestal] appropriate for site.
   12. Quick disconnect: Twist lock removable controls.

B. Construction: Fabricate from structural steel shapes rigidly welded and reinforced to withstand deformation during operating and stored phases of service.

C. Platform: Fabricate from heavy steel plate with beveled toe guards on all four sides complying with requirements of ANSI MH29.1. Provide matching hinged throwover bridge where indicated, and removable handrails.

1. Platform Surface: Non-skid safety tread deck plate.

D. Hinged Bridge: Provide hinged bridge bolted to full length heavy-duty piano type hinge welded to toe guard at end of the platform. Hinge to be minimum 1/4-inch-thick steel. Provide bridge complete with heavy-duty lifting chains. Chamfer edge of the bridge to prevent obstruction of material handling vehicle wheels.
   1. Bridge Material: Non-skid safety tread steel for bridges under 24" long and non-skid safety tread aluminum for bridges 24 inches long or greater. Bridge material shall be a minimum of 1/4 inch reinforced steel and 3/4-inch minimum thickness for aluminum.
   2. Bridge Size: 66 inches wide x 36 inches long bridge for pit-mounted lifts.

E. Handrails: Removable handrails on two sides of platform with single removable link chain across each end. Handrails 42 inches high with midrail and 4-inch high kickplate bottom. If rail sockets are provided with lift, mount flush with platform surface and fit securely in sockets.

F. Scissor Mechanism: Fabricate leg members from heavy steel formed tube or plate.

G. Cylinders: Equip with minimum two heavy-duty high pressure hydraulic ram type cylinders. Rams shall be either direct displacement plunger or rod and piston type with positive internal stops as standard with the manufacturer. Cylinder rods shall be chrome plated and polished to prevent rusting. Provide low temperature hydraulic oil.

H. Bearings: Provide pivot points with permanently lubricated anti-friction bushings or sealed ball bearings for minimum maintenance.

I. Operation
   1. Self-contained electric hydraulic power unit for raising and lowering of the lift, controlled from a remotely located push-button station.

J. Electrical Requirements: Coordinate wiring requirements and current characteristics with building electrical system.

K. Power Unit: Self-contained, remotely located power unit of proper size, type and operation needed for the capacity of the lift indicated. Power unit shall consist of a 5 HP continuous duty motor, high pressure gear pump, valve manifold, oil line filters, oil reservoir and fluid level sight gauge.
   1. Manifold: The manifold shall contain a relief valve, check valve, pressure compensated flow control valve and down solenoid valve and provisions for lowering the lift manually in case of power failure.
   2. Oil Line Filters: Oil line filters shall include one for the oil reservoir, one for the valve manifold and one for the lift itself.

L. Remote Control Station: Provide lift unit with a weatherproof multiple-button control station of the constant pressure type, complete with "Up" and "Down" push buttons. The controller shall consist of a magnetic motor starter with three pole adjustable overloads and a 24-volt control transformer with a 4-amp fused secondary prewired to terminal strips and mounted in a gasketed NEMA 12 oil and dust tight industrial enclosure. Control shall have a "quick disconnect" feature.

M. Safety Devices: Provide hinged safety maintenance bars. Provide visible and audible warning when lift is in motion. Provide an automatic safety stop velocity fuse or comparable mechanism.

N. Interconnection with overhead door sensor/switch: Provide a connection point for an interlock switch at the door to prevent the lift from operating if the door is not fully open. Coordinate electrical requirements with door manufacturer.

O. Upper Travel Limit Switch: Equip unit with the manufacturer's standard adjustable upper travel limit switch.

P. Steel surfaces must be clean and pretreated for optimum paint bond. Prime with a rust inhibitor primer and apply a hard enamel finish. Painted toe guards shall have a minimum of 2" yellow with black diagonal stripes to comply with ANSI Z53.1. Unless otherwise indicated, paint other surfaces in the manufacturer's standard color.

Q. Provide warning labels in accordance with ANSI 2535.4.

R. Provide Rodent Blocking Seal equivalent to rodentBLOCK 8 – ft dock leveler seal kit with Xcluder 109-0034 as distributed by North Shore Commercial Door.com, 800-783-6112. The seal is comprised of aluminum retainer, rubber seal with stainless steel mesh and poly fiber fill.

2.3 PORTABLE SCISSORS TYPE DOCK LIFTS

A. Description:
1. Type: Portable Single-scissors-type hydraulic dock lift designed for use on to be anchored to a concrete apron.
2. Rated Lifting Capacity: ANSI MH29.1, [4000] [5000].
3. Vertical Travel: 53 inches.
4. Travel Speed: 10 feet per minute down.
5. Lowered Height: 5 1/4 inches.
6. Platform Size: 6 feet x 6 feet.
7. Audible travel warning device with adjustable volume control that operates in up and down travel motion.
8. Flashing travel lights that that operates in up and down travel motion.
9. Self contained power unit.
10. Quick disconnect: Twist lock removable controls.

B. Construction: Fabricate from structural steel shapes rigidly welded and reinforced to withstand deformation during operating and stored phases of service.

C. Platform: Fabricate from heavy steel plate with beveled toe guards on all four sides complying with requirements of ANSI MH29.1. Provide matching hinged throw-over bridge where indicated, and removable handrails.
1. Platform Surface: Non-skid safety tread deck plate.

D. Hinged Bridge: Provide hinged bridge bolted to full length heavy-duty piano type hinge welded to toe guard at end of the platform. Hinge to be minimum 1/4-inch-thick steel. Provide bridge complete with heavy-duty lifting chains. Chamfer edge of the bridge to prevent obstruction of material handling vehicle wheels.
1. Bridge Material: Non-skid safety tread steel for bridges under 24-inches long and non-skid safety tread aluminum for bridges 24 inches long or greater. Bridge material shall be a minimum of 1/4 inch reinforced steel and 3/4-inch minimum thickness for aluminum.

2. Bridge Size: 66 inches wide x 18 inches long bridge.

E. Cylinders: Equip with minimum two heavy-duty high pressure hydraulic ram type cylinders. Rams shall be either direct displacement plunger or rod and piston type with positive internal stops as standard with the manufacturer. Cylinder rods shall be chrome plated and polished to prevent rusting. Provide low temperature hydraulic oil.

F. Bearings: Provide pivot points with permanently lubricated anti-friction bushings or sealed ball bearings for minimum maintenance.

G. Operation
1. Self-contained electric hydraulic power unit for raising and lowering of the lift, controlled from a remotely located push-button station.

H. Electrical Requirements: Coordinate wiring requirements and current characteristics with building electrical system.

I. Power Unit: Self-contained, power unit mounted on the lift and housed in a weatherproof enclosure. Power unit shall consist of a 2 HP continuous duty motor, high pressure gear pump, valve manifold, oil line filters, oil reservoir and fluid level sight gauge.

J. Safety Devices: Provide hinged safety maintenance bars. Provide visible and audible warning when lift is in motion. Provide an automatic safety stop velocity fuse or comparable mechanism.

K. Provide warning labels in accordance with ANSI 2535.4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to the A/E and the City prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the City of Key Colony Beach.

3.2 INSTALLATION

A. Install dock lifts in prepared opening in accordance with manufacturer's published instructions, ANSI MH29.1, and as indicated on Drawings.

B. Set square and level.

C. Anchor unit securely.

D. Make electrical connections as specified in Division 16.

E. Install rodent blocking seal in accordance with manufacturer’s instructions and ensuring that opening between pit and leveler is completely sealed.

3.3 CONSTRUCTION

A. Interface with Other Work: Coordinate forming of pit for hydraulic dock lifts to ensure that the pit depth is adequate to accommodate the lift in proper relationship to the loading platform. Attach the lift securely to the pit floor in accordance with the manufacturer's directions.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Control.

B. Inspect unit connection to structure and to electrical service.

C. Perform operational tests of unit in the presence of the A/E and the City. Demonstrate each function or operation.

D. Provide three (3) operator manuals, three (3) maintenance/repair manuals and three (3) parts breakdown diagrams.

E. OPERATING INSTRUCTION

1. Provide on-site instruction to review the operation of the system and detail any common troubleshooting or maintenance that is required to ensure normal operation.

2. Provide one complete set of equipment operating, installation, and programming manuals that will remain at the installed location.

END OF SECTION

11131 STRIP CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Strip curtains.

B. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.2 SUBMITTALS

A. Section 013300 – Submittal Procedures: Procedures for Submittals.
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Shop Drawings:
      a. Include plans, elevations, sections, details, and attachments to other work.
      b. Detail assemblies and indicate dimensions, method of field assembly, components, and location and size of anchors and field connection.
   3. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of screenline wall opening and contiguous construction by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 STRIP CURTAINS

A. General: Opening curtains consisting of overlapping strips suspended from top of opening to form a sealed opening curtain. Provide strips of length required to suit opening height and with sufficient unit number to close opening width with overlap indicated.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Chase Doors.
   2. Rotary Products Inc.
   3. Verilon Vinyl.

B. Section 016000 – Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.3 MATERIAL

A. Strip Material: Curved, opaque black, extruded PVC. Matte finish is preferred. Fabricate strips for manufacturer's standard method of attachment to overhead mounting system indicated.
   1. Standard Grade
   2. Strip Width and Thickness: 8 inches (203 mm) wide and 0.080 inch (2 mm) thick.
   3. Overlap: 2 inches.

2.4 MOUNTING

A. Wall Surface Mounting: Consisting of a steel plate bolted to face of wall; equip plate with permanently attached, threaded, mounting pins and steel-angle or plate retaining strip attached to plate with wing nuts.

2.5 STEEL FINISH: Hot dip galvanize components to comply with the following:

A. ASTM A 123/A 123M for iron and steel support mounting.

B. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware and anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

B. Report in writing to A/E and City prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

A. Strip Curtains: Attach curtain mounting system to wall with screw anchors or toggle bolts. Mount curtain strips to overlap.

3.3 FIELD QUALITY CONTROL

A. Section 014000 – Quality Control.

B. After completing installation, inspect exposed factory finishes and repair damaged finishes.

END OF SECTION

11303 CEILING FANS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. The ceiling-mounted circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with mounting hardware and a remote control.

B. Summary of Work

Installation of the fan, wireless network, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses, and disconnect switches, shall be provided by the contractor.

1.2 RELATED SECTIONS

A. 15300 Fire Protection

B. DIVISION 15 Heating, Ventilating, and Air Conditioning (HVAC)

C. DIVISION 16 Electrical

1.3 REFERENCES

A. International Organization for Standardization (ISO)

B. National Electrical Code (NEC)

C. National Fire Protection Association (NFPA)

1.4 SUBMITTALS

A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods

B. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information

C. Installation Guide: The manufacturer shall furnish a copy of all installation, operation, and maintenance instructions for the fan. All data is subject to change without notice.

D. Schedule

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. The fan and any accessories shall be supplied by a manufacturer, which has a minimum of twenty (20) years of product experience.

2. ISO 9001-compliant

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.

B. The fan and its components must be stored in a safe, dry location until installation.

1.7 WARRANTY

A. The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges within the USA, FOB Lexington, KY), pursuant to the complete terms and conditions of the Big Ass Fans Warranty in accordance to the following schedule:

Application	Period of Coverage
Non-Residential	3 years

Labor to repair the defect will be provided free of charge by the manufacturer's service center for defects arising during the Warranty Period.

PART 2 PRODUCT

2.1 MANUFACTURER

A. Hunter

B. Multifan

C. Macroair

2.2 PRODUCT

A. Complete Unit

1. Quality: The fan shall display good workmanship in all aspects of its construction. Field balancing of the airfoils shall not be necessary.

2. Colors: Airfoil colors may be as described in 2.2.C, "Airfoils."

B. Mounting System

1. Universal Mount

    a. The universal mount shall be suitable for a flat ceiling so that the bottom of the fan is 12 feet above finished floor.

    b. The fan shall be equipped with a mounting bracket, canopy, mounting ball and wedge, downrod, wiring cover, motor hub, and mounting hardware.

    c. The fan shall be available with a diameter of 60 in.

    d. The fan shall include one (1) downrod. The length of the downrod shall be as required to achieve the mounting height indicated in B.,1.,a. above.

C. Airfoils

1. The fan shall be equipped with six airfoils spanning a total diameter of 60 in.

2. Airfoils shall be made of aircraft-grade aluminum.

    a. Airfoils shall be White.

    b. Airfoils shall be suitable for covered outdoor spaces.

D. Motor

1. The fan shall have an electronically commutated motor (ECM) rated for 100–277 VAC, single phase.

2. The motor shall draw 21.8–23.7 watts depending on the speed at which the fan is operated and if a light is installed.

3. The fan shall be designed for continuous operation in ambient temperatures of 32–104°F (0–40°C) and a humidity range of 20–90% (non-condensing).

4. The fan's motor unit and motor unit trim shall be available in a White finish.

E. Safety Cable

1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be 1.5 mm in diameter and fabricated of aircraft steel.

2. Field construction of safety cables is not permitted.

F. Mobile App

1. The fan shall be able to wirelessly connect to local Ethernet networks or host a network. The fan's Bluetooth® capability shall permit over-the-air firmware updates.

2. Fan control features shall be managed by users via the manufacturer's mobile app. The mobile app shall be supported by Android™ and iOS® mobile devices.

a. Manual Speed Control. Speed settings range from 0 (Off) to 7 (High).

G. Display and Sound

1. Changes to fan settings shall be confirmed with auditory feedback (a beep) and/or visual indication.

H. Remote Control

1. The fan shall be equipped with a compact Bluetooth remote control that allows intuitive operation of the fan speed and light brightness in the following modes:

   a. Fan speeds 0 (Off) through 7 (High)

   b. Auto Mode

   c. Light brightness 0–100%

2. The remote shall operate on a CR 2450 3 V lithium battery (included).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the fan according to the manufacturer’s installation guide, which includes acceptable mounting methods.

END OF SECTION

12510 WINDOW TREATMENT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 09510 - Acoustical Ceilings.
2. 09900 - Painting.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTMI), latest edition:

1. E2180 Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials.
2. G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. National Fire Protection Association (NFPA), latest edition:

1. 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

1.3 SUBMITTALS

A. Samples: Submit samples for color and pattern selection by A/E.

PART 2 PRODUCTS

2.1 WINDOW CURTAINS

A. Materials.

1. Fabric:

a. Opaque, vinyl fabric, 9-gage before embossing, with seams electronically welded.
b. Fabric shall be flameproof and comply with Florida Building Code (FBC).
c. Color and pattern will be selected by A/E from manufacturer's stock color and pattern selection.

2. Traverse Track: With baked enamel finish complete with draw cord, ball-bearing tension pulleys, and all necessary mounting hardware.

B. Fabrication.

1. Fabricate window curtains at 25 percent fullness with maximum 6-inch overlap at windowsills and jambs where possible and 4-inch overlap at window heads where possible.

a. Coordinate window curtain overlaps with door entrances, cabinets, countertops, and the like.

2. Provide the necessary pulley hardware to offset a curtain pull where it would interfere with the chalkboards and tackboards.

2.2 WINDOW SHADES

A. Manufacturers:

1. ABI Verticals Miami, FL., (305)962-0758
2. NHDH Interiors, Miami, FL., (305) 216-7136
3. New Image Blinds, Miami, FL., (904) 328-5321
4. Ford Shutters Shades and Draperies, Miami, FL., (305) 945-5516

B. Fabric.

1. Fabric Composition: Fiberglass fabric core laminated 4-ply vinyl (25% Fiberglass/75% PVC)
2. Fabric Weight: 12 oz/yd². (+/- 2%)
3. Fabric Thickness: 15.0 mil (+/- 5%) / 0.38mm (+/- 5%) / 0.015 in (+/- 5%)
4. Breaking Strength: 240 lbs. Warp Direction / 960 lbs. Fill direction.
5. Tear Strength: 1,700 Grams Warp Direction / 1,800 Grams Fill direction.
6. UV Opacity: 100% Blackout.
7. Lead Free
8. Flame resistance shall comply with NFPA 701.
9. Shade fabric shall inhibit microbial and fungal growth, compliant with ASTM G21.
10. Color: As selected by A/E

C. Roller Operation:

1. Clutch Operation.

a. Manufacturers:

1) R-Series clutch controller by Rollease, Stamford, CT or other A/E accepted equivalent.
2) R-Series Standard or Fascia Bracket when required by Rollease, Stamford, CT or other A/E accepted equivalent

b. Shade Roller: Aluminum, 1-1/4" minimum diameter.
c. Aluminum weight bar with heat seal or hemmed stitching and tailored pocket.
d. Standard roll unless Reverse roll is required.
e. Provide 10 to 12 inches of additional fabric length beyond length required to cover opening.
f. #10 steel beaded chain with bead stop
g. Include necessary mounting hardware as recommended by the window shade manufacturer.
h. Fascia: Where required by A/E shades under 96” will require a 3” Aluminum fascia, over 96” will require a 4” Aluminum fascia.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION:

A. In existing facilities, remove existing window shades, window curtain fabric, traverse track, and hardware as indicated on drawings and install new shades, window curtain fabric, traverse track, and hardware as specified in this section or indicated on drawings and as recommended by window shade, window curtain, and traverse track manufacturers.

B. Install new traverse track and window shade brackets, complete with curtains and shades, plumb and level, securing to walls and ceilings to form a neat and rigid installation.

END OF SECTION

13845 INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: A complete, operable, tested intrusion detection system, listed and labeled by an OSHA approved Nationally Recognized Testing Laboratory (NRTL), including the furnishing and installation of main and distribution terminal cabinets, conduits system, and power feed. All programming shall be by the Contractor with approval from the City of Key Colony Beach District Communication Management Center (DCOM).

B. Related Sections:

1. 09900 - Painting
2. 16112 - Raceways and Conduits
3. 16131 - Outlet, Pull, and Junction Boxes

1.2 SYSTEM DESCRIPTION

A. Significant System Components and Procedures:

1. Contacts for every exterior door including roof accesses.
2. Intrusion control panels.
3. Power supply.
4. Extended zone modules.
5. Keypads.
6. Raceway and junction box system.
7. Testing.
8. Record drawings.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data sheets for each item of equipment, depicting equipment capacity before starting work.

B. Shop Drawings: Include manufacturer's catalog cuts, data sheets, equipment layout riser, equipment dimensions, and wiring diagrams with standard symbols for each component used.

C. Quality Assurance Submittals: Submit the following with the required shop drawings and manufacturer's literature and data.

1. Load calculations for battery backup and system components.
2. Programming schedule sheet with zone descriptions.
3. Warranty:

a. Letter from authorized manufacturer's representative addressed to the City of Key Colony Beach, stating compliance to warranty requirements.
b. Submit 5 copies of warranty certificate.

D. Closeout Submittals: Record drawings indicating actual locations of cabinets, boxes, conduit runs and warranties.

1.4 QUALITY ASSURANCE

A. Items and Components: UL listed meeting the latest editions of standards 603, 609, 634, 639, 1076, and 1610.

B. Install wiring according to National Electrical Code (NEC) applicable to the project .

C. Shunt switches are not allowed.

D. The system shall provide for the separate zoning of cafeterias, cafetoriums, auditoriums, food service areas, gymnasium/locker rooms, little theaters, the administration area, music rooms, and any other areas according to program requirements. One building or wing may have more than one zone, but one zone shall not include more than one building.

E. System shall be hardwired in its entirety.

F. In terminal cabinets, use screw-on terminal strips for power and signal cable splices.

1.5 WARRANTY

A. Provide full manufacturer's published standard warranty for parts and components.

B. Provide 1-year full maintenance (parts, wiring, and labor) provided by Contractor or manufacturer's authorized representative from date of substantial completion.

C. Provide warranty response information inside alarm system control panel.

D. Warranty shall allow the City of Key Colony Beach to repair vandalized areas without voiding the total system warranty

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Door Contacts:

1. Side Hinged Doors: Recessed magnetic switch, Model 1078W by GE Sentrol, Model 1078WH (BR) by Interlogicor the City of Key Colony Beach accepted equivalent, with contacts rated at 0.5 amps and 7.5 watts max., complete with necessary mounting accessories for installation in steel doors in a closed-circuit alarm system.
2. Side Hinged Door (For remodeling Projects Only): Surface magnetic switch, Model T-N by Interlogic, with contacts rated at 0.5 amps and 7.5 watts max., complete with necessary mounting accessories for installation in steel doors in a closed-circuit alarm system.
3. Hinged Roof Access Doors: Surface mounted, magnetic switch, Amesco Model ODS 59A, Fair VIP 1000-98L24 or the City of Key Colony Beach accepted equivalent.

Provide 2 mounting spacers and matching cover plate, for closed circuit alarm systems.

4. Roll-Up Overhead Doors: Floor mounted extra heavy-duty magnetic switch in an aluminum housing, Model ODS 59A by Amesco or Model 1000-98L24 by Flair Electronics, or the City of Key Colony Beach accepted equivalent, with armored cable, complete with necessary mounting accessories for installation in closed circuit alarm systems.

B. Cable: Belden No.8740 (2 conductor), No.8443 (3 conductor), No.9794 (4 conductor), as directed by security system manufacturer.

1. Conductors for Monitoring Devices: Minimum 22 gage AWG stranded, unshielded cable with vinyl plastic insulation, color-coded.
2. NRTL labeled and listed, NEC type CM or CL3, .
3. Comply with UL 1581 flame test.
4. Power Conductor for Motion Detectors, EZMs, and Keypads: CL-2 or CL-3, jacketed, minimum 18 gage stranded wire.
5. Power Conductor for Battery: Minimum 18 gage stranded wire.
6. Underground cable shall be for wet locations according to NEC.

C. Intrusion Control Panels:

1. Manufacturers:

   a. NAPCO Model Gemini -X255.
   b. Bosch Security Series 2000.
   c. Or other the City of Key Colony Beach accepted equivalent.

2. Provide mandatory NRTL Mercantile listing with tamperproof provisions.
3. Indicate location on riser diagram.
4. Install panels with centerline at 5'-0" above finish floor.
5. Panel cabinet shall be #14-gauge steel construction with hinged, lockable door.

D. Panel Batteries:

1. Provide two 7-amp batteries in parallel in the panel.

E. Zone Expansion Modules/Expansion Zone Modules (EZM):

1. Remotely located in a distributed fashion to minimize raceway and wiring.
2. Powered from the intrusion control panel.
3. Power supply load shall not exceed 85 percent of the maximum load.
4. Mount EZM's in a hinged door junction box with a fire-retardant painted plywood backboard inside the box, 10" x 10" x 4" minimum size.
5. Install EZM cabinets with centerline at 5'-0" above finish floor.
6. Install power supplies between 6'-0" to 8'-0" above finish floor.
7. List EZM's location numbers inside and outside the junction boxes and on riser diagram.
8. Do not use the keypad as a zone expander.

F. Miscellaneous: Refer to Section 16112 for products also required for installation under this section.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the Work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install wiring, conduit, boxes, and the like required for a complete system according to manufacturer's instructions and approved submittals.

B. System equipment and wiring installation shall be by the properly licensed company, either the original equipment manufacturer or the factory distributer for the brand of equipment used. Furnish wiring diagrams and wire runs for the raceway system installed by the licensed electrical contractor, under Division 16.

C. Provide door contacts and related devices at exterior doors, roof scuttles, and interior doors to high security spaces including, but not limited to, spaces containing records, audiovisual equipment, instructional TV equipment, computer equipment, chemical storage, facility operation and management equipment, and other similar valuable goods. Rooms with interior corridor access and motion detectors do not require door contacts.

1. Hinged Door Contacts: A maximum of 4 associated door contacts may be grouped in a zone. Provide independent wiring to each switch from a junction box located next to the expansion zone module (E.M.) before converting to a zone.

    a. Side Hinged Doors:

        1) Install recessed switch components in spaces in both door and head jamb prepared by the door and frame manufacturer.
        2) Set magnet into top of door with accepted silicone sealant.

    b. Hinged Roof Access: Mount on inside face of access housing according to switch manufacturer's recommendations.

2. Wiring:

    a. Install wiring in metallic conduit from door head switch through door lintel construction to adjacent junction box.
    b. Connection between top of sheet metal sleeve in head jamb section and conduit in door lintel construction to adjacent junction box need not be solid but sheet metal sleeve and conduit shall be in alignment with each other.
    c. Provide EOL resistor and indicate location on drawings
    d. A maximum of 4 associated door switches may be grouped in a zone. Provide independent wiring to each switch from a junction box located next to the expansion zone module (E.M.) before converting to a zone.
    e. Splices in main cabinets and sub panels shall be on terminal strips.

3. Bonding and Grounding: Provide as required by the latest edition of the NEC.
4. Conductor Identification: Identify each pair of conductors, each contact in each panel, and at loose wire terminations.

5. Cable Slack:

    a. Terminate cables with enough slack, each duly tagged for future on terminal strips in junction box in electrical room as shown on Drawings, extending 1-inch empty conduit from this box underground to pull box as shown Drawings (site plan).
6. Permanently label all conduits as to plan room number destination, at all terminal cabinets.
7. Mount all junction boxes located above ceiling with the opening facing down, and with a reasonable immediate access pathway provided.
8. All conduit runs shall be as direct as possible in order to save on wiring cost and reduce poor performance due to cable voltage drops.

D. At security cabinets, provide 3/4" plywood backboard with fire retardant paint.

E. Provide patch cord from intrusion detection circuit board to telephone outlet provided by the City of Key Colony Beach in the intrusion detection panel.

3.3 FIELD QUALITY CONTROL

A. Before testing the intrusion detection system transmission from the project site to the central control station, coordinate with the City of Key Colony Beach and A/E to ensure the City of Key Colony Beach will be available to verify a successful and trouble-free transmission signal.

B. Site Test:

1. Check and test installation for shorts, grounds, circuit continuity, and minimum 12 volts readings at all motion detectors.
2. Cables: Test free from opens, grounds, or crosses (shorts) between conductors.
3. Walk-test doors and motion detectors for proper function and operation. Ensure proper zoning of devices.
4. Test all functions on intrusion control panels for proper functions and operations.
5. Verify signals are properly received at the City of Key Colony Beach DCOM.
6. Check for proper standby battery backup in intrusion panels and remote power supplies.
7. Inspect and test cabinet tampers on intrusion cabinets.
8. Verify raceway cover is properly painted blue.

3.4 DEMONSTRATION AND TRAINING

A. Provide a minimum of 2 hours of training to designated City of Key Colony Beach personnel, including City of Key Colony Beach staff and maintenance personnel. Training shall be provided by a competent, factory authorized personnel, and shall include instructions on the operation, and troubleshooting of the installed systems. Training shall be scheduled by the Contractor through the City of Key Colony Beach Project Manager.

END OF SECTION

13860 ACCESS CONTROL SYSTEM (ACS)

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete, operable and tested Access Control System (ACS), including but not limited to all necessary wiring, controls, accessories, hardware and software.

1.2 RELATED REQUIREMENTS

A. Coordinate access control system (ACS) with work before and after. See especially:

1)	Electric lock strikes and door hinges wired to ACS.	Section 08710
2)	Electrical raceways (including conduits and cable trays), junction boxes and power cabling sufficient to support both current and specified future ACS configurations.	Division 16

B. The following work does NOT integrate with the ACS under the work of this section:

1)	Intrusion detection system.	Section 13845

1.3 DEFINITIONS

A. Definitions for Software and Equipment.

1) CSA: Client software application.
2) CUI: Configuration user interface.
3) SUI: Surveillance user interface.
4) IO: Input / output.
5) PC: A computer that is part of the ACS.
6) REX: Request to exit.
7) SDK: Software development kit.
8) SSM: Server software modules.
9) UCT: Coordinated Universal Time (as sent to satellite by NIST and USNO)

1.4 SYSTEM PERFORMANCE

A. ACS shall provide a complete, operable, and integrated system that shall include but not be limited to the following items:

1) All equipment, editable software program, cabling, and configuring as needed for facility security at all points of access.
2) ACS shall identify and authorize (or deny) the entry and exit of persons and groups using proximity card readers, expandable to add or substitute other credentialing, controlling and reporting technology in the future.
3) ACS shall communicate, trigger alarms, and report the status of doors and persons in the facility at all times – to facility administrators and DCOM, as needed for the security of occupants and property.

4) ACS shall enable administrators to temporarily or permanently credential persons and groups for entry, and to produce cards.
5) ACS shall link with door hardware, UCT time signals, and phones in the facility, with provision for possible future linking to detection or alarm systems, some of which may follow IP protocol.
6) The ACS manufacturer/installer shall configure, test and demonstrate the system until every point of access in the facility is secure.

1.5 QUALITY ASSURANCE

A. ACS manufacturer/installer: A firm with at least 10 years documented experience in providing access control systems of the type specified herein. The manufacturer/installer shall:

1) Integrate all the work defined above during system design, its execution, and for the duration of the specified special warranty.
2) Employ a supervisor, foremen, and key mechanics who each have at least 5 years of documented ACS design, and installation, callback and maintenance experience in the ACS industry.
3) Employ technicians and engineers who have been trained and certified on the ACS software and associated interfaces by the ACS manufacturer.
4) Provide proof of certifications for each of these persons before start of installation.
5) Inform provider of electrical raceways of location and extent of raceway needs to serve ACS equipment.
6) Use factory-trained technicians in making all electrical connections.
7) With the Contractor, be responsible for the functioning of the ACS, free of defects.

B. Manufacturer / Installer Resources and Response: The Contractor and ACS manufacturer/installer shall provide proof that the ACS manufacturer has a local ACS installer with manufacturer-authorized certifications and access to all local manufacturer-authorized product distributors who collectively carry a complete inventory of each manufacturer's ACS products, and who will respond with mechanics and equipment to calls from City of Key Colony Beach or the facility's administrator.

1) Location of local ACS manufacturer/installer: Monroe County or no more than 60 miles away from facility.
2) Response Time: Manufacturer/Installer shall send qualified mechanics to the facility, after notification by email or phone:

a) Within 4 hours of notification of emergencies.
b) Within 2 weekdays of notification for non-emergency calls or maintenance

1.6 SUBMITTALS

A. Access Control Schedule, as specified in PART 3, prepared by Contractor's ACS provider/installer in consultation with CTF-SCS, and A/E.

B. Scope and Procedure: Submit 4 copies of

1) List, for A/E and City of Key Colony Beach approval, 3 similar projects (with owner contact information), installed and maintained by proposed system integrator.
2) List, with brief descriptions, of security equipment and software features that will be supplied, following the requirements of PART 2 below.

3) Product data sheets, riser and connection diagrams specific to this Work.
4) Proposed acceptance test procedure.
5) One copy of each of the above shall be for review

C. Electrical Infrastructure Quantities, for provision by Contractor: ACS manufacturer/installer shall submit the needed quantities and extent of the following, directly to Contractor (without review or approval by A/E):

1) Electrical boxes and power cabling as needed for ACS.
2) Empty conduit scheduled by ACS manufacturer/installer to serve doors not currently shown in the Construction Documents to receive electrical access control devices in the future.

D. Shop Drawings: Submit 10 copies of:

1) Riser and connection diagrams, schedules for location and function of each device, and specification data sheets for this Work. Do not submit generic riser diagrams.

E. Record Documents: After substantial completion of the ACS, submit 4 paper copies and 1 electronic copy that includes:

1) Detailed record drawings. Include floor plans of the facility showing Access Control Rack, Client Station, and controller locations as well as each point of access, type of access control, settings as configured, and level of security – all in editable form suitable for updating and extending by City of Key Colony Beach and the facility.
2) Floor plans. Based on the Contractor's final record document drawings for the Work.
3) O&M manuals. With the 4 paper copies, submit 1 set of operation instructions and manuals and the instruction documents used in training the City of Key Colony Beach operating staff.
4) Serial numbers. Provider/installer's part and serial numbers for each item of installed and specified equipment for the City of Key Colony Beach Property Control Auditing.
5) Warranties. Executed special warranties.

F. Additional Deliverables: to be delivered directly to CTF-SCS after City of Key Colony Beach's acceptance of record documents: Keys, spare parts, and special tools, plus 1 set of detailed record drawings, floor plans, and O&M manuals as specified above.

1.7 SPECIAL WARRANTIES

A. Product Special Warranty

1) Duration: Provide a 3-year limited warranty from the ACS manufacturer/installer that covers items of ACS software, equipment, cables and cards, starting when the system is considered substantially complete by the A/E and the City of Key Colony Beach.

2) Scope: Warrant against defects in software, equipment, cables, and cards.

a) Warrant that all items of equipment are new and not used.
b) Replace access cards in cases of deterioration with age or damage due to reasonable flexing.

3) Format of special warranty: Provide on letterheads of ACS component manufacturers or on letterhead of producer/installer, incorporating as a minimum the special warranty terms specified herein, and signed by corporate officers.

4) Remedy: Whenever equipment defects appear within the specified special warranty period, provide replacement components, or repair components to new condition, along with replacement/repair labor at no cost to the City of Key Colony Beach and with no pro-rata charge for equipment depreciation.

B. Installation Special Warranty:

1) Duration: Provide a 5-year limited warranty from the ACS manufacturer/installer that covers the installation and functioning of the product, starting when the system is considered substantially complete by the A/E and the City of Key Colony Beach.

2) Scope: Warrant against defects in cabling, quality of installation, connections to hardware and sensors, programming, configuring and subsequent functioning to meet the needs of the facility.

3) Format of special warranty: Provide on manufacturer/installer's letterhead, incorporating as a minimum the special warranty terms specified herein, and signed by corporate officers.

4) Remedy: Whenever defects of installation and function appear within the specified special warranty period, provide the labor, tools, repair materials and minor parts (not items of original equipment) to diagnose and repair the ACS at no cost to the City of Key Colony Beach.

5) Response: Respond to emergency calls and routine calls within the times and with the resources specified in Quality Assurance.

PART 2 PRODUCTS

2.1 MAIN CABINET

A. Surface mounted steel construction #14-gauge 36" x 36" x 6" cabinet with lockable hinged cover on ½" thick plywood backboard painted light gray.

2.2 DISTRIBUTION BUILDING, ELEVATOR ROOM, AND FLOOR CABINETS

A. Steel construction #14-gauge 24" x 24" x 6" cabinet with hinged lockable cover on ½" thick plywood backboard painted light gray.

2.3 CONDUIT AND BOXES

A. Provide and install the building and floor distribution cabinets for each building according to the following criteria:

1. There must be one of these cabinets within 300' of a controlled device.
2. Each cabinet can feed no more than 8 controlled devices and the cabinet must be located on the same floor as the controlled devices.
3. The main cabinet can serve as the distribution cabinet for its area.

4. A 2" raceway from the main cabinet to the next building & floor distribution cabinet.
5. After feeding all distribution cabinets with this raceway, return to the main cabinet.
6. Raceway shall not exceed 400' without a pull box.
7. Do not provide 1/2” conduits, minimum conduit size shall be ¾".

B. Provide and install ¾" conduits from the distribution cabinets and distribute to feed the junction and mounting boxes designated for the area.

1. Each separate ¾" feed will supply no more than two Controlled Device/Card Reader Feed locations.

C. Provide and install an elevator interface cabinet, 12” x 12” x 4” with hinged lockable cover and a ½" plywood backboard painted light gray with a 10-lug terminal strip mounted on the board at all designated elevator control panel locations.

1. Feed this interface box from the ¾" card access raceway.
2. Provide and install a separate ¾" raceway from the box into elevator control panel.
3. Label this box “Card Access/Elevator Interface”.
4. The Elevator Contractor shall extend his control wiring from the elevator control panel to this interface box.

D. Provide 4-11/16" x 4-11/16" x 2⅛" flush mounted box with single gang mud ring and weatherproof cover at each elevator stop.

1. Mount the box adjacent to the elevator call-button box and use a ¾" conduit to connect the two boxes.
2. Run a ¾" conduit from the 4-11/16" x 4-11/16" x 2⅛" box back to the nearest Card Access terminal cabinet and terminate.

E. At each controlled door, install the electric hardware’s power supply above drop ceiling within 50' of the hardware.

1. In “separate” raceway, supply 120V feed to the power supply.
2. Provide and install a ¾" conduit from the supply box to a neutral 6" x 6" x 4" distribution box located next to the supply.
3. Feed this box from the ¾" card-access system raceway.
4. Also, from this box provide and install an additional ¾" raceway along with (8) 18AWG and (2) 12AWG conductors run from the supply box to feed the electrical power transfer device.
5. From the supply, using that wiring, connect the electric hardware through the electrical power transfer device.

F. Provide and extend raceway to feed 4-11/16" x 4-11/16" x 2⅛" flush mounted boxes with single gang mud ring and weatherproof covers; mounted with the opening vertical, at all designated card reader locations.

1. Locate to the strike side of single doors, and as designated for double doors, elevator control, and gates.
2. Center 4' above finished floor.

G. Provide and install a 2" conduit from the Main Card Access terminal cabinet to a brooks box located at designated entry gates.

1. Exact location determined during plan review.

H. Provide and install a 4-11/16" x 4-11/16" x 2⅛" card access feed junction box with cover, at the interior side of all designated card access door locations.

1. If the area location has removable ceiling tile, the box shall be located above the tile.
2. If the location has a structure of fixed ceiling material, then flush-mount the box with a square
to round mud ring & cover.

I. Provide and install a 4-11/16" x 4-11/16" x 2⅛" flush mounted box with single gang mud ring and weatherproof cover; mounted with the opening vertical at 48” AFF as the designated “TeleEntry” mounting box.

J. Provide and install a 4-11/16" x 4-11/16" x 2⅛" flush mounted box with single gang mud ring and weatherproof cover; mounted with the opening vertical at 60" AFF as the designated “Master Key Control Box” mounting box and provide a 24" x 24" free space for mounting the Key Box.

K. Provide and install a ¾" conduit from the main telephone room terminal board to the main card access cabinet.

L. Provide and install six additional recessed mounted 4-11/16” x 4-11/16” x 2-1/8” boxes with flush single gang ring and cover; mount the opening vertical with ¾”-conduit run to nearest card access junction box, (estimate 100’ of conduit for each run).

1. Wall mounted locations directed in the field during construction prior to final above ceiling inspection.

2.4 POWER FEEDS

A. Provide a double duplex, dedicated 120-volt power receptacle fed from the optional branch of emergency generator power source, adjacent to the lower portion of the main terminal cabinet and each distribution cabinet.
B. Provide and install dedicated 120-volt power feeds from the optional branch of emergency generator source to all Electric Hardware Power supplies.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install system in accordance with NECA "Standard of Installation".
B. Permanently label all conduits as to plan room number destination, at all terminal cabinets.
C. Paint all Card access system junction box covers tan.
D. Install ½" (tan round indicators) of paper construction on ceiling tile grid work at all locations where card access system boxes are located above the drop ceiling.
E. Permanently label all the card access system terminal cabinets, "card access system".
F. Install 200 lb strength pull string throughout the raceway system.
G. The Card Access System raceway shall be a separate raceway and shall not interconnect with or be used by any other system.
H. Mount all junction boxes located above ceiling with the opening facing down, and with a reasonable immediate access pathway provided.

1. Note: The requiring of removing of a light fixture or other similar ceiling equipment is not a reasonable access pathway).

I. All conduit runs shall be as direct as possible in order to save on wiring costs and to reduce poor performance due to cable loss.

3.2 LOCATION

A. Provide a card reader/controlled device at locations shown on floor plans.

3.3 DEMONSTRATION AND TRAINING

A. Training of the City of Key Colony Beach’s operation and maintenance personnel is required in cooperation with the City of Key Colony Beach's Representative.
   1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
   2. Schedule the instruction in coordination with the City of Key Colony Beach's Representative after submission and approval of formal training plans.

B. Provide demonstration and training for all types of card access systems installed in this project.

END OF SECTION

14240 MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATOR

PART 1 GENERAL

1.01 SUMMARY

A. Section includes Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:

1. Standard pre-engineered hydraulic passenger elevators.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control systems.
4. Jack(s).
5. Accessibility provisions for physically disabled persons.
6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:

1. Division 1 General Requirements.
2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
4. Division 5 Metals:
   a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
   b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
6. Division 16 Sections:
   a. Providing electrical service to elevators, including fused disconnect switches where permitted. (Note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
   b. Emergency power supply, transfer switch and auxiliary contacts.
   c. Heat and smoke sensing devices.
   d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
7. Division 15 Plumbing
   a. Sump pit and oil interceptor.
8. Division 15 Heating, Ventilation and Air Conditioning
   a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Florida Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12-volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically, this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.

23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second-floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right-hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:

1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:

1. City of Key Colony Beach's manuals and wiring diagrams.
2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.

1. The manufacturer of machines, controllers, signal fixtures, door operator cabs, entrances, and all other major parts of elevator operating equipment.

a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
2. The manufacturer shall have a documented, on-going quality assurance program.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. Florida Building Code.
3. NFPA 70 National Electrical Code.
4. NFPA 80 Fire Doors and Windows.
5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
6. Section 407 in ICC A117.1, when required by local authorities

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2-hour label by a Nationally Recognized Testing Laboratory.

E. Inspection and testing:

1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the City of Key Colony Beach upon completion and acceptance of elevator work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.

   Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.

   1. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   2. Manufacturer shall have a service office and full-time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:

   1. Basis of Design based around TK Elevator’s Endura Machine Room-Less hydraulic elevator.

B. Other Manufacturers:

   1. Schindler
   2. Kone

2.02 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

B. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied powder coat for structural and architectural parts. Color selection must be based on elevator manufacture’s standard selections.

C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

D. Flooring by others.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing, or the plunger assembly used to house the section. Each plunger shall have a high-pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section.

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also, a means for manual operation at the valve in the pit is required.

2.04 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
    1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
    2. An oil hydraulic pump.
    3. An electric motor.
    4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
    1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
    2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
    3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
    4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
    5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
    6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
    7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e., pump motor, starter, etc.)

8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.05 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
   2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
   3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3-phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two-point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:

   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
   2. Reveals and frieze: a. Reveals and frieze: Stainless steel, no. 4 brushed finish
   3. Canopy: Cold-rolled steel with hinged exit.

4. Ceiling: Downlight type, metal pans with suspended LED downlights and dimmer switch. Number of downlights shall be dependent on platform size with a minimum of six. The metal pans shall be finished with a stainless steel, no. 4 brushed finish.
5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.

7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Not required

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer-based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
   3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully

closed, the travel shall reverse, and the door shall reopen to answer the other call.

4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless-steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: Not required for this application.

E. Special Equipment: Not Applicable

2.09 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
    1. Access to main control board and CPU
    2. Main controller diagnostics
    3. Main controller fuses
    4. Universal Interface Tool (UIT)
    5. Remote valve adjustment
    6. Electronic motor starter adjustment and diagnostics
    7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
    8. Operation of auxiliary pump/motor (secondary hydraulic power source)
    9. Operation of electrical assisted manual lowering
    10. Provide male plug to supply 110VAC into the controller
    11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: Fully automatic operation (Simplex 10D-4A) Upon loss of the normal power supply, building-supplied standby power is available to the elevator on the same wires as the normal power. Once the loss of normal power has been detected and standby power is available, the elevator is lowered to a pre-designated landing and will open the doors. After passengers have exited the elevator, the doors are closed. At this time the elevator is automatically allowed to continue service using the building-supplied standby power.

E. Special Operation: Not Applicable

2.10 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
    1. Provide one pushbutton riser with faceplates having a brushed stainless-steel finish.
        a. Phase 1 firefighter’s service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be

indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at all typical landings.

D. Hall lanterns: A hall lantern with adjustable chime shall be provided at each landing and located adjacent to the entrance. The lanterns, when illuminated, shall indicate the elevator car that shall stop at the landing and in what direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall lantern shall illuminate, and the chime shall sound. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor. Illumination of the arrow shall be with LED's. Faceplates shall match the hall station finish. Provide at all typical landings.

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.

1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise the City of Key Colony Beach, Contractor, A/E, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
    1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct City of Key Colony Beach's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train City of Key Colony Beach's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with City of Key Colony Beach's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
    1. Elevator Model: endura MRL Twinpost above-ground 2-stage
    2. Elevator Type: Hydraulic Machine Room-Less, Passenger
    3. Rated Capacity: 3000 lbs.
    4. Rated Speed: 80 ft./min.
    5. Operation System: TAC32H
    6. Travel: 23'-2"
    7. Landings: 3 total
    8. Openings:
        a. Front: 3

b. Rear: 0

9. Clear Car Inside: 6'-8" wide x 4'-9" deep
10. Inside clear height: 7'-4" standard
11. Door clear height: 7'-0" standard
12. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
13. Door Type: One-speed | LH Side opening
14. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
15. Seismic Requirements: No
16. Hoistway Dimensions: 8'-4" wide x 6'-3" deep
17. Pit Depth: 4'-0"
18. Button & Fixture Style: Traditional Signal Fixtures
19. Special Operations: None

END OF SECTION

14420 VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SUMMARY

This section includes vertical wheelchair lifts (vertical platform lifts) specifications.

Related Requirements:

1. Division 16 – Electrical; for rough-in and connections.

1.2 REFERENCES

A. Reference Standards:

1. American Society of Mechanical Engineers (ASME); latest editions:

a. ASME A17.1 Safety Code for Elevators and Escalators.

b. ASME A17.5 Elevator and Escalator Electrical Equipment.

c. ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts.

2. Canadian Standards Association (CSA); latest editions:

a. CSA B44.1 Elevator and Escalator Equipment

b. CSA B3555 Platform Lifts and Stair Lifts for Barrier-Free Access

1.3 SUBMITTALS

A. Product Data: Manufacturer's standard specifications, descriptive literature and certifications, including:

1. Catalog cut-sheets.

2. Sample warranty.

B. Shop Drawings: Graphic information specifically prepared for this project, including:

1. Dimensioned plans, elevations, sections and construction details indicating full extent of work required for vertical wheelchair lifts.

2. Verify dimensions.

C. Manufacturer's Written Instructions, including:

1. Delivery, storage and handling.

2. Preparation and Installation.

3. Maintenance.

D. Warranty: Fully executed, issued in the “City of Key Colony Beach’s” name, and registered with manufacturer, including:

1. Manufacturer’s [2-year] limited warranty, from date of substantial completion, covering defects in materials and workmanship for major components.

2. Manufacturer’s [1-year] limited warranty, from date of substantial completion, covering defects in materials and

1.4 QUALITY ASSURANCE

A. Installer: Acceptable to manufacturer, experienced in performing work of this section and specialized in installation of work similar to that required for this project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in accordance with manufacturer’s written instructions.

B. Deliver materials in manufacturer’s original unopened packaging with identification labels intact.

C. Store materials protected from exposure to harmful weather conditions and at temperature conditions in accordance with manufacturer’s written instructions.

PART 2 PRODUCTS

2.1 VERTICAL WHEELCHAIR LIFTS

A. Manufacturer: Bruno Independent Living Aids, Inc.; 1780 Executive Dr.; Oconomowoc, WI 53066; Tel: 877-778-699, Email: commercialvlp@bruno.com; Website: www.bruno.com/cvpl., or approved equal.

1. Single Source Responsibility: Provide components and materials in this section from a single manufacturer.

B. Product: VPL-3300B Series Vertical Platform Lifts; designed to lift single passenger with wheelchair, scooter or motorized chair to maximum height of 53 inches (1346mm); weatherproof for interior or exterior use.

1. Type:

a. Unenclosed: Designed with minimum floor space required; including, drive tower, platform, platform gate, upper landing gate, automatic folding ramp, and controls.

2. Platform size: 36 by 48 inches (914 by 1219 mm)

3. Finish and color: Powder coat finish unless noted otherwise, with non-slip additive on walking surfaces; champagne color.

4. Rated capacity: 750 pound (340 kg).

5. Installation method: Without pit.

C. Model: VPL-3353B

1. Type: Unenclosed

2. Number of stops: Two.

3. Platform configuration Straight through.

4. Maximum travel height: 53 inches (1346 mm).

5. Components:

a. Drive tower, including:

I. Main frame: Steel tube guides with formed steel sheet back; welded construction.

II. Travel carriage: Steel tube and plate fabrication with 2¼ inch (57 mm) diameter front and back sealed dual-ball- bearing wheels, and adjustable low-friction plastic side stabilizer pads.

III. DC battery-powered drive system, including:

a. Primary drive: ½ hp motor, 1750 rpm, 24V DC permanent magnet, 20 full-load amps, continuous duty.

b. Intermediate reduction: Dual 4L style poly-V belts and pulleys with 3.94:1 reduction.

c. Final drive: 1 inch (25 mm) diameter Acme screw with bronze nut and safety back-up nut.

d. Motor controller: 24V DC relay control with 35A circuit breaker and disconnect.

e. Braking: Precision landing control.

IV. Batteries (2): 12V DC; 17Ah.

V. Internal battery charger: 5A, 24V DC output with 120V AC, 3A 60 Hz input.

VI. Emergency lowering: Manual hand crank.

VII. Limit switches: Adjustable upper and lower limit switches; upper and lower final limit switches.

VIII. Drive tower cabinet: Formed steel sheet enclosure with top; bolted assembly.

b. Platform: Formed steel floor with fully enclosed bottom safety panel (unenclosed application only); 42-inch (1067 mm) high sidewalls with 1 inch (25 mm) metal tube frames fitted with sheet metal panels; grab bar; lighted, platform controls with keyed on-off switch, continuous pressure up-down paddle switch, and emergency stop with audio visual alarm.

c. Platform gate: 42-inch (1067 mm) high; 1½ inch (38 mm) metal tube frame with 16 gauge steel panel, hinges, latch plate, and pull handle; electro-mechanical interlock releases gate with platform at lower landing; electronic sensors stop platform from operating unless gate is locked.

d. Upper landing gate: 42 inch (1067 mm) wide by 42 inch (1067 mm) high; 1½ inch (38 mm) square by 12 gauge, steel tube frame with 16 gauge steel insert panel, hinges, latch plate, cam locking actuator, and pull handle; 3 inch (76 mm) by 1½ inch (38 mm) by 12 gauge steel gate posts welded to 5 inch (127 mm) by 4¾ inch (121 mm) by 3⁄16 inch (5 mm) thick steel mounting electro-mechanical interlock releases gate with platform at upper landing; electronic sensors stop platform from operating unless gate is locked; landing controls, built into gate post, with keyed on-off switch and continuous pressure up-down paddle switch.

e. Automatic folding ramp: 16 inch (406 mm) long by width of platform; self-lowering.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions of work previously installed under other sections or contracts are acceptable for installation of vertical wheelchair lifts in accordance with manufacturer's written instructions and approved submittals.

1. Notify A/E of unacceptable conditions upon discovery.

2. Do not proceed with preparation and installation until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Prepare mounting locations for installation in accordance with manufacturer's written instructions and approved submittals

3.3 INSTALLATION

A. Install vertical wheelchair lifts in accordance with manufacturer's written instructions and approved submittals.

3.4 CLEANING

A. Clean-up waste and debris daily during installation.

B. Upon completion, remove surplus materials, remaining debris, tools and equipment.

C. Collect recyclable waste and dispose of as specifications

3.5 PROTECTION

A. Protect installed products from damage during subsequent construction.

B. Repair damage to adjacent materials caused by installation of vertical wheelchair lifts.

END OF SECTION

15010 GENERAL PROVISIONS

PART 1 GENERAL

1.1 SUMMARY

A. Substitutions and Product Options:

1. Products List: Submit list of major products proposed to be used with names of manufacturers and installing subcontractors.
2. Contractor's Options:

    a. For products specified only by standard, select any product meeting standard.
    b. For products specified by naming 1 or more products by manufacturer's name and catalog number, select any 1 of the products or manufacturers named.
    c. Contractor may submit a request for substitution for any product or manufacturer not specifically named according to Instructions to Bidders and General Conditions.

3. Substitutions:

    a. The A/E will consider written requests from the Contractor for substitution of products for 45 days after contract award date.
    b. Submit a separate request for each product, supported with complete data, with drawings, and appropriate samples, including, in addition to the requirements of the General Conditions, the following:

        1) Comparison of qualities of proposed substitution with product specified.
        2) Changes required in other elements of the work because of proposed substitution.
        3) Effect on construction schedule.
        4) Cost data comparing proposed substitution with product specified.
        5) Any required license fees or royalties generated by the proposed substitution.
        6) Availability of maintenance service and source of replacement materials.

    c. The City's decision on approval or rejection for substitution will be final.

4. A request for a substitution is a representation that the Contractor:

    a. Has investigated proposed product and determined it is equal for less cost to or superior for equal cost in all respects to product specified.
    b. Provides the same warranties or bonds for the proposed substitution as for the product specified.
    c. Will coordinate installation of any accepted substitution into work and make other changes as may be required to make work complete.
    d. Waives all claims for additional costs, under Contractor's responsibility, that may become apparent.
    e. Has verified the proposed product qualifies for FPL Commercial/Industrial Energy Conservation Programs Standards rebates by meeting or exceeding FPL specified qualifications.

5. A/E will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the City's decision to accept or reject requested substitution.

1.2 SUBMITTALS

A. Submit shop and detail drawings, factory certified prints, brochures, and materials lists for items specified according to Instructions to Bidders and General Conditions. In addition to submitting these documents to the A/E for review and approval, the Contractor shall provide a copy of the shop drawings to the Building Code Consultant for review purposes only.

B. Substantial Completion Submittal Requirements:

1. Operating and Maintenance Manuals and Charts: Provide 3 complete sets of operating and maintenance instructions, literature, and information concerning equipment under this Division, including, but not limited to HVAC systems, indexed and bound in accepted loose leaf binders.
2. Record Prints:

    a. Keep 1 complete set of prints on file at job site for sole purpose of recording "record" data. Mark changes in red on the prints as work progresses.
    b. Update "record" prints before each requisition for payment for review and acceptance by A/E.
    c. Deliver completed set of "record" prints to A/E before request for final payment.

1.3 QUALITY ASSURANCE

A. Qualifications: Perform work by workers skilled in their respective trades and install specified materials and equipment according to manufacturer's recommendations.

B. Where special qualifications are required, i.e., for welders or brazers, a currently active certificate of qualification from a recognized testing laboratory and dated within 12 months before performance of work will be required.

1. If quality of work of any such specially qualified worker creates reasonable doubt as to skill, A/E may require worker to be removed and replaced.

C. Tradesperson Qualifications:

1. Contractor shall provide or cause to be provided by the appropriate subcontractors in the Mechanical and or plumbing trades for all work required by this Division 15 a ratio of one licensed master or journeyman for every three trainees at all times as those terms are defined by Chapter 10 of the Monroe County Code. No other workers shall be allowed.
2. Where the work of these trades is subcontracted:

    a. The contractor shall include this requirement in those subcontracts.
    b. The subcontractor shall show capacity to bond the subcontracted work. The decision to require such bond to be issued remains with the general contractor.

D. To ensure compliance with the above tradesperson qualifications requirement, the General Contractor shall require the trade subcontractor to submit with each draw request and shall in turn submit with the General Contractor’s draw request, a certified payroll

identifying each tradesperson employed for the work of this section during the payroll period, the qualification level of each tradesperson, and where licensed as a Master or Journeyman the license number of each individual.

1. This certified payroll shall also reflect the number of hours spent on this project performing the work of this section and shall reflect the appropriate ratio of qualified tradespersons as required by this section.
2. Failure to comply with this section either in providing the appropriate number of required licensed personnel or failure to submit the appropriate certified payroll information as required herein shall be a major breach of the contract and shall result in rejection of the payment application where the breach occurs and be cause for termination of the contract.

1.4 WORK INVOLVING REFRIGERANTS:

A. Regulatory Requirements (EPA):

1. All air-conditioning technicians on job site shall have EPA certification: According to EPA Section 608, Clean Air Act Amendments of 1990, individuals who service, repair, or dispose of air-conditioning and refrigeration equipment, including in-house service personnel, installers, contractor employees, and anyone else who performs installation, maintenance, or repair of HVAC refrigeration equipment shall be EPA certified.
2. Contractor shall be licensed by Monroe County or the State of Florida as a mechanical or air- conditioning contractor. A copy of the qualifier's license shall be included as part of required documents.
3. Contractor shall supply copies of current Certificates of Competency from Monroe County for all air- conditioning personnel on job site.
4. Refrigerant Recycling/Recovery Equipment: According to EPA Section 608, owners of refrigerant recycling or recovery equipment, including contractors and others responsible for HVAC equipment serving, shall submit EPA form OMB #2060-0256 signed by the City/responsible company officer, and sent to the appropriate EPA office.

B. Removal of Existing Refrigerants by City of Key Colony Beach: Where contract documents stipulate that refrigerant is to be reclaimed by City of Key Colony Beach:

1. Notify City of Key Colony Beach Project Manager and the appropriate City of Key Colony Beach Maintenance Satellite Supervisor at least 3 working days (72 hours) before starting demolition or removal of existing HVAC or refrigeration equipment, to allow refrigerant removal/recovery by City of Key Colony Beach Air-conditioning Department.
2. All reclaimed refrigerant from existing systems will remain the property of City of Key Colony Beach .

C. Before starting work, submit a current, clear, legible copy of the following required documentation to the Environmental Protection Agency (EPA):

1. EPA Technician UNIVERSAL CERTIFICATE of COMPLETION according to 40 CFR Part 82, subpart F.
2. EPA Refrigerant Recycling/Recovery Equipment Affidavit.

1.5 WARRANTY

A. Furnish copies to the City of guarantees for equipment or materials as specified in Instructions to Bidders and General Conditions.

B. The Contractor shall respond to repair of compressors, pumps, and other routine warranty service requests by completing repairs within 24 hours of service request by the City.

C. The Contractor shall respond to emergency warranty service requests with the arrival of service technician at affected site within 4 hours of notification of emergency. Repairs shall be expedited to bring system online as soon as possible. Emergencies include, but are not limited to failures of controls, cooling towers, and any other component causing system failure.

D. If problem is not correctable within specified time frames, the Contractor shall provide in writing an expected completion date to the City.

E. Inspections at End of Warranty:

1. At the end of the 1-year warranty period, the City will decide if the warranty items cited during the course of the warranty period have been completed to the satisfaction of the City.
2. Meet on-site with City of Key Colony Beach Warranty Section and A/E before the end of the 1-year warranty period and address unresolved warranty items to the satisfaction of the City.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide new materials, free from defects, of domestic manufacture unless otherwise noted.

2.2 EQUIPMENT

A. Use equipment scheduled in the Construction Documents to determine space and service requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Clean surfaces free of grease, scale, rust, and other foreign matter and leave ready for painting.

B. Field paint exposed piping, ducts, hangers, and supports as specified in Division 9, Finishes, of City of Key Colony Beach Master Specifications.

1. Touch-up factory finishes marred in construction with factory touch-up kits.

C. Provide starters, required control items, and wiring diagrams for motors specified under this Division, unless otherwise noted.

D. Electrical items furnished shall conform to the requirements of Division 16.

3.2 FIELD SUPERVISION

A. Verify measurements at building site before starting work. Submit discrepancies and differences to A/E for consideration and decision before proceeding with work.

B. Obtain full information regarding:

1. Peculiarities and limitations of space available for installation of equipment.
2. Materials under contract.
3. Accessibility required to dampers, valves, and other apparatus, including any part of any system needing maintenance or operation.

C. Provide accurate layout, grades, and elevations. Set sleeves and openings in ample time for other trades to proceed in a timely manner. Take proper precautions to protect work and equipment from damage.

D. Cut openings and chases required to accommodate the Work and repair floors, walls, and ceilings damaged by such cuttings.

E. Perform required tests in the presence of A/E and authorities having jurisdiction. Give 48-hour notice before tests.

F. Insure compliance with safety codes and other codes and ordinances applicable to the performance of work under this Division.

3.3 FIELD QUALITY CONTROL

A. Work will be inspected by A/E during construction.

B. HVAC systems shall be operational and maintain 75 $\pm$ 2 degrees F. and a constant 55 $\pm$ 2 percent relative humidity for a period of at least 3 days (72 hours) before installation of specified interior finishes. These conditions shall be maintained at all times until interior finish installations are completed and accepted by City of Key Colony Beach. Record conditions at least every 4 hours and provide supplemental temporary air-conditioning or dehumidification if HVAC is not operating at specified conditions. Exterior openings shall be kept closed during these periods by using temporary or permanent barriers.

C. Maintain a repair log of equipment before substantial completion.

D. Prerequisites to substantial completion inspection shall be completed construction, testing, adjustments, repair logs, balancing, start-up, and required instruction periods on specified mechanical equipment and systems.

1. Air-conditioning:

a. Ductwork shall be installed complete with required dampers, deflectors, hangers, and insulation.
b. Air-conditioning units shall be leveled.
c. Control system components shall be installed and tested for function.
d. System testing and balancing shall be completed.

3.4 DEMONSTRATION

A. As a condition for substantial completion and after systems have been tested and checked as complete and operational, Upon the City's request and at no cost to the City, provide on-site training of the operation of systems to the City's maintenance and administrative staff.

B. Furnish a minimum of 8 hours or as needed to provide adequate in-service training. These sessions will be broken into segments to facilitate the training of individuals in operating the equipment. Operating manuals and user's guides shall be provided at training sessions.

C. The completion of such training shall be documented to the satisfaction of the City.

END OF SECTION

15023 CODES AND STANDARDS

PART 1 GENERAL

1.1 REFERENCES

A. Comply with the following:

1. Florida Building Code (FBC).
2. Florida Building Code (FGC) - Fuel Gas.
3. Florida Building Code (FMC) - Mechanical.
4. Florida Building Code (FPC) - Plumbing
5. Florida Building Code (FPC) - Energy Conservation Code.
6. National Electrical Code - NEC (NFPA 70).
7. National Fire Protection Association - (NFPA). NFPA 101 and other NFPA codes as applicable.
8. American National Standards Institute (ANSI) A117.1.
9. American Society of Civil Engineers (ASCE) 7.
10. ASHRAE Standards as referenced by applicable Code(s).

1.2 QUALITY ASSURANCE

A. Where materials and equipment are available under the continuing inspection and listing service of on OSHA approved Nationally Recognized Testing Laboratories (NRTL) and National Electrical Manufacturer's Association (NEMA), furnish materials and equipment so listed.
B. Where codes conflict, the most stringent requirement applies

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

15044 GENERAL COMPLETION

PART 1 NOT USED

PART 2 NOT USED

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Construction, satisfactory testing, adjustments, balancing, start-up, and required instruction periods shall have been completed on specified mechanical equipment and systems before substantial completion inspection. All safety equipment shall be in place and operational. There shall be no undue equipment noises, leaks, or misaligned equipment.

1. Air-conditioning:
   a. Ductwork: Installed complete, including required dampers, deflectors, hangers, and insulation.
   b. Air-conditioning Units: Installed, cleaned, and leveled. New filters in place.
   c. Condensers: Installed, leveled, and charged with refrigerant.
   d. Insulation: Installed with no condensation leaks.
   e. Control System Components: Installed and tested for function.
   f. Safety Equipment: Installed and tested.
   g. System Testing and Balancing: Complete.

2. Plumbing:
   a. Piping: Pressure testing complete. System free flowing.
   b. Plumbing Fixtures: Unchipped, leveled, clean, and handicapped accessible. Grouting completed.
   c. Toilet Room Accessories. Installed and secured.
   d. Insulation: Installed.
   e. Domestic water: Permanent connection with backflow preventers in place.
   f. Compressed Air System: Piping sloped, air outlets and moisture traps installed and working.
   g. Safety Equipment: Installed and tested.
   h. Valving: Open.

3. Fire Protection:
   a. Water Flow Alarms: Tested and functioning.
   b. Fire Extinguishers: Installed.
   c. Sprinkler Heads: Supported and protected.
   d. Materials and Test Certificate: Complete and signed.
   e. Piping: Pressure testing complete. System free flowing.
   f. Fire protection water source: Permanent connection with backflow preventer in place.
   g. Safety Equipment: Installed and tested.
   h. Valving: Open.

END OF SECTION

15047 IDENTIFICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Identification including necessary accessories indicated on Construction Documents and specified in this section or as required for proper identification of equipment and piping.

B. Related Sections:

1. 02221 -Excavating, Backfilling, and Compaction for Utilities
2. 11600 - Laboratory Equipment.
3. 15410 - Piping (Plumbing).
4. 15330 - Automatic Sprinkler Piping.
5. 15510 - Piping (HVAC)

1.2 SUBMITTALS

A. Submit properly identified product and technical data including printed installation instructions before starting work.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Color Coding: ANSI Z535.1 (latest edition) shall take precedence over any discrepancies in determining proper color code identification.
2. Conform to the standards established in ANSI A13.
3. Comply with OSHA standards.

PART 2 PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

A. Identify equipment served by piping systems by number or legend as shown on Construction Documents.

B. Engraved Plastic Name Plates: Provide engraved laminated plastic name plates with 1-inch-high letters on equipment cabinets.

C. Valves: Provide all valves with a 1-1/2" diameter brass tag having 1/2" high black filled numbers and 1/4" high letters, as manufactured by Seton or accepted equivalent.

1. Service shall be identified by abbreviations such as: CHW (Chilled Water), CW (Condenser Water), HW (Hot Water), DW (Domestic Water), GAS, etc.
2. Valve tag fasteners shall consist of No.6 brass beaded chain. The use of color-coded one-piece nylon ties is acceptable instead of beaded chain fasteners.
3. Prepare schematic piping diagrams of systems controlled by valves with a schedule identifying all valves. Diagram and Valve Schedule shall be posted in the mechanical

room where system depicted is located. All diagrams shall be printed on non-fading media and framed under a plastic laminate surface.

D. Piping Identification:

1. Color Coding: Identify piping with markers and directional arrows according to the following color-coding system:

Description	Background	Letters
Hot Water	Yellow	Black
Cold Water	Green	White
Gas	Yellow	Black
Air	Blue	White
Vacuum	Green	White
Steam	Yellow	Black
Nitrogen	Green	White
Oxygen	Yellow	Black
Hydrogen	Yellow	Black
Refrigerant	Yellow	Black
Fire	Red	White

2. Piping Identification Materials:

a. Identify contents and flow direction of piping or pipes wrapped with insulation by using:

1) Brady B-946 self-sticking vinyl.
2) Champion America Inc., pressure sensitive vinyl.
3) Seton Opti-Code.
4) Ready Made adhesive pipe markers.

3. Valve Identification:

a. Identify location and system under valve control with a color-coded thumb tack under valve and lay-in ceiling tile.

E. Underground Tapes:

1. Electrical Warning Tape: 6 mil, 3 inches wide polyethylene.

a. BURIED ELECTRICAL LINE BELOW - No.37236 by Seton or accepted equivalent.

2. 2" Metallic Detection Tapes:

a. BURIED SEWER LINE BELOW - No.37220 by Seton or accepted equivalent.
b. BURIED WATER LINE BELOW - No.37222 by Seton or accepted equivalent.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

B. Verify surfaces are clean and dry before application of identification signage.

3.2 INSTALLATION

A. Brass Tags or Engraved Plastic Name Plates:

1. Install brass tags or engraved plastic name plates according to manufacturer's instructions.
   a. Place brass tags or name plates in locations easily visible within the space at normal eye level or as otherwise directed by A/E.

B. Piping Markers and Directional arrows:

1. Location:
   a. Pipes Passing Through Walls: Provide pipe markers and directional arrows on the pipe on each side of the wall.
   b. Pipes Behind Access Doors/Panels: Provide pipe markers and directional arrows within view.
   c. Continuous Run Pipe Lines: Provide pipe markers and directional arrows at intervals not exceeding 50 feet.
   d. Risers and ”T” Joints: Provide pipe markers and directional arrows at each riser and ”T” joint.
   e. Vertical and Horizontal Change of Direction: Provide pipe markers and directional arrows at each vertical and horizontal change of direction.

2. Special Requirements:

   a. Directional Arrows: When identifying by directional arrows, point arrow head away from pipe markers and in the direction of flow.

      1) Direction of Flow: If the flow can be in both directions, identify by using double-headed directional arrows.

   b. Thin Film Pipe Markers and Thin Film Directional Arrows: When using both thin film pipe markers and thin film directional arrows on soft insulation, provide a spiral wrap of accepted pipe banding tape around the pipe as foundation for both markers and directional arrows.

C. Underground Tapes:

1. Electrical Warning Tape: Install warning tape 8 inches below finish grade on all underground outside electrical lines.
2. 2" Metallic Detection Tapes: Install metallic detection tape 4 inches to 6 inches below finish grade on all underground outside plumbing and air-conditioning lines.

END OF SECTION

15051 MECHANICAL SUPPORT DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. Individual controllers for mechanical equipment specified in this Division with installation in Division 16.
2. Motor control centers, motor control panels, and other group controllers for mechanical equipment specified under Division 16.

1.2 REFERENCES

A. Comply with applicable standards of the following:

1. National Electrical Manufacturers Association (NEMA): MG 1 – Motors and Generators.

1.3 SUBMITTALS

A. Properly identified manufacturer's catalog cuts and technical data before starting the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Motors:

1. Gould.
2. Baldor.

B. Starters:

1. Allen-Bradley.
2. Accepted equivalent.

2.2 EQUIPMENT

A. Motors:

1. Open Motors: Induction type, unless otherwise noted, with pressure gun grease fittings.

a. Provide slide rails where motor drives require adjustment.
b. Connected load shall not cause running current to exceed the nameplate amperage.
c. Rated Temperature Rise: 40 degrees.

2. Motors 1/6 HP and Under: May be split phase type, unless otherwise noted.

3. Motors Smaller Than 1 HP: Single phase, open, capacitor type according to NEMA standards wound for voltage specified on the drawings, 60 Hz, AC, unless otherwise noted.
4. Motors 1 HP and Larger: 3 phase, Class B, general purpose, squirrel cage, open type, induction motors according to NEMA Design B standards, wound for voltage specified on the drawings, 60 Hz, AC, unless otherwise noted.
5. Motors 1 HP and Larger: Shall be premium high efficiency meeting the nominal efficiencies found in NEMA MG 1. Minimum power factor for motors between 1 and 5 HP shall be 0.70 and 0.80 for larger sizes.

B. Starters:

1. For Motors Smaller Than 1/2 HP: Across-the-line type with "on/off" push button (unless otherwise noted) suitable for mounting in standard electric switch box.
2. For Motors 1/2 HP and Larger: with control circuit transformers, fused CLF primary, overload protection in 3 phases and "manual-off-auto" switch in covers, unless otherwise noted.

    a. Provide NEMA 1 enclosures, unless otherwise noted.

3. Manual Starters for Small 3 Phase Motors: Where indicated, with toggle operator and 3 overload heaters.

    a. Provide NEMA 1 enclosures, unless otherwise noted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specified equipment according to manufacturer's recommendations and applicable codes and regulations.

END OF SECTION

15090 SUPPORTS, ANCHORS, AND SEALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Pipe supports, anchors, seals and accessories indicated on the Drawings and specified in this section.

B. Related Sections:

1. Division 7 - Thermal and Moisture Protection
2. 15410 - Piping (Plumbing).
3. 15430 - Piping Specialties (Plumbing).
4. 15515 - Valves, Hangers, and Specialties.

1.2 REFERENCES

A. Pipe Supports: ANSI B31.1, Power Piping.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Inserts:

1. Malleable iron case of galvanized steel shell expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, and lugs for attaching to forms.
2. Size insert to suit threaded hanger rods.
3. Wall Support:

    a. Pipe Sizes to 3 Inches: Cast iron hook.
    b. Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamps.

4. Vertical Support: Steel riser clamp.
5. Floor Support:

    a. Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.
    b. Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws and concrete pier or steel support.

6. Provide copper plated supports for copper piping or provide non=conducting PVC jacketing or insulating grommet between support and piping.

B. Hanger Rods: Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

C. Flashing: Stainless steel as per Division 7.

D. Sleeves:

1. Pipe Through Floors: Form from 18 gage galvanized sheet metal.
2. Pipes Through Beams, Walls, Fireproofing, Footings, Potentially Wet Floor: Form from steel plate or 18 gage galvanized sheet metal.
3. Size large enough to allow for movement due to expansion.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Inserts:

1. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.
2. Where concrete slabs form finished ceiling, furnish inserts flush with slab surface.

B. Supports:

1. Support CPVC and polypropylene according to manufacturer's requirements.
2. Support riser piping independently of connected horizontal piping where practical.

C. Priming: Prime coat exposed steel (not galvanized) supports.

D. Flashing: Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

E. Sleeves: Where piping passes through floor, ceiling, or wall, close space between pipe or duct and construction with noncombustible insulation. Provide tight fitting metal caps on both sides and caulk.

END OF SECTION

15175 TANKS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Aboveground and underground tanks and accessories indicated on the Drawings and specified in this section.

B. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 03300 - Cast-In-Place Concrete.
3. 02735 - Waste Water Drainage System
4. 15410 - Piping (Plumbing).

C. American Society for Testing and Materials (ASTM) - latest edition of the following:

1. C890 - Standard Practice for Minimum Structural Design for Monolithic or Sectional Precast Concrete Water and Waste Structures.
2. C923 - Standard Specifications for Resilient Connectors Between Reinforced Concrete Manholes Structures, Pipes, and Laterals.

D. Comply with Florida Building Code (FBC), latest edition.

E. Comply with Florida Statute 64E-6.013 – Construction Material and Standards for Treatment Receptacles.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Access Manholes and Frames: Catalog cuts.

C. Steel Tanks: Catalog cuts and manufacturer specifications.

D. Concrete Tanks: Catalog cuts and manufacturer specifications or construction details and dimensions.

E. Polyethylene Grease Interceptor Tanks: Catalog cuts and manufacturer specifications or construction details and dimensions.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Grease Interceptor Tanks:

1. Precast Reinforced Concrete:

a. Precast reinforced concrete tank, 4,500 psi according to Division 3, monolithic bottom and sides, finish smooth and impervious inside, with required inlet and outlet fittings, access manhole frames and covers, and cleanouts.
b. Access manholes shall have non-skid removable cast iron covers, with bolted gas/water tight seal and lift hole. Unless otherwise indicated on the Construction Documents, covers shall be rated for heavy traffic (minimum 16,000 lbs.).
c. Tank construction, capacity, and size as shown on Construction Documents.

2. Polyethylene:

a. Seamless molded high-density polyethylene with minimum 3/4" uniform wall thickness.
b. Furnished for below grade installation with field adjustable riser system.
c. Access manholes shall have non-skid removable cast iron covers, with bolted gas/water-tight seal and lift hole. Unless otherwise indicated on Construction Documents, covers shall be rated for heavy traffic (minimum 16,000 lbs.).
d. Tank construction, capacity, and size as shown on Construction Documents.
e. Tanks located within in a vehicular traffic area shall be provided a reinforced concrete slab designed to carry the traffic load.
f. Approved Manufacturer: SCHIER Grease Interceptors or other A/E approved equal.

3. An appropriate mechanism shall be provided to make access-manholes vandal, tamper and child resistant.
4. Manhole covers shall have identification cast in top surface. Provide covers labeled "GREASE INTERCEPTOR" as required.

B. Transformer Oil Retention Sump: Sump construction details, capacity and size as shown on Construction Documents.

C. Fuel Storage Tank: Capacity and size as shown on Construction Documents.

PART 3 EXECUTION

3.1 INSTALLATION

A. The excavation for underground tanks shall be level and free of debris and rocks that could damage the receptacle or prevent proper leveling, backfilling or compaction. Backfill material shall be free of rocks and debris.

B. Installation of underground tanks shall be as required by Codes, as recommended by manufacturer or as shown on Construction Documents whichever is more stringent. Follow installation procedures that prevent the tank from settling, floating or from being damaged or distorted shall

C. Set manhole cover frames at proper elevation, flush with paving surfaces per manufacturer’s recommendations. Secure with two 5/8" diameter galvanized steel anchor bolts. Install labeled covers to identify tank contents.

D. Submit proposed tank installations to DERM. Secure permit from DERM prior to installation.

E. Water Tightness Testing: Tanks shall be water tested in accordance with applicable Codes and regulations.

END OF SECTION

15180 MECHANICAL SYSTEMS INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15510 - Piping (HVAC).
2. 15410 - Piping (Plumbing).
3. 15515 - Valves, Hangers, and Specialties.
4. 15540 - Pumping Equipment (HVAC).
5. 15890 - Ductwork.

1.2 REFERENCES

A. Current applicable edition of standards of: American Society for Testing and Materials (ASTM):

1. C534-94 Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
2. C547-95 Specification for Mineral Fiber Pipe Insulation.
3. C552-91 Specification for Cellular Glass Thermal Insulation.
4. C553-92 Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
5. C585-90 Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
6. C612-93 Specification for Mineral Fiber Block and Board Thermal Insulation.
7. D1056-91 Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
8. D1668-95 Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing.
9. E84-96a Test Method for Surface Burning characteristics of Building Materials.
10. E96-95Test Methods for Water Vapor Transmission of Materials.

B. National Bureau of Standards (NBS).

C. National Fire Protection Institute: NFPA 90A.

D. Underwriters Laboratories (UL) - 723.

E. Insulation Contractor’s Association of South Florida Inc.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts, performance curves, and procedures before starting work.

1.4 DELIVERY AND STORAGE

A. Protect materials from the weather during storage and installation.

1.5 QUALITY ASSURANCE

A. Materials shall be labeled, listed, or have certified test reports submitted from testing laboratory accepted by the City of Key Colony Beach.

B. Comply with the most stringent requirements between the Insulation Contractors Association of South Florida Inc. and as specified.

C. There shall be no fiberglass in contact with the HVAC airstream anywhere in the system whether protected by encapsulation or not.

D. Foam plastic insulation shall be certified, by an independent third-party national recognized laboratory, that the product emits less than 1 part per million formaldehyde out gassing after 24 hours.

E. All adhesives and sealants used on the construction of mechanical insulation shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 2.2, Indoor Environmental Quality Section, Credit EQ-4.1.

F. All coatings and mastics for mechanical insulation used on the building's interior shall comply with the VOC limits set forth by Green Seal GS-11 and comply with the South Coast Air Quality Management District (SCAQMD) Rule #1113; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 2.2, Indoor Environmental Quality Section, Credit EQ-4.1.

G. Fiberglass Adhesives and Vapor Barrier Coatings shall meet California Department of Public Health (CDPH) Standard Method Ver. 1.1, 2010 Small Scale Environmental Chamber Test for VOCs, and CA Specification 01350.

1.6 FIRE HAZARD RATING

A. Fire hazard rated materials shall be UL labeled or a certified test report by a City of Key Colony Beach accepted testing laboratory shall be submitted indicating product's compliance with specified fire hazard requirements.

B. Insulation (including adhesives) shall be fire retardant or self-extinguishing. Finishing jackets, insulation, and adhesives shall have composite fire and smoke ratings complying with ASTM E84, NFPA 255, and UL 723, as plain or on a composite basis.

C. When insulation, vapor barrier covering, wrapping materials, and adhesives are applied separately in field, each item shall be tested individually.

D. When insulation, vapor barrier covering, wrapping materials, and adhesives are factory composite systems, they shall be tested as an assembly.

E. Insulation materials, adhesives, coatings, and other accessories shall have a fire hazard rating not more than 25 for flame developed and not more than 50 for fuel contributed and smoke developed, except as follows:

1. Flexible unicellular insulation.
2. Nylon anchors for securing insulation to ducts or equipment.
3. Factory pre-molded 1-piece fittings and valve covers

F. Flame resistance treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Insulation:

1. Armaflex.
2. Armstrong.
3. Certain-Teed.
4. Foamglas.
5. Manville.
6. Owens-Corning.
7. Pittsburgh Corning.

B. Insulating Cement Mastics, adhesives and coatings as manufactured and recommended by:

1. Keene Powerhouse.
2. Fibrex FBX fast set.

2.2 MATERIALS

A. Insulation: Type and thickness as specified.

1. Provide fire retardant or self-extinguishing insulation, including adhesives.
2. Finishing jackets, insulation, and adhesives shall have composite fire and smoke ratings per ASTM E84, NFPA 255, and UL 723.

B. Tape: As recommended by the insulation manufacturer or 3M adhesive EC-1329.

C. Insulating Cement: All-purpose mineral wool cement.

D. Glass Cloth Jacket: Factory sized white, standard weight, with 1-1/2" minimum longitudinal pressure sealing lap and seal strips for butt joints.

E. Vapor Barrier Jacket:

1. Flame resistant glass fiber adhered to outside of a 1 mil aluminum foil sheet with longitudinal pressure sealing lap and seal strips for butt joints.
2. End cement perm rating shall not exceed 0.05.

F. Weatherproof Metal Jacket (Exterior Above Ground Only):

1. Damage and corrosion resistant, longitudinal seam closure, joint construction capable of locking insulation and jacket securely in place.
2. Seal and weatherproof butt joints with factory supplied 2 inch wide "snap-straps" lined with plastic sealing compound secured with outer holding band.
3. Jacket Material: 0.016 aluminum.

G. Molded Fiberglass Pipe Insulation:

1. Rigid molded sectional pipe covering with integral factory jacket.
2. Comply with ASTM C547.
3. Maximum Thermal Conductivity: 0.23K factor at 75 degrees F. mean temperature.
4. Alkalinity: Less than 0.6 percent.

H. Foamed Plastic Insulation:

1. Closed cell.
2. Comply with ASTM C534.
3. Maximum Thermal Conductivity: 0.27K factor at 75 degrees F. mean temperature.
4. Water Vapor Permeability: 0.1 perms.

I. Cellular Glass Insulation:

1. Comply with ASTM C552
2. Maximum Thermal Conductivity: 0.33 K factor at 75 degrees F.
3. Water Vapor Permeability: 0.00 perm-in.

J. Flexible Fiberglass Ductwrap Blanket Insulation:

1. 2.2/2.3 inches thick, 3/4 pounds per cubic foot density fiberglass blanket with UL approved aluminum foil vapor seal facing reinforced with fiberglass scrim, laminated to 30 lb. kraft paper, R = 6.5.
2. Comply with ASTM C553, TYPE I, Class B-4.
3. Maximum Thermal Conductivity: 0.24K factor at 75 degrees F.

K. Rigid Fiberglass Ductboard Insulation:

1. Comply with ASTM C612.
2. Maximum Thermal Conductivity: 0.24K factor at 75 degrees F.
3. Provide scrim foil facing having a minimum 3 pounds per cubic foot density, 2 inches thick.

L. Accessories:

1. The following accessories shall be used in the application of thermal insulation:

    a. PVC fittings cover and PVC jacketing:

        1) Certain-Teed "Snap Form".
        2) Manville Corp. "Zeston".
        3) Proto.

    b. Vapor Barrier Mastic:

        1) Foster 30-65.
        2) Childers CP-34.
        3) Vimasco 749.

    c. Lagging Adhesive:

1) Foster 81-42W or 30-36.
2) Childers CP-50 AMV1.
3) Vimasco 713.

d. Weather Barrier Breather Mastic:

1) Foster 45-00 or 46-50.
2) Childers CP-10 or CP-11.
3) Vimasco WC-5.

e. Insulation Bonding Adhesive (to metal):

1) Foster 85-60.
2) Childers CP-127.
3) Duro Dyne SSG.

f. Insulating and Finishing Cement:

1) Fibrex Inc. FBX Super Blend Cement.
2) Manville Corp. No.375 Insulating and Finishing Cement.
3) Keene Corp. Super Powerhouse.

g. Insulation Joint Sealants: Foster 95-50, Childers CP-76, Pittsburgh Corning PC444 or accepted equivalent.
h. Metal Jacketing Sealant: Foster 95-44, Childers CP-76, Pittsburgh Corning 727 or accepted equivalent.
i. Staples: Type 304 or 316 stainless steel outward clinching type.
j. Wire: 16 gage, copper weld wire.
k. Bands: 3/4 by 0.015" thick galvanized steel.
l. Glass or Polyester Reinforcing Mesh :

1) 10 strands by 10 strands per square inch or 9 strands by 9 strands per square inch.
2) Childers Chil Glas #10.
3) Foster Mast a Fab.
4) Pittsburgh Corning PC 79.

m. Insulation Jackets:

1) Jackets inside building shall comply with fire hazard classifications as specified. Insulation jackets shall not support mold growth.
2) Vapor Barrier Jackets:

a) For Cold Pipelines (-30 degrees F. to 60 degrees F.): Perm rating shall not exceed 0.05, ASTM E96 Procedure A. Puncture resistance shall not be less than 50 beach units.
b) For Air-conditioning Ducts: Perm rating not more than 0.05, ASTM E96, Procedure A. Puncture resistance shall not be less than 25 beach units.

2.3 SYSTEMS INSULATION BY SERVICE TYPE

A. Chilled Water Supply and Return Piping Insulation:

1. 1" diameter and smaller - copper, aboveground:

    a. Foamed Plastic Pipe Insulation: 1 inch thick.
    b. Provide vapor barrier mastic on all seams, elbows and fittings.

2. 1-1/2" to 4" diameter - aboveground:

    a. Cellular Glass Insulation.
    b. Thicknesses as follows:

        1) 2 inches thick for interior ceilings.
        2) 2-1/2 inches thick for areas such as exterior or perimeter corridors and walkways, whether exposed of concealed, or in ceilings or breezeways.
        3) Provide insulation joint sealant on all longitudinal and butt joints.
        4) Provide vapor barrier mastic and reinforcing mesh on all elbows, fittings and valves. Omit this finish at exterior aboveground piping as specified in paragraph 3.2.C of this section.

3. 5" to 10" diameter - aboveground:

    a. Cellular Glass Insulation.
    b. Thicknesses as follows:

        1) 2-1/2 inches thick for interior ceilings.
        2) 3 inches thick for areas such as exterior or perimeter corridors and walkways, whether exposed of concealed, or in ceilings or breezeways.
        3) Provide insulation joint sealant on all longitudinal and butt joints.
        4) Provide vapor barrier mastic and reinforcing mesh on all elbows, fittings and valves. Omit this finish at exterior aboveground piping as specified in paragraph 3.2.C of this section.

4. Underground, all sizes.

    a. Cellular Glass Insulation: 2-1/2 inches thick with factory applied jacket.

B. Hydronic and Domestic Hot Water Supply, Return and Recirculation Piping and Fittings Insulation:

1. 1-inch-thick molded fiberglass insulation with pre-sized factory applied FRJ jacket of glass cloth with longitudinal lap and butt joint strips with self-sealing adhesive.
2. Insulation may be 1/2" insulation for vertical branches to individual fixtures.
3. Minimum density of 7-1/4 pounds per cubic foot, maximum thermal conductivity factor of 0.26K at 75 degrees F. mean temperature, and alkalinity of 0.696.
4. Flame Spread: 25 or less.
5. Smoke Developed: 50 or less.
6. Accessories: Adhesives, mastics, cements, tapes for fittings, and related materials shall have the same composite ratings as listed above.

C. Solar Collector Piping and fittings Insulation:

1. Same as specified for Hot Water Piping except with weatherproof jacket.

D. AHU Drainage Piping, Drinking Fountain, and Electric Water Cooler Drain Piping; refrigerant suction piping, insulation:

1. Elastomeric (foam plastic) thermal insulation 1 inch thick with built-in vapor barrier rated self-extinguishing ASTM D1056.
2. Maximum thermal conductivity factor of 0.26K at 70 degrees F. mean temperature, density of 5-6 pounds per cubic foot, and a water vapor transmission of 0.1 perms.

E. Engine Exhaust and Gas Boiler Flue Insulation:

1. 3 inches thick hydrous calcium silicate on pipe, fittings, and muffler.
2. 3 inches thick Temp Matt on flexible connections.
3. Fasteners: 14 gage galvanized iron wire on 9-inch centers.
4. Fittings: Fabricated from pipe insulation.
5. Finish: 1200-degree F. glass cloth.
6. Maximum thermal conductivity factor of 0.5 K at 500 degrees F. mean temperature and a density of 11 pounds per cubic foot.

F. Hot Water Storage Tank Insulation:

1. 3-inch-thick block insulation with V-grooves.
2. Secure with 24 gage galvanized wire or 1/2" wide galvanized bands on 12-inch centers.
3. Finish with exposed smooth coat of insulating cement and when dry apply Foster GPM mastic with glass cloth reinforcing.

G. Interior Concealed Ductwork Insulation:

1. Flexible fiberglass Ductwrap Blanket Insulation:

    a. 2.2 inches thick, 3/4 pounds per cubic foot density, R=6.5.
    b. 2.0 inches thick, 1-1/2 pounds per cubic foot density, R=6.3.

H. Interior or Exterior Exposed Ductwork Insulation:

1. Rigid Fiberglass Ductboard Insulation: 2 inches thick, 3 pounds per cubic foot density, with factory applied FSK jacket.

I. At contractor’s option, where specified and approved by the City of Key Colony Beach on per project basis pre-insulated, underground exterior piping may be used.

1. Pre-insulated underground piping system shall consist of integral sealed units insulated with rigid polyurethane foam sealed with outer jacket and compression fitted rubber end seals:
2. Pipe: All sizes: Pipe shall be as specified in Section 15510.
3. Insulation: All sizes: Rigid 90 to 95 percent closed cell polyurethane with 1.9 to 3.0 lbs./cu.ft. density and a thermal conductivity (K) of 0.13 to 0.17 BTU/sq.ft./°F./inch at 73 degrees F, 2 1/2" minimum thickness.
4. Jacket: All sizes: Type I, Grade 1 PVC or HDPE with a minimum wall thickness of 0.060 inches.
5. Fittings: Fittings shall be coated in the field (Ricwil "Rip Coat or equivalent).
6. Manufacturers:

a. Energy Task Force, Apopka, FL.
b. Insul-Tek, Mulberry, FL.
c. Steel-Gard by Ricwil.
d. Insul-8 by Rovanco Corp.
e. Heat Tite by Thermal Pipe Systems Inc.
f. Thermacor Process, Inc.

    1) Ferro-Therm (Welded)
    2) Ferro-Therm D.I. (Gasketed)
    3) Copper-Therm (Brazed).

g. U.I.P. by Urecon, Melbourne, FL.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install insulation according to applicable codes and regulations.

B. Except as specified, install materials according to manufacturer's recommendations and specifications for obtaining conformance to construction documents.

C. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use and samples required for acceptance shall have manufacturer's stamp or label attached listing manufacturer, brand name, and a description of material.

D. Provide allowances for expansion/contraction, and wall and manhole penetrations.

E. Run continuous through wall, floor, and ceiling penetrations.

F. Insulation materials shall not be applied until:

1. Test results specified in other sections of these specifications are completed and accepted.
2. Rust, scale, dirt, and any other foreign material have been removed.
3. Ductwork or piping material are clean, dry, joints firmly butted together, and tightly sealed at all joints, seams, and fittings.

G. Wrap butt joints with a 3-inch-wide strip of the same material as the jacket.

H. Insulation shall be kept clean and dry at all times.

I. Insulation on exposed piping penetrating floors in locations subject to water damage, such as kitchens and custodial spaces, shall be protected with aluminum jacketing as specified herein. Apply jacketing over the insulation for a minimum height of three feet above the finish floor.

J. Duct Materials:

1. Fiber glass duct lining is not allowed.
2. Duct materials exposed to the airflow shall be noncombustible metal.
3. Duct insulation for thermal purposes shall be separated from airflows by solid metal.

4. Provide natural noise attenuation procedures, as recommended in ASHRAE, Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), and industry's good engineering practices.
5. Fiberglass ducts or ductboards shall not be used to convey air.

K. Protection Shield: Where pipe or tubing insulation pass through hangers, provide:

1. For Piping 4 inches and smaller: A protection shield, 180-degree arc, 16 gage galvanized sheet metal covering, minimum 12 inches long.
2. For Piping Larger than 4-inch diameter: A protection shield, 180-degree arc, 16 gage galvanized sheet metal covering, minimum 18 inches long.
3. Hangers not exceeding maximum spacing distances recommended by insulation manufacturer to prevent crushing or compressing insulation.

L. Flanges, Fittings, and Valves on Insulated Piping:

1. Provide pre-molded glass fiber fittings wired or taped on and adhered with canvas jacket and mold resistant lagging adhesive.
2. Terminate insulation and jacket neatly and finish with insulating cement troweled to a bevel and of the same thickness as adjoining insulation.
3. Vapor seal insulation on cold systems with vapor barrier mastic.

M. Vapor Barriers:

1. Intact and continuous.
2. Apply over staples.

N. Omit Pipe Insulation from the Following:

1. Screwed unions, except at "cold drains" and air- conditioning wastes. Terminate insulation neatly at both sides of unions with insulation cement.
2. Discharge lines from safety and relief valves.
3. Nickel or chrome plated piping.

O. All ductwork shall be insulated, except as noted below:

1. Exhaust air ductwork.
2. Where indicated on plans: supply air ductwork, exposed in air-conditioned spaces. (Note: Ceiling plenums, and mechanical equipment rooms are not to be considered air-conditioned spaces.)

P. Ceiling supply air registers located on perimeter rooms and corridors shall be field insulated with flexible fiberglass duct wrap insulation as specified. Insulation shall cover the upper body and installation flanges.

Q. All appurtenances subject to condensation shall be protected as necessary and covered with vapor seal mastic.

3.2 APPLICATIONS

A. Molded Fiberglass Pipe Insulation Installation (Hot Water Piping):

1. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with self- sealing laps. Position longitudinal seam so seam is on bottom to prevent dirt and moisture infiltration. Seal end joints with 3-inch-wide straps of vapor barrier tape. Seal ends of insulation with vapor seal mastic at valves, fittings and flanges.
2. Cover valves, fittings, and flanges with insulation similar to adjacent pipe covering, or one-piece PVC cover sections as specified.

B. Foamed Plastic Insulation Installation (Return Suction Piping, Interior Condensate Drains, and Electric Water Cooler Drains):

1. Insulation shall be slipped on pipe without slitting. Butt joints shall be sealed with the manufacturer's recommended adhesive.
2. Where slip-on techniques are not possible, the insulation shall be carefully slit and applied to the pipe. Seal joints with the manufacturer's recommended adhesive.
3. Insulate valves and fittings with fabricated foamed plastic insulation, or one-piece PVC cover sections as specified.
4. Provide vapor barrier mastic for chilled water service insulation for all areas.

C. Cellular Glass Insulation Installation (Chilled Water Supply/Return):

1. Interior aboveground.

    a. Each length of insulation shall be secured with two wires. Insulation shall be applied with all joints fitted to eliminate voids. Voids shall be eliminated by refitting or replacing insulation. Do not fill voids with joint sealer.
    b. Seal longitudinal and butt joints with insulation joint sealant.
    c. On any straight run over 40 feet, install an expansion joint consisting of a 2-inch-wide section of foamed plastic. Finish over this section with reinforcing mesh and vapor barrier mastic.
    d. Finish concealed piping with factory installed white all-purpose jacket, all joints and seams sealed with fire rated adhesive. Finish elbows and fittings with vapor barrier mastic reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch.
    e. For exposed piping in machine rooms and similar spaces, finish with vapor barrier mastic reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch. Then apply second coat of vapor barrier mastic and brush lightly with a wet brush to a smooth finish.

2. Exterior Aboveground:

    a. Same as interior aboveground, except finish specified above for elbows and fittings shall be omitted.
    b. Finish straight runs with 0.016" aluminum jacket secured with 1/2" aluminum bands and seals, aluminum screws, or pop rivets on 9 inches on center. Elbows, valves, and fittings shall be finished with preformed aluminum fitting covers. Seam shall be placed at bottom. Caulk all joints to prevent water intrusion with 1/8-inch bead of metal jacketing sealant to prevent water intrusion.

3. Exterior Underground:

    a. Same as interior aboveground.

b. Finish with factory applied jacket, self-sealing, nonmetallic consisting of special bituminous resin, reinforced with an aluminized Mylar film and a release paper. Finish jacket shall be not less than 70 mils thick and weigh not less than 39 lbs. per 100 sq.ft.
c. Provide a minimum of 6 inches of clean sand all around underground insulated piping. Provide one foot above the 6 inches of sand cover with rock free backfill.

D. Flexible Fiberglass Ductwrap Blanket Insulation Installation:

1. Apply insulation to duct with joints tightly butted. Prepare stretch-out dimensions and cut out insulation so a 2-inch minimum overlap is created that will overlap the facing and insulation at the other end, and the adjoining seam. Install so insulation is not excessively compressed at duct edges. Foil face shall be on outside. Seams shall be stapled approximately at 6 inches on center with outward clinching staples.
2. On ductwork having a 24 inch or larger dimension, insulation shall be secured to the bottom of the duct with mechanical fasteners spaced at not more than 18 inches on center and held in place with washers or clips. Cut off protruding pin after clips are secured.
3. Seal all insulation joints, pinheads, tears, punctures, washers, clips, and staples with 2 coats of a vapor barrier mastic type sealant, reinforced with 1 layer of 4-inch woven glass fabric.

E. Rigid Fiberglass Ductboard Insulation Installation:

1. Apply insulation tightly and smoothly to duct.
2. Secure insulation on the sides and bottom of duct by impaling insulation over pins or anchors located not more than 18 inches apart and held in place with washers or clips.
3. Cut off protruding pins after clips are secured and seal with vapor barrier mastic.
4. Apply insulation with joints tightly butted.
5. Seal ductwork joints, punctures, and pin heads with a vapor barrier mastic.
6. Insulation shall be continuous through walls and floors except at fire dampers and at combination smoke/fire dampers.

F. Equipment:

1. Chilled Water Pump Casings:

a. Insulate with not less than 2 inches of cellular glass block insulation finished with a 1/2" thick coat of insulating cement reinforced with 1-inch hexagonal mesh wire cloth, followed by a 1/2" thick coat of hard finish insulating cement.
b. Apply casing insulation in 2 removable sections to ease pump maintenance.

G. Electric Duct Heaters:

1. Insulate all sides of electric duct heaters (except control panel side) installed in supply air ducts, as specified for supply air ductwork.

END OF SECTION

15240 VIBRATION ISOLATION

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15450 - Plumbing Equipment.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.
4. 15540 - Pumping Equipment (HVAC).
5. 15555 - Horizontal Fire Tube Boilers.
6. 15682 - Centrifugal Water Chillers.
7. 15684 - Rotary Screw Water Chiller.
8. 15855 - Air Handling Units.
9. 15861 - Air Moving Equipment.
10. 15890 - Ductwork.
11. 15970 - HVAC Control System.

1.2 SUBMITTALS

A. Vibration Isolators: Provide catalog cuts, diameters, isolation efficiencies, deflections, free height, operating height, solid height, and lowest equipment speed for each isolator.

B. Equipment Bases: Provide catalog cuts or drawings.

C. Concrete Inertia Bases: Drawings showing required concrete steel reinforcing, construction details, and dimensions.

1.3 QUALITY ASSURANCE

A. Vibration isolators and equipment bases shall be the products of 1 manufacturer who shall determine mounting sizes and provide field supervision and inspection to assure proper installation and performance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Vibration Isolation:

1. Consolidated Kinetics Corp., Columbus, OH.
2. Korfund Dynamics Corp., Westbury, NY.
3. Mason Industries, Inc., Hollis, NY.
4. Vibration Mountings and Controls, Inc., Butler, NJ.

2.2 MATERIALS

A. Rubber-in-Sheer Type Isolators:

1. Molded mount shaped elements with bolt holes for bolting to equipment bases and mounted on bottom steel plates for bolting to foundations.
2. Double rubber-in-shear elements shall be mounted in series.
3. Metal surfaces shall be neoprene covered and have friction pads both top and bottom.

B. Spring Isolators:

1. Free-standing type, laterally stable without any housing, complete with rubber sound-deadening pads between active spring and its support, leveling adjustment bolts, and adequate facilities for bolting to both equipment and supporting structure.
2. Spring diameter not less than allowable compressed height of spring.
3. Spring base, minimum 1/4" thick rubber acoustical friction pads at underside.
4. Spring isolators for equipment with operating weight different from installed weight shall have built-in adjustable limit stops to prevent equipment rising when weight is removed.
5. Limit stops shall be out of contact during normal operation. Similarly, springs having a deflection of 2 inches or greater shall have neoprene limit stop to prevent undue motion during starting and stopping, but unrestrained otherwise.

C. Hanger-Type Isolators:

1. Rubber-in-shear or combination rubber-in-shear and springs, mounted in a hanger box, as required to meet static deflection.
2. Provide lockout plates when required.

D. Vertically Restrained Spring Isolators:

1. Incorporate a single spring vibration isolator having characteristics specified and a steel mount assembly designed to limit vertical movement of isolated equipment.
2. Provide flat steel top load plate and base plate bonded to 1/4" thick neoprene noise-stop pad.

E. Inertia Blocks:

1. Reinforced concrete.
2. Provide a common support for motors and driven equipment.
3. Frames for inertia blocks shall be structural steel with reinforcing bars welded in place and shall be provided by the isolator manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount equipment and piping on or suspended from accepted foundations and supports, as indicated in construction documents or as required. Mountings shall be non-resonant with equipment operating or with building structure natural frequencies.

B. Concrete inertia bases and required reinforcing shall be furnished and installed under this section.

1. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for concrete foundations and supports and required hanger bolts and other appurtenances necessary for proper installation of the equipment.
2. Work shall be shown in detail on shop drawings, prepared under this section, and drawings submitted to A/E showing complete details of bases including necessary concrete and steel work and vibration isolation devices.

C. Place floor-mounted equipment on 4-inch-high concrete pads extending 6 inches beyond equipment outline, unless otherwise specified.

D. Vibration Isolation Systems:

1. Guaranteed to have deflection indicated on schedule on Construction Documents.
2. Mounting sizes shall be determined by vibration isolation manufacturer.
3. Install according to manufacturer's instructions.

E. Vibration isolation systems for each floor or ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shut down conditions of 1/4". Motions in excess shall be restrained by accepted spring type mountings.

F. Mounting systems exposed to weather and other corrosive environments shall be protected with factory corrosion resistant coatings. Metal parts of mountings (except springs and hardware) shall be hot dip galvanized. Springs shall be cadmium plated and neoprene coated. Nuts and bolts shall be cadmium plated.

G. Where steel spring isolation systems are described in following paragraphs, mounting assemblies shall use bare springs with spring diameter not less than 0.8 of loaded operating height of spring. Each spring isolator shall be designed and installed with ends of spring to remain parallel. Spring deflection before becoming solid shall be at least 50 percent greater than specified minimum deflection.

H. Factory Assembled Air Handling Units:

1. Mount units directly on stable bare steel spring isolators.
2. Where units to be mounted are furnished with internal structural frames and external lugs, both of suitable strength and rigidity, or without any severe overhangs, no additional structural frame need be furnished and installed beneath unit.
3. Motor shall be integrally mounted to unit and shall be mounted on slide rails. Mountings shall provide static deflection shown on drawings.

I. Ceiling Supported Fans, Unit Ventilators, and Air Handlers:

1. Units shall be hung by means of vibration isolator hangers consisting of steel housing or retainer incorporating a steel spring and neoprene isolators.
2. If equipment to be mounted is not furnished with integral structural frames and external mounting lugs, both of suitable strength and rigidity, accepted structural sub-base shall be installed in the field to support equipment to be hung and receive hangers.
3. Diagonal hanger rod isolators shall be provided as required to limit horizontal motion to 1/4" maximum under fan operating conditions.

J. Centrifugal Pumps:

1. Each pump with its driving motor shall be bolted and grouted to a spring supported concrete inertia base reinforced as required.
2. Concrete inertia base thickness shall be a minimum of 8 inches.
3. Spring supported concrete inertia foundation shall be poured within structural perimeter frame, reinforced as necessary, of required thickness specified above.
4. Mountings shall provide minimum static deflection as shown on drawings.
5. Structural perimeter frame, mounting templates, height saving brackets, and spring system shall be provided as an assembly by vibration control manufacturer.

K. Support Piping:

1. Water piping inside mechanical rooms shall be resiliently supported.
2. Resilient diagonal mountings or other accepted devices shall be provided as required to limit piping motion due to equipment start up or shut down, to a maximum deflection of 1/8".
3. Isolators for water piping shall be resiliently spring and neoprene supported with mountings providing a minimum static deflection of 1/2".
4. Where supplementary steel is required to support piping, supplementary steel shall be sized to limit maximum deflection between supports to 0.08" and shall be resiliently supported from building structure with mountings as specified. Supported piping from supplementary steel shall be rigidly suspended or supported.

L. Control Air Compressors:

1. Bolt and grout to reinforced concrete inertia block, 6 inches thick minimum mounted on bare steel spring isolators with 2-inch deflection.

M. Air Compressor Flexible Connectors:

1. Flexible stainless steel metal pipe connectors shall be installed in 2 planes 90 degrees to each other in discharge piping from compressor.
2. Flexible connectors shall have a minimum burst pressure of 4 times operating pressure.
3. Pipe sizes through 2-inch I.D. shall be furnished with hex male nipple fittings and pipe sizes 2-1/2" I.D. and larger shall be furnished with fixed steel flanges both sides.

N. Centrifugal Water Chillers and Rotary Water Chillers (Screw):

1. Each chiller shall be resiliently supported on vertical restrained steel spring vibration isolation mountings.
2. Spring mountings shall incorporate unrestrained stable springs with built-in leveling device and resilient vertical limit stops to prevent spring elongation when partial load is removed. The mountings shall be capable of providing rigid anchor, during erection of machine, so it can be erected at a fixed elevation.

O. Floor Mounted Centrifugal Fans:

1. Each fan with its driving motor shall be bolted to a spring supported structural steel base.
2. Mountings shall provide minimum static deflection as shown on construction documents.
3. Structural frame, height saving brackets, and spring system shall be provided as an assembly by vibration control manufacturer.

P. Roof Mounted Equipment:

1. No additional vibration isolation is required for curb mounted equipment.
2. Roof mounted equipment not installed on curbs shall be installed on a structural framing system as indicated on drawings. The clearance from the finished roof the bottom of the supporting steel shall be as required in Chapter 15 FBC.
3. Isolators shall be as specified for floor mounted equipment except spring isolators shall be the vertically restrained type.

END OF SECTION

15300 FIRE PROTECTION (GENERAL REQUIREMENTS)

PART 1 GENERAL

1.1 SUMMARY

A. Furnishing of labor, materials, equipment, and service necessary or incidental to the complete installation and testing, adjusting, and placing into service of the fire protection systems as shown in Construction Documents.

1. Drawings and specifications are considered as mutually explanatory, and work called for by one and not the other shall be performed as though called for by both. In cases of conflicting information, the A/E shall be notified at once in writing.
2. Where incidental equipment or appurtenances are required and are not listed or shown, furnish as required for a complete fire protection system.
3. Drawings diagrammatically show general arrangement and approximate sizes of equipment. Every item that may be required, necessary, or incidental to the proper and dependable operation of each system is not necessarily shown or specified.

B. Work included in this specification shall consist of, but is not necessarily limited to, the following items:

1. Prepare fire protection system engineering documents for approval and permitting.
2. Arrange for, obtain, and bear the cost of necessary permits, bonds, and fees.
3. Comply with the requirements set forth under Related Sections for the specific fire protection system type.

C. Related Sections:

1. 15320 - Fire Pump and Controls.
2. 15330 - Automatic Sprinkler Systems.
3. 15371 - Kitchen Hood and Duct Fire Protection.
4. 15375 - Standpipe and Hose Systems.
5. 16721 - Fire Detection Alarm Systems.

D. Work Specified in Division 16: Wiring and connections to central alarm panel from water flow switches, valve tamper switches, and alarm bells.

1.2 REFERENCES

A. Local fire department regulations.

B. State of Florida Department of Professional Regulations for Professional Engineers.

C. NFPA - National Fire Protection Association Standards 13, 14, 25, 101 and 214.

D. State and local codes as applicable.

1.3 RESPONSIBILITIES FOR FIRE PROTECTION SYSTEM DESIGN

A. Engineer of Record, as defined in Florida Rules, Chapter 61G15-32, shall provide the design requirements and review the fire protection system engineering documents

prepared by the Delegated Engineer for conformance with criteria water supply conditions and other pertinent requirements.

B. Delegated Engineer, as defined by Florida Rules, Chapter 61G15-32, shall prepare the signed and sealed fire protection system engineering documents and submit them for approval by the Engineer of Record. The documents shall conform with the design intent established by the Engineer of Record and shall be submitted to the building authority for permitting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 TESTS

A. Acceptance of the work shall be based upon the inspection and tests of the completed installation by representatives of the Authority Having Jurisdiction and the Engineer of Record.

END OF SECTION

15320 FIRE PUMP AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Horizontal or vertical in-line fire pump, jockey pump, and controls including necessary accessories as shown in Construction Documents, specified in this section, and as required by NFPA 20.

B. Related Sections:

1. 15300 - Fire Protection (General Requirements).
2. 15330 - Automatic Sprinkler System.
3. 15375 - Standpipe and Hose System.

1.2 REFERENCES

A. Florida Building Code (FBC)

B. American Society for Testing and Materials (ASTM).

C. American National Standards Institute (ANSI).

D. Factory Mutual (FM).

E. National Electrical Code (NEC).

F. National Electrical Manufacturers Association (NEMA).

G. National Fire Protection Association (NFPA).

H. Underwriters Laboratories (UL) or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Shop Drawings:

1. Fire pump and accessories.
2. Control panels and devices.
3. Jockey Pump and accessories.

1.4 QUALITY ASSURANCE

A. Fire protection equipment and devices shall be listed by an OSHA approved NRTL or FM approved for service intended.

B. Install according to NFPA 20, NEC requirements, and local code regulations.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Fire Pump:

1. UL 448 listed and FM approved automatic centrifugal pump complete with motor, controller and accessories, with shut off pressure not exceeding 140% of rated pressure and capable of delivering not less than 150 percent of rated capacity at not less than 65 percent of rated pressure, with characteristics as shown in Construction Documents. Motor shall not exceed 115% of the full load rated amperage at any pump operating point.

2. Manufacturers:

   a. Armstrong.
   b. Pentair - Aurora.
   c. Pentair - Fairbanks Morse
   d. Patterson.
   e. Peerless.

3. Pump: Split case centrifugal, horizontal or vertical in-line, single stage with renewable bronze, case wearing rings and impeller wearing rings, steel shaft with renewable bronze or stainless-steel sleeves, grease lubricated ball bearings, deep type stuffing box bushings with bronze glands and external water seal, and lubrication fittings. Sized for minimum suction pressure 20 psig at the water source.
4. Provide required UL accessories including:

   a. Discharge manifold assembly in compliance with NFPA 20.
   b. Automatic air release valve.
   c. Suction and discharge pressure gages.
   d. Eccentric suction and concentric discharge reducers.
   e. Circulation relief valve.

5. Motor:

   a. Motors shall be listed for fire pump service.
   b. Horizontal open drip-proof grease lubricated, ball bearing squirrel cage, and induction type with non-overloading characteristics at any point of the curve.
   c. Pump and motor shall be mounted on a cast iron drip rim base plate. Motor mounting bracket on machined pump shall be completely aligned.

6. Transfer Switch Fire Pump Controller:

   a. Design and build according to the latest edition of NFPA 20.
   b. The fire pump controller and built-in automatic transfer switch shall have a minimum withstand current rating of at least 100,000 RMS symmetrical amps at 200 – 600 volts. A higher withstanding rating shall be provided for higher available fault currents.
   c. The power transfer switch and fire pump controller shall be factory assembled, wired, and tested.

d. Controller and transfer switch shall be in a NEMA Type 2 enclosure suitable for floor mounting. The power transfer switch shall include a disconnect/isolating switch capable of interrupting the motor locked rotor current.
e. Controller shall be of the primary resistor or reactor reduced voltage type with a combined automatic/manual start and manual/timed automatic stop.
f. Controller shall have the following accessories as a minimum. Operator interface shall be via a keypad.
g.
    1) Pressure switch for automatic starting.
    2) "Power-on" pilot light indicating breaker closed and power available.
    3) Data logging capable of storing at least 7 days worth of data.
    4) Power monitor for phase failure and phase reversal.
    5) START and STOP push buttons for manual operation.
    6) Timing relay for reduced voltage starting.
    7) Relays with normally open (N.O.) and normally closed (N.C.) dry contacts for pump running, power failure, and phase reversal.
    8) Failed to start relay with N.O. and N.C. dry contacts.
    9) Automatic stop timer set at 10 minutes, with provision to change to manual shutdown only.

h. Transfer switch operation and accessories shall be according to NFPA 20.
i. Provide extra N.O. dry contact for interfacing with fire alarm system .
j. Wiring of controller, transfer switch, and alarms shall be under Division 16.
k. Transfer switch pump controllers shall be as manufactured by Firetrol, Joslyn-Clark, ASCO or Master Control.

B. Jockey Pump: Peerless Pump Co. or accepted equivalent, Burks Series CS, close coupled, turbine pump with bronze impeller, and mechanical seal. Characteristics as shown in Construction Documents.

C. Jockey Pump Controller: Main disconnect, fuse block with power fuses across the line starter, Hand-or-Automatic (H-O-A) selector switch, minimum run period timer, pressure switch in NEMA 2 cabinet, and UL listed.

D. Test header according to NFPA 20.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount pump on concrete equipment base.

B. Check pump and motor on base for misalignment.

3.2 FIELD QUALITY CONTROL

A. Factory test each pump for performance data and compliance with specifications and NFPA acceptance requirements.

B. Furnish NFPA 20 pump acceptance test report. Test Report shall be in the format shown in NFPA 20.

END OF SECTION

SECTION 15330 - AUTOMATIC FIRE SPRINKLER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wet automatic fire sprinkler systems including fire pump, fire pump controller, alarms, safety devices, piping, sprinklers and related accessories, sized and spaced for the occupancy shown on the drawings.
2. Different sprinkler piping systems, including necessary accessories to combine into one system.

B. Related Sections:

1. 07840 - Firestopping and Fire and Smoke Sealing.
2. 09900 - Painting.
3. 15047 - Identification.
4. 15300 - Fire Protection (General Requirements).
5. 15320 - Fire Pump and Controls.
6. 16721 - Fire Detection Alarm Systems.

1.2 REFERENCES

A. American Society of Mechanical Engineers/American National Standards Institute, Inc. (ASME/ANSI).

1. ASME/ANSI B2.1, B16.1, B16.3, B16.4, B16.9, B16.25, B18.2, B31.

B. American Society for Testing and Materials (ASTM), latest publications:

1. A47 Standard Specification for Ferritic Malleable Iron Castings.
2. A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A135 Standard Specification for Electric-Resistance-Welded Steel Pipe.
4. A234 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

C. Underwriters Laboratories (UL), Factory Mutual (FM) or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).

D. Federal Specifications (FS) WW-H-171E, Pipe Hangers and Supports.

E. National Fire Protection Association (NFPA).

1. NFPA 13 - Standard for the Installation of Sprinkler Systems.
2. NFPA 15 - Standard for Water Spray Fixed Systems for Fire Protection.
3. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
4. NFPA 25 – Standard for the Inspection, Testing and Maintenance of Water Base Fire Protection Systems.

5. NFPA 70 - National Electrical Code.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide a hydraulically designed installation of automatic sprinklers with 100 percent coverage of the facilities except for areas indicated to be excluded.
2. Sprinkler head arrangement shall be symmetrically laid out on ceiling tile. Coordinate with partitions, columns, beams, lighting fixtures, ceiling grilles, and other architectural elements. Sprinkler heads shall be spaced, located, and positioned according to NFPA 13.
3. Use maximum allowable spacing of sprinkler heads for the hazard occupancy type designed within the available system flow and pressure.
4. Furnish guards on sprinkler heads located near heaters, boilers, in stair enclosures, and under air conditioning ducts or building obstructions below 8'-0" above finish floor and as required by NFPA 13.
5. Calculations, drawings, referenced diagrams, performance curves, and data used to layout and identify system shall be signed and sealed by a Florida registered professional engineer acting as the delegated engineer.

    a. Design density shall be as required for the hazard classification of the spaces protected. Design shall avail itself of any reductions in area of coverage permitted by NFPA 13. All such reductions shall be clearly identified in the design drawings and calculations.

1.4 SUBMITTALS

A. Submit properly identified manufacturer's literature.

B. Submit shop drawings for the following. Drawings and calculations shall be signed and sealed by a Florida Professional Engineer being the delegated engineer in accordance with Florida Administrative Rules, Chapter 61G15-32.

1. Valves and appurtenances.
2. Pipe hangers and supports.
3. Sprinkler heads.
4. Piping.
5. Flow switches and control devices.
6. Submit complete, 1/8" scale, drawings of fire sprinkler system layout.
7. Hydraulic calculations in accordance with NFPA 13.

1.5 QUALITY ASSURANCE

A. Fire protection equipment, valves and devices shall be listed in the Underwriters Laboratories Certification Directory, FM Approval Guide, or other OSHA approved NRTL, for service intended. Equipment shall be installed in conformance with standards of National Fire Protection Association (NFPA) and Factory Mutual (FM).

B. Products meeting the requirements manufactured by Stockham, Jenkins, Walworth, Mueller, Kennedy, Potter Roemer, Larsen’s, Guardian, or others as approved by the A/E .

C. Install equipment according to the requirements of its listing.

D. Electrical installation shall comply with NEC and local codes.

1.6 DRAWINGS

A. The intent of the drawings is to provide the fire sprinkler contractor information on the areas to be covered and the basis of design as a framework for bidding a system as specified herein and designed by the contractor's delegated engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. The use of chlorinated polyvinyl chloride (CPVC) piping for fire sprinkler systems is not allowed by City of Key Colony Beach.

B. Steel Piping:

1. Pipe shall be new, designed for 175 psi working pressure, conforming to ASTM specifications, along with the applicable ASTM standard marked on each length of pipe.
2. Pipe shall be steel, Schedule 40, black, and according to ASTM A135 Grade A or ASTM A53 Grade A seamless.
3. For sizes above 2 inches only, pipe may be steel, Schedule 10, black, and according to ASTM A135 Grade A.
4. Black steel pipe for use with push-on fittings (Schedule 40 or 10) shall conform to ASTM A135 tolerances and fitting manufacturer's tolerances.
5. Coat black steel pipe with a suitable protective coating. Sprinkler piping exposed to the weather or used in a corrosive atmosphere, as noted on drawings, shall be galvanized.

C. Steel Pipe Fittings:

1. Threaded: malleable or banded cast iron. ANSI B16.4 and B16.3, Class 125. Threaded joints shall comply with ANSI B1.20.1.
2. Flanged fittings, ANSI B16.5. Gaskets shall be full face, minimum 1/8-inch-thick rubber. Flange bolts as per ANSI B18.2.
3. Victaulic fittings with grooved joint couplings and EPDM gaskets.
4. Welded Fittings: ANSI B16.25. Welded joints shall comply with ANSI B31.

D. Valves and Appurtenances:

1. Gate and Butterfly Valves: Shall be UL or other NRTL listed, or FM approved.

    a. 2-1/2 inches and larger: Shall be flanged or grooved connection ends, butterfly with weatherproof actuator housing or outside screw and yoke, cast or ductile iron body and bonnet, 175 WWP Class.
    b. 2 inches and smaller: Shall be OS & Y threaded bronze, rising stem 175 WWP Class.

2. Check Valves: Shall be UL or other NRTL listed, or FM approved

a. 2-1/2 inches and larger: Shall be flanged or grooved end connection ends, cast or ductile iron body with bronze or iron disc and seat, 175 WWP Class.
b. 2 inches and smaller: Shall be threaded bronze swing type, 175 WWP Class.

3. Globe Valves: Bronze body and disc, screwed bonnet, 200 psi wog, threaded ends.
4. Provide control valves with tamper indicators monitored by the Fire Alarm System.
5. Audible electrically operated sprinkler alarms shall be as specified under Division 16.
6. Escutcheons: Chromium plated steel or chromium plated brass, either one piece or split patterns.
7. Valve Directory: Plastic laminated on solid backing, giving number, location, and function of each valve.

    a. Where it is necessary to operate more than one valve to control a section of piping, note this fact and show the number of second valve on directory.

8. Inspector's Test Connections: One test pipe and valve connection of not less than 1 inch diameter, terminating in a smooth bore, 1/2" brass outlet, discharging through a suitable air gap connection to sanitary collection system.

E. Hangers and Supports:

1. Provide adjustable hangers as required for proper support of pipelines according to requirements of NFPA 13, Fed.Spec.WW-H-171E, and is UL listed. Hangers shall allow for expansion and contraction of pipelines and be wrought iron clevis type. Wire type hangers are not allowed.
2. Piping Supported from Concrete Slabs: Use hangers attached to galvanized rods suspended from concrete inserts. Powder actuated fasteners and devices are not allowed. "Redhead" self-drilling concrete expansion anchors are acceptable.
3. Single Pipe Runs: Support with adjustable swivel ring hangers. Wire type hangers are not acceptable.
4. Piping Supported from Walls or Columns: Use welded steel brackets and adjustable swivel ring hanger.
5. Standpipes Supported from Walls with Wrought Strap: Grinnell Fig.262.

F. Sleeves: Per NFPA regulations.

G. Sprinkler Heads:

1. Sprinkler head rating shall be as per NFPA 13 with fusible link or heat sensitive bulb.
2. Provide accepted head types shown on the drawings or as follows:

    a. Unfinished Areas: Pendent sprinklers with standard finish and polished brass escutcheon plates.
    b. Finished Suspended Ceiling Areas: Chrome plated, flush type, sprinkler heads.
    c. Sidewall mounted sprinkler heads.

3. Spare Sprinklers and Devices:

    a. Provide a stock of spare sprinklers of all types and ratings installed. Quantity shall be as required in NFPA 13.
    b. Provide a sprinkler wrench for each type of sprinkler and one water flow stopper suitable for interrupting sprinkler head discharge.

c. Sprinklers shall be kept in a cabinet provided by and installed by the Contractor at a location designated by the A/E and/or City of Key Colony Beach.

H. Flow Switches:

1. Provide liquid flow switch at sprinkler main branches. Signal from switches shall be wired to Fire Alarm Panel.
2. Wiring and conduit shall be provided under Division 16.
3. Flow switch shall be of paddle type, tamper proof, adjustable retarding device to prevent false alarms from line surges.
4. Two single pole, double throw microswitches to operate separate circuits, rated at 10 A, 120 VAC and 2 A, 30 VDC, in separate wiring chambers.

I. Joint Compound: White-Tite Seal or other accepted equivalent by A/E.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fire Sprinkler System:

1. Installation shall be in accordance with NFPA 13.
2. Place main piping with minimum 12-inch clearance between other mechanical and electrical services.
3. Branch piping shall clear light fixtures by at least 6 inches.
4. Where automatic sprinkler protection is indicated for suspended ceiling, install piping above ceiling with sprinkler heads installed below ceiling in pendant position.
5. Arrangement and locations of fire protection systems shall be as indicated on approved submittals and as specified.
6. Submit to the A/E detailed drawings of proposed departures from approved submittals due to actual field conditions or other causes.
7. Materials installed in fire sprinkler system shall be suitable for pressures and temperatures encountered.
8. Coordination of Drawings:

    a. Because of the scale of drawings, it is not possible, nor is it the intent, to indicate required offsets, fittings, and accessories on the bid documents.
    b. Investigate structure and other trades involved including finish conditions affecting work and arrange such work accordingly.
    c. Furnish such fittings, valves, and accessories as needed to meet such conditions at no additional cost to City of Key Colony Beach.
    d. Provide coordination drawings between this and all other trades.

9. Cutting and Repairing: Lay out in advance. Excessive cutting of construction is not allowed. Damage to buildings, piping, wiring, or equipment because of cutting for installation shall be repaired by mechanics skilled in the trade involved at no additional expense to City of Key Colony Beach.
10. Protection to Materials and Equipment: Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of work, materials and equipment shall be thoroughly cleaned, adjusted, and operated.

11. Provide test and drain lines as required by NFPA 13. Pressure gauges, signs, and other standard appurtenances shall be furnished as required for a complete installation according to NFPA 13.
12. Install sprinkler piping so it can be thoroughly drained, and where practical, arranged to drain at the main drain valves. Drips and drains shall conform to NFPA 13.

B. All work shall be done by experienced mechanics.

C. Piping:

1. Run piping enclosed in wall chases, partitions, and ceilings where provided.
2. Use reducing fittings for changes in pipe size. Bushings are not allowed.
3. Use extra heavy pipe for nipples where unthreaded portion is less than 1-1/2". Close nipples are not allowed. Use saddle nipples.
4. Install piping to allow freedom of movement during expansion and contraction operations, without causing warping, by using expansion joints and pipe loops.
5. Offset piping as necessary to avoid interference with other work and to maintain headroom.
6. Provide proper drain and drip where necessary.
7. Run pipe in the most direct, straight mechanical manner, parallel to building lines and properly graded.

D. Identification: Identify piping, valves, and specialties as specified under Section 15047.

E. Joints:

1. Make joints in screwed piping with acceptable compound on male threads only. Threads shall be perfect, clean cut, and of proper length. Pipe shall be properly reamed after cutting and threading.
2. Make flanged joints with full-face rubber gaskets or stainless steel.

F. Hangers and Supports:

1. Properly support piping by accepted hangers and supports.
2. Chain, straps, perforated bar, or wire hangers are not allowed.
3. Provide necessary supplemental steel for proper support or attachment of hangers.

G. Sleeves:

1. Provide sleeves large enough to accommodate pipes passing through floors, ceilings, walls, or partitions.
2. Pack sleeves through firewalls or slabs according to UL requirements.
3. Provide square ends projecting 2 inches above floor for sleeves through floors.
4. Make sleeves passing through walls or beams flush with adjacent sides.
5. Provide flashing for sleeves passing through roof.
6. Make sleeves watertight (where required) by caulking space between pipe and sleeve.

H. Caps and Plugs: Keep openings closed during construction with cast-iron or malleable caps, plugs, or blind flanges.

I. Pipe Anchors: Provide anchors to support risers, to maintain pipes in position, and to properly regulate expansion.

J. Escutcheons:

1. Provide escutcheons on both side of piping in partitions, ceilings, and floors.
2. Fit and firmly secure escutcheons to pipes passing through finished floors, ceilings and walls with escutcheons of sufficient outside diameter to cover sleeved openings
3. Set-in fire-retardant mastic.

K. Valves:

1. Control Valves:

a. Place valves in readily accessible locations or with suitable means of access.
b. Seal gate valves in open position with riveted straps or wire and lead seals designed for this purpose.

2. Alarm Valves, Variable Pressure:

a. Provide in each main automatic sprinkler system riser, where indicated, an accepted variable pressure alarm valve complete with trim.

1) Circuit Closer Switch: Designed for 100 volts AC with two pairs of reversible contacts for connection to and suitable for operation of the alarm system.

L. Inspector's Test Connections:

1. Extend from highest point of automatic sprinkler system to a point where discharge can be readily observed.
2. Locate test valve at an accessible point, not over 7 feet from the floor.

3.2 FIELD QUALITY CONTROL

A. Flush fire mains with clean water until clean and accepted.

1. Maintain a flow of 7 feet per second velocity for a period of time consistent with length of pipe or as required to accomplish flushing.

B. Upon completion of the work, notify any local authorities having jurisdiction and A/E, and arrange to have their authorized inspectors present when final job inspection and tests are conducted.

C. Test all parts of system hydrostatically at 200 psi for a minimum 2-hour period according to NFPA 13 and 24.

1. Repair all defects and retest.

END OF SECTION

SECTION 15375 - STANDPIPE AND HOSE SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: A complete fire protection standpipe system including necessary accessories as indicated on Construction Documents, specified in this section, and as required by NFPA 14.

B. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 15300 - Fire Protection (General Requirements).
3. 15320 - Fire Pump and Controls.
4. 15330 - Automatic Sprinkler Systems.
5. 16721 - Fire Detection Alarm Systems.

1.2 REFERENCES

A. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

C. NFPA 25- Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

D. Underwriters Laboratories (UL), Factory Mutual (FM) or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Submit Shop Drawings on the following:

1. Valves and appurtenances: Catalog cuts
2. Pipe hangers and supports: Catalog cuts
3. Piping: Manufacturer's name and mill reports

C. Detailed system drawings.

D. Hydraulic Calculations.

1.4 QUALITY ASSURANCE

A. Fire protection equipment and devices shall be listed by an OSHA approved NRTL, or be approved by Factory Mutual (FM), for service intended. Equipment shall be installed in conformance with National Fire Protection Association (NFPA) and/or FM standards.

B. Products meeting the requirements manufactured by Stockham, Jenkins, Walworth, Mueller, Kennedy, Potter Roemer, Larsen’s, Guardian, or A/E approved equal, are acceptable.

C. Electrical installation shall comply with the National Electrical Code (NEC).

1.5 PROJECT CONDITIONS

A. Coordination of Drawings: Because of small scale of Construction Documents, it is not possible to indicate all required offsets, fittings and accessories. Contractor shall carefully investigate structure and all other trades involved including finish conditions affecting all his work and shall arrange such work, accordingly, furnishing such fittings, valves, and accessories as may be required to meet such conditions, at no additional cost to City of Key Colony Beach.

PART 2 PRODUCTS

2.1 MATERIALS

A. Piping: ASTM A53 seamless. Schedule 40 black-steel pipe.

B. Fittings:

1. Up to 2-1/2 inches: Threaded malleable iron or screwed banded cast iron. ANSI B16.4, Class 125.
2. 3 Inches and Larger: Cast iron or steel flanged fittings, ANSI B16.5; Victualic grooved joint couplings with EPDM rubber gaskets.
3. Welded Fittings: ANSI B16.25.

C. Valves and Appurtenances:

1. Gate Valves:

a. 2-1/2" and larger: Shall be listed by FM or an OSHA approved NRTL. Gate valves shall have flanged or grooved-connection ends, butterfly with weatherproof actuator housing or outside screw and yoke, cast or ductile iron body and bonnet, 175 WWP Class.
b. 2 Inches and Smaller: OS & Y threaded bronze, rising stem 175 WWP Class.

2. Check Valves:

a. 2-1/2" and Larger: Shall be listed by FM or an OSHA approved NRTL. Check valves shall have flanged or grooved-connection ends, cast or ductile iron body with bronze or iron disc and seat, 175 WWP Class.
b. 2 Inches and Smaller: Threaded bronze swing type, 175 WWP Class.

3. Globe Valves: Bronze body and disc, screwed bonnet, 200 psi wog, threaded ends.
4. Hose Valves and Racks: Provide with 2-1/2" valve, enamel rack, 2-1/2" x 1-1/2" reducing coupling, 100 feet of 1-1/2" linen hose and brass fog nozzle.
5. Post Indicator Valves: Iron body, bronze mounted, flanged, non-rising stem, solid wedge disc with vertical indicator post.
6. Siamese Connection: Cast brass free standing plugs and chains, polished chrome plated, 6 inches x 2-1/2" x 2-1/2". Stamp "Fire Sprinklers".
7. Roof Manifolds: Roof type, Angle inlet, cast brass, two-way, with cast brass, 2-1/2" valves with cap and chains. Provide pressure gage at top of riser.
8.

D. Hangers and Supports:

1. Provide adjustable hangers as required for proper support of pipelines, according to NFPA 13. Hangers shall allow for expansion and contraction of pipelines. Hangers shall be wrought iron clevis type.
2. Piping supported from concrete slabs: Use hangers attached to rods suspended from concrete inserts. Powder and pneumatic actuated (shot-type) fasteners shall not be used to provide support for construction elements located overhead.
3. Single Pipe Runs: Support with adjustable swivel ring hangers.
4. Piping Supported from Walls or Columns: Use welded steel brackets, and adjustable swivel ring hanger.
5. Piping supported from steel structure:

    a. Extension C-clamp
    b. Bar joist clip

6. Standpipes supported from walls: Wrought strap.

E. Hose Cabinet: Furnish and install Hose Cabinet with 20-gauge steel door and frame and an 18-gauge box, reinforced and furnished with a piano hinge and handle hardware, with a baked enamel finish. For extinguisher in cabinet, see extinguisher specification, Section 10522.

F. Fire Department Valve Cabinet: Construction as specified for Hose Cabinet above.

G. Joint Compound: White Tite Seal

H. Materials installed in fire standpipe system shall be suitable for pressures and temperatures encountered. Installation shall be as required by NFPA 14 and as specified.

PART 3 EXECUTION

3.1 INSTALLATION

A. Standpipe System:

1. Cutting and Repairing: The work shall be carefully laid out in advance, and no excessive cutting of construction will be allowed. Damage to buildings, piping, wiring, or equipment because of cutting for installation shall be repaired by mechanics skilled in the trade involved at no additional expense to the City of Key Colony Beach.
2. Protection to Materials and Equipment: Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Upon completion of work, materials and equipment shall be thoroughly cleaned, adjusted and operated.

B. Piping:

1. Run piping enclosed where possible in wall chases, recesses, pipe shafts, wall partitions, and ceilings where provided.
2. Use reducing fittings for changes in pipe size. Bushings are not allowed.
3. Use extra heavy pipe for nipples where unthreaded portion is less than 1-1/2". Close nipples are not acceptable; use saddle nipples.

C. Joints:

1. Make joints in screwed piping with acceptable compound on male threads only. Do not use lamp wick in joints. Threads shall be perfect, clean cut and of exactly proper length. Pipe shall be properly reamed after cutting and threading. After installation, exposed threads shall be painted as specified in Section 09900 - Painting.
2. Make flanged joints with full face rubber gasket, or stainless steel.
3. Grooved joints shall be made in accordance with the manufacturer’s instructions.

D. Hangers and Supports:

1. Properly support piping by accepted type hangers and supports as required by NFPA 13:

    a. To secure piping in place.
    b. To prevent vibration.
    c. Of ample size to carry pipe.

2. Chain, straps, perforated bar, or wire hangers are not allowed.
3. Provide necessary supplemental steel for proper support or attachment of hangers.

E. Sleeves: Provide sleeves large enough to accommodate pipes passing through floors, ceilings, walls, or partitions.

1. Penetrations by fire protection water lines through fire rated floors and walls shall be installed and firestopped using UL classified through penetration firestopping and fire and smoke barrier caulking as specified in Section 07270, Firestopping and Fire and Smoke Barrier Caulking.
2. The fire rating of the firestopping caulking shall be equivalent to or greater than the fire rating of the floor or wall penetrated.
3. Install firestopping and caulking according to with manufacturer's instructions.

F. Escutcheons: Fit and firmly secure escutcheons to pipes passing through finished floors, ceilings and walls, escutcheons of sufficient outside diameter to cover sleeved openings and set in fire-retardant mastic.

END OF SECTION

15410 PIPING (PLUMBING)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07620 - Roof Assembly Steel Blocking and Sheet Metal.
2. 11600 - Laboratory Equipment.
3. 15440 - Plumbing Fixtures, Trim and Supports.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) - latest publications:

1. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
3. A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
4. B32 - Standard Specification for Solder Metal.
5. B88 - Standard Specification for Seamless Copper Water Tube.
6. B306 - Standard Specification for Copper Drainage Tube (DWV).
7. C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
8. C1277 – Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
9. D312 - Standard Specification for Asphalt Used in Roofing.
10. D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride)(CPVC) Compounds.
11. D2241- Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
12. D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Shop Drawings:

1. Pipe and Fittings: Manufacturer's name and mill reports.
2. Expansion Joints: Catalog cuts.
3. Dielectric Unions: Catalog cuts.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials shall be new, unused, and best of their respective kinds, free from defects in labor quality, complying with latest publications in effect at time of bidding, and according to Construction Documents.

B. Cast Iron Drainage Pipe and Fittings:

1. Hub and Spigot: Service weight centrifugally spun cast iron, hub and spigot, tar coated inside and out, ASTM A74.
2. No-Hub: Service weight centrifugally spun cast iron, no-hub, tar coated inside and out, CISPI 310.

C. Galvanizing: By hot process on both inside and outside of pipe with zinc coating averaging at least 2 ounces per square foot and free from defects.

D. Threaded Cast Iron Drainage Pipe:

1. Uncoated service weight, ANSI A40.5.

E. Copper Tubing:

1. Type K or L: Seamless hard drawn or annealed, ASTM B88.
2. Type DWV: Seamless hard drawn, ASTM B306.

F. Steel Pipe: Seamless or welded steel, Schedule 40, black or galvanized threaded, ASTM A53 seamless Grade A.

G. Ductile Iron Pipe: ANSI/AWWA C151/A21.51.

H. Polyvinylchloride Pipe (PVC) or CPVC:

1. Non-Threaded, Type 1 Grade 1, ASTM D1784, for use with potable water NSF standard 61.

I. Cast Iron No-Hub Pipe Joint:

1. Cast Iron: ASTM A888.
2. Neoprene Gaskets: ASTM C564.
3. Aboveground: Stainless Steel Clamp and Shield Assembly: 300 Series, CISPI 301-69T.
4. Underground: ASTM C1277, cast iron couplings with neoprene compression gasket and stainless-steel bolts.

J. Cast Iron Threaded Drainage Fittings: Recessed pattern ANSI B16.12.

K. Cast Iron Threaded Fittings: Standard weight unless noted otherwise, ANSI B16.4.

L. Malleable Iron Fittings: Standard weight, threaded banded 150 pounds ANSI B16.3. Galvanized or black to match piping.

M. Cast Iron Fittings and Flanges:

1. Standard Weight: ANSI B16.1, unless otherwise noted.
2. Extra Heavy: ANSI B16.2.

N. Steel Flanges: 150 psi and 300 psi Class, ANSI B16.5, Grade 1.

O. Brass Fittings:

1. Copper Tubing Solder Drainage Fittings: Wrought copper, ANSI B16.22.
2. Copper Tubing Solder Fittings: Wrought copper, ANSI B16.22.
3. Threaded: Standard weight, banded, ANSI B16.15.

P. Press Fittings for Copper: Type K copper and bronze, ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

1. Viega, Lakewood, OH.
2. Ridge Tool Co., Elyria, OH.
3. Accepted equivalent.

Q. Polyvinylchloride (PVC) Solvent Cement: ASTM D2564.

R. Compression Gaskets, Cast Iron Soil Pipe: ASTM C564.

S. Solder Metal:

1. Similar to silver-tin-copper alloy ASTM B32.
2. All solder shall be certified no-lead.

T. Joint Compound: Tite-Seal or accepted equivalent.

U. Unions: As specified in Section 15430.

V. Protective Coating: Cabot's Flexi-Black or accepted equivalent.

W. Vent Flashing: Provide flashing for vents through the roof for installation as specified in Division 7.

X. Vandalproof Ventstack Caps: Provide vandalproof ventstack caps,

1. Vandalproof hood (threaded) and counterflashing (threaded) cast iron with standard rust resistant prime coating for installation under this section. No.1100-5 hood and 1520-2 counterflashing by Elimdor/Stoneman.
2. Vent extension/flashing by Vent Extensions, Inc., Wellington, FL.
3. Vandalproof cap, 18 gage, type 304 stainless steel by S.B.C., North Miami, FL.

Y. Glass Pipe: Borosilicate glass with compression type stainless steel coupling and tetra-fluorethylene gasket. Fed.Spec.DD-G-541-B and Mil.Spec.MIL-P-22561-B. Kimax by Schott Process Systems, Inc. or accepted equivalent.

Z. High Silica Cast Iron: 14-1/2 percent silicon content cast iron with mechanical joints and 300 stainless steel coupling with PFTE gasket torqued to 9-11 ft. lbs. or bells and spigots with acid-proof rope packing.

AA. Stainless Steel: Schedule 10, seamless with plain ends, ASTM D312, Type 304.

BB. Thermoplastic:

1. Polypropylene acid resistant piping joined by fusion collars of electrical resistance coils.

    a. Enfusion by Enfield Industrial Corp.
    b. Fuseal by R & G Sloane.
    c. Fusion Lock by Zurn.
    d. Orion Fittings Inc.

2. Polypropylene acid resistant piping joined by mechanical joint stainless steel compression fittings.

    a. Orion Fittings Inc.
    b. Accepted equivalent.

CC. Neutralization Tanks with Venting Provisions:

1. Polypropylene acid resistant tanks by Orion.
2. Knight-ware acid resistant stoneware by Koch Engineering Company, Inc.
3. Labline.
4. Neutratanks by Enfield.
5. Polypropylene acid resistant tanks by Schier.
6. Access covers by Josam or Zurn.

DD. Glass Fittings: Beaded ends with compression type coupling.

EE. Silicon Cast Iron Fittings: Plain end with mechanical couplings, or bell and spigot with acid-resistant packing.

FF. Exterior Wall Pipe Penetration: Provide a multi-section circular clamping device to the pipe. Link Seal, or accepted equivalent.

GG. Locator Tape for PVC: 2 inches wide, metallic. Suitable for the services protected, by Seton or accepted equivalent.

PART 3 EXECUTION

3.1 MATERIALS

A. Run piping as indicated in Construction Documents subject to modifications as required to suit field conditions, to avoid interference with other trades, and for proper, convenient, and accessible locations to parts of the piping system.

B. Run piping in wall chases, recesses, pipe shafts, and hung ceilings where provided.

1. Do not run gas or water piping in floor fill.
2. Run piping as high as possible under building, above ceilings, and close to slabs.
3. Do not permanently close, frame-in, or cover piping before examination and final tests.

C. Run piping straight and where concealed as direct as possible with risers erected plumb and true.

1. Install piping with minimum 1 inch clearance between finished pipe coverings and adjacent work.
2. Support piping from structure above, maintaining maximum headroom available.

D. Do not run piping in telephone rooms, electrical equipment rooms/closets, transformer vaults or rooms containing related equipment, or close to or above control panels, switchboards and electric motors except required branch piping to pumps. If pipes are installed in these rooms, they shall be relocated at no extra cost to City of Key Colony Beach.

E. Provide control valves where noted or required for complete regulating control of systems, plumbing fixtures, and equipment. Provide valves in accessible locations above ceiling with access panels.

F. Coat Underground metal piping, except cast iron or as noted on the Drawings, with 1/16" thick black bituminous protective coating.

G. Fittings, Valves, and Hangers on Chrome Plated Piping: Chrome plated finish to match.

H. Provide reducing fittings for changes in pipe sizes. Bushings will not be allowed.

I. Provide extra heavy pipe for nipples where unthreaded pipe is less than 1-1/2".

1. Do not use close nipples. Use saddle nipples.
2. Provide galvanized iron sleeves for pipes passing through roof slabs, interior floors, ceilings, walls, or partitions.

J. Provide at least 20 feet of bare copper pipe for exterior electrical ground at each domestic water service entering each building.

K. Expansion Swings:

1. Make adequate provisions for proper expansion and contraction of piping and for piping passing through building expansion joints.
2. Make branch connections from risers with ample swing or offset to avoid strain on fittings or short pipe lengths. Anchor horizontal runs of pipe over 50 feet in length to walls or supporting structure about midway of run to allow expansion evenly divided toward ends.
3. Provide sufficient number of elbow swings or accepted expansion joints to allow proper expansion and contraction of mains and risers.

L. Pipe Slopes:

1. Lay horizontal soil and waste pipes, unless otherwise noted on drawings, to:

a. 1/8" per foot minimum for pipe 3 inches and larger.
b. 1/4" per foot minimum for pipe less than 3 inches.
c. Horizontal vent lines shall have a minimum grade back to the stacks or vertical lines and shall run as direct and free from bends as possible.

2. Lay storm drainage pipes to 1/8" per foot minimum, unless otherwise noted on drawings.

M. Exposed Piping:

1. Install horizontal runs maximum 4 inches below adjacent structure and run parallel or perpendicular to walls, ceilings, beams, and columns unless otherwise noted on Construction Documents.

N. Piping Materials by System:

1. Sanitary Soil, Waste, and Vent Piping:

a. Aboveground: PVC, service weight no-hub cast iron pipe and fittings, DWV copper pipe with cast brass or wrought copper solder joint drainage fittings.
b. Under Ground Floor Slabs:

1) Cast iron bell and spigot pipe and fittings.
2) Cast iron no-hub pipe and fittings with corrosion resistant couplings and neoprene compression gaskets.
3) PVC schedule 40 with DWV pattern glue fittings.

2. Vandalproof Vent Caps:

a. Install according to manufacturer’s printed instructions.

3. Domestic Water Supply Piping: Drilling tubes for field manufactured fittings is not allowed.

a. Aboveground Interior:

1) Copper Tubing Type L:

a) Wrought copper solder joint fitting without the use of lead components. Tubing used with this type shall not be soft drawn.
b) Bending of tubing having a radius of not less than 4 tube diameters without deformation may be used for tubing diameters not exceeding 1 inch. Copper tubing used for this type connection shall be bending temper.
c) Victaulic copper connection system with Style 606 couplings. Tubing used with this type connection shall be drawn temper.

2) Domestic water piping over 2 inches in diameter and located above accessible corridor ceilings shall be CPVC, Schedule 40, with CPVC glued joint fittings.
3) Domestic water piping located above inaccessible ceilings and/or in chases, regardless of size, shall be copper.

b. Underground Exterior:

1) PVC.
2) Copper Tubing Type K:

a) Soft tempered copper with cast bronze or soldered joint fittings coated with bitumen.

c. Optional Press Connections for Aboveground Interior Copper Tubing Type L and Underground Exterior Copper Tubing Type K:

1) Press fittings shall be made according to the manufacturer's installation instructions.
2) The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting.
3) The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
4) The joints shall be pressed using the tool approved by the manufacturer.

4. Storm Drainage Piping: Same as for sanitary systems.
5. Natural and Liquefied Petroleum Gas Piping:

a. Aboveground, Interior: ASTM A53 threaded Schedule 40 black steel pipe with malleable iron fittings (ANSI B16.3, A19.7).
b. Aboveground, Exterior: ASTM A53 threaded schedule 40 galvanized steel pipe.
c. Below Ground Floor Slabs: ASTM A53 threaded steel sleeve to building exterior and gas line.
d. Test gas piping with pressures and test durations according to NFPA 54.

6. Acid Waste and Vent Piping:

a. Aboveground:

1) Borosilicate glass.
2) High silica cast iron with mechanical coupling joints.
3) Thermoplastic with fusible sockets or stainless-steel compression fittings complying with manufacturer's torque settings. No plastics allowed above ceiling spaces used as plenums.

b. Under Ground Floor Slabs:

1) High silica cast iron with mechanical coupling joints with spigot and socket joint with lip seal. Connections to other piping materials shall be at least 6 inches above slabs or at least 5 feet away from buildings.
2) Thermoplastic with fusible sockets or stainless-steel compression fittings complying with manufacturer's torque settings.

c. Underground Exterior:

1) High silica cast iron with mechanical coupling joints.
2) Thermoplastic with fusible sockets or stainless-steel compression fittings complying with manufacturer's torque settings.

d. Cleanouts and All Accessories in Contact with System Contents:

1) Compatible pipe materials.
2) Exposed frames and covers shall be as specified for sanitary piping.

e. Aggregate for neutralization tanks shall be between 2 and 3 inches in size with calcium carbonate content in excess of 90 percent.
f. Provide concrete vaults for neutralization tanks installed below ground, according to manufacturer's requirements. Provide access covers for vault.
g. Provide venting for neutralization tanks according to Florida Building Code. Connect vent to the building's acid resistant vent system as shown.

7. Condensate Drainage Piping:

a. Aboveground: DWV copper pipe with cast brass or wrought copper solder joint drainage fittings.
b. Underground: PVC pipe and socket type plastic drainage fittings.

8. Fuel Piping: Schedule 40 black steel with malleable iron fittings. Coat underground piping with 1/16" thick black bituminous protective coating.
9. Compressed Air Piping: Galvanized steel pipe with galvanized malleable iron fittings.
10. Acetylene: Copper type K tubing with solder fittings above and below ground. Joints are not allowed under concrete slab. Use silver brazing only.

O. Joints and Methods of Connections:

1. Cast Iron Bell and Spigot Pipe:

a. Compression Gaskets:

1) Gasket and pipe by same manufacturer.
2) Install according to manufacturer's instructions.

2. Cast Iron No-Hub Pipe:

a. Aboveground: Joint with neoprene rubber sleeve and stainless-steel ring clamp according to manufacturer's instructions.
b. Underground: Joint with cast iron coupling, neoprene gasket, and stainless-steel bolts according to manufacturer's instructions.

P. Pipe Cleaning Systems:

1. Domestic Water Piping: Entire domestic water distribution systems shall be flushed clean after the permanent water meter has been installed and before the bacteria testing is conducted.
2. Fuel, compressed Air, and Gas Piping: Blow clear of chips and scale with compressed air at 100 psi.

3.2 TESTS

A. Furnish necessary instruments, test equipment, and personnel required to perform tests and remove test equipment and drainpipes after tests have been made and accepted.

B. After portions of mechanical work are completed and ready for testing, given 48 hours notice to A/E and perform tests in A/E's presence.

C. Tests may be made of isolated portions of piping to facilitate the general progress of installation.

1. Revisions subsequently made in piping system shall require retesting of such affected portions of piping systems.
2. Subject piping and connections to a hydrostatic or pneumatic pressure test before painting, installation of insulation or concealment.
3. Sanitary, Storm, and Acid Waste Drainage Systems:

    a. Apply a water test to all parts of drainage systems before pipes are concealed or fixtures set in place.
    b. Close openings of each system to be tested tightly except highest openings above roof and fill entire system with water up to overflow point of highest opening.
    c. Subject systems to not less than 10 feet of hydrostatic head, except uppermost 10 feet of piping directly below opening.

        1) Water shall remain in the systems for not less than 60 minutes after which time no leaks occur at any point and no lowering of water level at overflow point is visible.

4. Water Supply Piping:

    a. Apply a pressure test to water system before piping is concealed or insulated and before fixtures and equipment are connected.
    b. Apply a hydrostatic pressure of not less than 100 psig for 2 hours, with no leaks occurring in the system.

        1) Water used for tests shall be obtained from a potable source of supply.

5. Fuel, Acetylene, Compressed Air, and Gas Piping Systems:

    a. Subject piping to pneumatic test pressure of 100 psi and hold for 2 hours to demonstrate an airtight system.
    b. Subject joints during pressure test to soap suds coating and visual inspection for leaks.

3.3 CLEANING AND ADJUSTING

A. Clean fixtures, equipment, piping, and exposed work.
    1. Show traps, wastes, and supplies free and unobstructed.
    2. Plated, polished bronze, or painted surfaces bright and clean.

B. After installation, adjust valves, faucets, and automatic control devices for quiet operation. Balance system as required for proper operation.

C. Disinfection: After cleaning and testing domestic water system, disinfect by introducing a solution of calcium hypochlorite with 50 parts per million of chlorine.
    1. Open and close all valves while system in being chlorinated. After disinfecting agent has been applied for 24 hours, test for residual chorine at ends of pipe.
    2. If less than 5 ppm is indicated, repeat process until it is equal to or greater than 5 ppm or according to AWWA C601 Standards.

END OF SECTION

15421 DRAINS AND CLEANOUTS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15410 - Piping (Plumbing).
2. 15430 - Piping Specialties (Plumbing)

1.2 SUBMITTALS

A. Product Data: Submit properly identified manufacturer's literature before starting work.

B. Submit Shop Drawings/Catalog cuts on the following:

1. Drains.
2. Cleanouts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Model numbers are taken from Josam.

1. Accepted equivalents:

a. Jay R. Smith Mfg. Co.
b. Blucher-Josam.
c. Wade.
d. Zurn.

2.2 MATERIALS

A. Drains:

1. Shower Stall:

a. Coated cast iron floor drain, 2-piece body, double drainage flange, invertible non-puncturing flashing collar, weepholes, bottom outlet, connection to suit pipe joint system, and adjustable satin Nikaloy 6" X 6" super-flo strainer.
b. Josam Series 30000-6S or accepted equivalent.

2. Toilet Room:

a. Same as Shower Stall above except with trap primer connections.
b. Josam Series 30000-6S or accepted equivalent.

3. Mechanical Equipment Room:

a. Coated cast iron floor drain with double drainage flange, non-puncturing flashing collar, weepholes, bottom outlet, to suit piping joining system connection, round top, removable shallow sediment bucket, trap primer connection, and medium duty anti-tilting super-flo grate with perimeter drainage slots.
b. Series 32100 by Josam or accepted equivalent.

4. Kitchen:

a. Floor drain with trap primer , connection to suit pipe joining system, double drainage flange, weepholes, bottom outlet, removable shallow sediment bucket that supports a medium duty anti-tilting Nikaloy 12-5/8" diameter super-flo grate.
b. Series 32.200, by Josam or accepted equivalent.

5. Funnel Drain:

a. Two-piece body, double drainage flange, flashing collar, weepholes, 9" x 3-1/2" oval Nikaloy Funnel.
b. Series 30000E3by Josam or accepted equivalent.

6. Can Wash:

a. Coated cast iron, double drainage flange, weepholes, removable sediment bucket, bronze adjustable spray nozzle.
b. Series 39240 by Josam or accepted equivalent.

7. Area Drain:

a. Coated cast iron with round heavy duty anti-tilting grate with perimeter drainage slots, medium sump, bottom outlet.
b. Series 24000 by Josam or accepted equivalent.

8. Rectangular Drain:

a. With 5" X 13" strainer.
b. Series 30000-R by Josam or accepted equivalent.

9. Roof Drain:

a. Coated cast iron roof drain with sealing gasket, large vandalproof cast iron locking dome, non-puncturing clamp ring with internal gravel stop, adjustable top with wide roof flange, under deck clamp assembly, large sump with anchor flange and bottom outlet connection to suit pipe system.
b. Zurn 100C Froet Drain.

B. Cleanouts and Cleanout Access Covers:

1. Floor, Interior Finished Rooms:

a. Cast iron, adjustable inside caulk outlet, brass internal plug, Nikaloy scoriated cover plate secured by countersunk plug.
b. Series 56670 by Josam or accepted equivalent.

2. Stack Base for use in block, plaster and tile walls.

a. Cast iron "T" branch tee with plated cast iron countersunk plug, steel round access cover plate secured with countersunk screw.
b. Series 58600PLG by Josam or accepted equivalent.

3. Exterior, Heavy Duty:

a. Cast iron, outlet as required by pipe system bronze internal plug, ductile iron scoriated heavy duty cover.
b. Series 58600 by Josam or accepted equivalent.

4. Cleanout Sizes:

a. Full pipe size up through 4 inches, pipe cleanouts with bodies of standard pipe size and caulking ferrules conforming to thickness required for pipe and fittings of same metal.

5. Removable Cleanout Plugs:

a. Cast bronze with screw threads and recessed bronze socket. Series 58540 by Josam or accepted equivalent.

C. Wall Access:

1. Cast bronze, square frame and cover, 9" X 9" minimum opening or larger, as required.
2. Series 58640 by Josam or accepted equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide drains and cleanouts as scheduled on drawings.

B. Cleanouts:

1. Place pipe cleanouts at the foot of each storm soil and waste stack in storm and sanitary system and place pipe cleanouts in horizontal runs in sanitary system not to exceed 75 foot spacing.
2. Install access covers as specified.

C. Interior Flush Cleanouts:

1. Flush cleanouts with recessed sockets (without access covers) may be used in non-finished areas such as equipment rooms, storage rooms, and the like, if top of hub is installed in level position and top of clean out plug is flush with the concrete floor.

D. Exterior Unfinished Grade Mounted:

1. Recessed plug mounted cleanouts flush with grade. Surround cleanout with concrete doughnut.

END OF SECTION

15430 PIPING SPECIALTIES (PLUMBING)

PART 1 GENERAL

1.1 SUMMARY

A. Related Section:

1. 15410 - Piping (Plumbing).
2. 15421 - Drains and Cleanouts.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM), latest publication:

1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

1.3 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Submit Shop Drawings/catalog cuts for the following:

1. Unions and Flanges.
2. Hangers and Inserts.
3. Trap Resealers.
4. Vacuum Breakers.
5. Gages and Thermometers.
6. Strainers.
7. Firestop Devices.
8. Backflow Preventors.
9. Water Hammer Arrestors.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Backflow Preventers for Domestic Water Service:

1. Reduced pressure zone, with 2 quarter turn, full ported, bronze ball valves, upstream strainer, and flanged adaptor ends. By Watts or other A/E accepted equivalent.

B. Trap Resealers:

1. Water Closet Valve: Chrome plated with tubing to wall and wall flange. Water closet shall be no more than 20 feet from floor drain. as furnished by flush valve manufacturer.
2. Lavatory or Sink: Cast brass chrome plated with 1/2" female union connection and 1/2" female outlets, integral vacuum breaker.

a. Manufacturers:

1) Josam, No.88250.
2) Jay R Smith , No. 2699.
3) Zurn Industries, Inc., No.Z-1022XL.

3. Remote Location:

Machined brass valve with integral vacuum breaker, pressure adjustment and distribution units with visual operations inspection cover where required for multiple connections as manufactured by Precision Plumbing Products, or equivalent as approved by A/E.

C. Water Hammer Arrestors:

1. Sized per PDI-WH 201 at each branch of cold and hot water supplies as shown on Construction Documents.

a. Josam, No.75000, Sioux Chief or other A/E accepted equivalent.

D. Vacuum Breakers:

1. Hose Bibb Vacuum Breaker: Non-removable. 288A by Watts Regulator Co. or other A/E accepted equivalent.
2. For fixtures without an air gap between the supply valve and the drain, as specified in Section 15440.

E. Unions and Flanges:

1. Steel Pipe 2" and Smaller: Malleable iron unions with brass seat. Galvanized pipe requires galvanized unions.
2. Steel Pipe 2-1/2" and Larger: Flanged connections 150-pound Class. Galvanized pipe requires galvanized unions.
3. Copper Pipe 2" and Smaller: Bronze unions.
4. Copper Pipe 2-1/2" and Larger: Bronze flanged connections 150-pound Class.
5. Dielectric Unions or Flanges:

a. Meet dimensional requirements and tensile strength of pipe unions or flanges according to Fed. Spec. WW-U-531D.
b. Suitable for required operating pressures and temperature conditions.
c. Provide metal connections on both ends. Ends shall be threaded or soldered to match adjacent piping.
d. Separate metal parts at union to prevent current flow between dissimilar metals.

F. Escutcheons:

1. Provide escutcheons securely in place on exposed pipes passing through walls, partitions, floors, and ceilings of finished areas unless otherwise noted on Construction Documents.
2. Provide escutcheons with sufficient outside diameter to adequately cover sleeved openings.
3. Interior Walls, Partitions, and Ceilings: Solid or stamped chrome plated brass or stainless steel, one piece or split pattern.

4. Floors and Exterior: Solid cast brass, rough chrome plated or cast nickel bronze alloy, one piece or split pattern.

G. Pressure Gages:

1. Cast aluminum alloy case, face diameter minimum 3-1/2", range selected so operating pressure is at middle of range.
2. Accuracy: ANSI Grade A maximum of 1.5 percent error at any reading on scale.
3. Manufacturers:

a. Ashcroft.
b. Marshalltown.
c. Taylor Instrument Company.
d. Trerice.

H. Thermometers:

1. Straight type alcohol filled, 9-inch scale, ”V” shaped adjustable angle separable socket well.
2. Accuracy 1 percent of scale range.
3. Manufacturers:

a. Ashcroft.
b. Marshalltown.
c. Taylor Instrument Company.
d. Trerice.

I. Thermometer Wells:

1. Brass construction with extension neck (2 inches minimum) with brass cap and chain.
2. Manufacturers:

a. Ashcroft.
b. Marshalltown.
c. Taylor Instrument Company.
d. Trerice

J. Flexible Connectors:

1. Rubber flexible pipe, 125 psi minimum working pressure rating, 9-inch maximum length.
2. Install according to manufacturer's recommendations.
3. By Metraflex or other A/E accepted equivalent.

K. Pressure Reducing Valves:

1. 25 to 75 psi range, union connection, lead free, built-in bypass, all bronze, monel screen.

a. 1/2" through 2": Model 600XLHTSC by Zurn Wilkins or other A/E accepted equivalent.
b. 1/2" through 3": for flow rates over 80 GPM, Model 500 XLHTSTSC by Zurn Wilkins or other A/E accepted equivalent.

c. 3/4" to 1": for flow rates under 20 GPM, Model 70XL by Zurn Wilkins or other A/E accepted equivalent.

L. Strainers:

1. Wye pattern, stainless steel screen, all bronze, 400 psi WOG, blow-off tapping, 1/2" to 2". YB Series by Zurn Wilkins or other A/E accepted equivalent.
2. Wye pattern, 2-1/2" and above ASTM 126, Class B Cast Iron, flanged connections, stainless steel screen, 200 psi WOG, 2-1/2 inch to 10 inches. FS series by Zurn Wilkins or other A/E accepted equivalent.

M. Pipe Hangers and Supports:

1. Provide hangers, supports, and supplementary steel as specified for different applications. All supports and parts shall conform to the latest requirements of the ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90 except as supplemented or modified by the requirements of this specification.
2. Support spacing shall be as required by the appropriate Tables found in the FBC-Mechanical, Plumbing and Gas.
3. Insert, Hangers, Rods, and Clamps: Figure numbers used refer to Anvil International Inc., Grinnell, Fee and Mason or Elcen Metal Products are also accepted manufacturers.

    a. Inserts:

        1) Universal Concrete Insert: Fig.282.
        2) CB Junior Concrete Insert: Fig.285.
        3) Wedge Type Concrete Insert: Fig.281.

    b. Hangers: Adjustable clevis type.

        1) Cast Iron Pipe: Fig.590.
        2) Copper Tubing: Fig.CT-65.
        3) Insulated Steel Pipe: Fig.300.
        4) Uninsulated Steel Pipe: Fig.260.

    c. Clamps:

        1) V.F.S. beam clamp with weldless eyenut, Fig.292, clamp size 1, rod size 3/4".
        2) C-clamp with retaining clip, Fig.87.
        3) I-beam clamp, Fig.133.
        4) Universal side I beam clamp, Fig.217.

    d. Rods: Galvanized with continuous thread, Fig.146.
    e. Riser Clamps:

        1) Black Steel, Fig.261.
        2) Plastic coated, Fig.261C
        3) Copper finish, Fig.CT121.

4. Diameter of Hanging Rods: Shall be as listed below.

Pipe Size	Rod Diameter
Up to 2"	3/8"
2-1/2 and 3 inches	1/2"
4 and 5 inches	5/8"
6 inches	3/4"
8 inches & larger	1 inch

5. Wall Support:

    a. U-clamps as accepted.
    b. Unistrut supports.

6. Vertical Support: Steel riser clamps.

N. Insulation Protection Shield: Fig.167.

O. Access Panels (Wall or Ceiling): As specified in –Division 8.

PART 3 EXECUTION

3.1 INSTALLATION

A. Inserts:

1. Use inserts for suspending hangers from reinforced concrete slabs or beams when possible.
2. Provide flush inserts at concrete to be a finished surface.

B. Flashing:

1. Flash and counterflash where mechanical equipment passes through exterior or waterproofed floors, walls, or roofs.

C. Sleeves:

1. Seal space between pipe or duct and surrounding floor, wall, or ceiling construction with intumescent caulking.

    a. Pipe Through Floors: Form from 18 gage galvanized sheet metal.
    b. Pipes Through Beams, Walls, Fireproofing, Footings, and Potentially Wet Floors: Use steel pipe or fabricate from 18 gage galvanized sheet metal.

2. Size sleeves to allow movement caused by expansion.
3. Seal and fireproof penetrations as required.

D. Pipe Hangers and Supports:

1. Provide adjustable hangers, inserts, brackets, rolls, clamps, and supplementary steel as required for proper support of pipelines.

a. Design hangers to allow for expansion and contraction of pipelines. Size to allow pipe covering to run continuously through hangers. Allow for proper anchoring and movement of all hot pipes.
b. Install hangers to allow 6" minimum clear space between finished covering and adjacent work.
c. Place a hanger within 1 foot of each horizontal elbow.
d. Use hangers with 1-1/2" minimum vertical adjustment after piping is erected.
e. Provide multiple or trapeze hangers if several pipes can be installed in parallel and at the same elevation.
f. Support riser piping independently of connected horizontal piping.
g. Piping shall not be supported by equipment.
h. Coordinate location of hangers with light fixtures.
i. Wire brush steel or iron supports and prepare surfaces ready for painting specified under Division 9. Prime coat exposed non galvanized hangers and supports.
j. Provide copper plated hangers and supports for copper piping. Dissimilar metal contact is not allowed.

2. Horizontal Cast Iron and PVC Pipe: Place hangers within 18 inches of hub or joint.
3. Hubless Joints: Provide support at every other joint. Support each joint when length between supports exceeds 4 feet.
4. Plastic Pipe: Provide roll hangers and install loose to allow for contraction and expansion.
5. Trapeze Clamp or Hangers:

    a. Secure pipes supported by trapeze clamp or hangers and not mounted on pipe rolls to trapeze with pipe clamps or ”U” bolts.
    b. Place clamp or hangers at each change of direction.
    c. Place clamp or hangers within 1 foot of valves and other appurtenances in horizontal piping.
    d. Place clamp or hangers maximum 3 feet from end of each branch runout.

6. Insulated Pipes:

    a. Provide hangers with a diameter large enough to include insulation.
    b. Install a protection shield with each hanger. 180-degree arc, 16 gage galvanized sheet metal covering, minimum 12 inches long.
    c. Provide support saddles for insulated piping over 2 inches in diameter.
    d. Where “U” bolts are applied, provide additional protection under bolt to avoid crushing insulation.

7. Special Supports: Clamps, hangers, and supports required by equipment manufacturers shall be installed according to equipment manufacturer's recommendations.
8. Plumber’s tape, straps, chain, wire hangers, or perforated bar are not allowed for hanging pipe.

E. Backflow Preventers:

1. Install aboveground in 6'-0" high fenced enclosures with gate.

F. Unions and Flanges: Provide at connections to equipment and control valves.

G. Escutcheons: Fit and firmly secure escutcheons to pipes passing through finished floors, ceilings and walls.

END OF SECTION

SECTION 15440 PLUMBING FIXTURES, TRIM, AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. Division 10 - Toilet Room Accessories.
2. 15410 - Piping (Plumbing).
3. 15430 - Piping Specialties (Plumbing).

1.2 SUBMITTALS

A. Submit Shop Drawings for the following:

1. Fixtures: Catalog cuts with rough-in dimensions identified as designated in fixture schedule, riser diagrams, and as specified.
2. Faucets: Catalog cuts and templates for drilled openings.
3. Fixture Trim: Catalog cuts.
4. Carriers: Catalog cuts.

1.3 QUALITY ASSURANCE

A. Certification: Submit letters, signed by the installer of the product, attesting that no lead is contained in any piece of equipment or in the piping connections that could contaminate water, drinks, or food by contact.

B. Comply with Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fixtures:

1. American Standard.
2. Acorn Engineering.
3. Bradley.
4. Fiat.
5. Elkay.
6. Kohler.
7. Kreolab
8. Toto.
9. Zurn

B. Fittings:

1. American Standard.
2. Chicago Faucets.
3. Fiat.
4. Elkay.

5. Powers Process Controls.
6. Symmons Industries.
7. Sloan.
8. T & S Brass.
9. Toto.
10. Zurn.

C. Equipment:

1. Guy Gray.
2. Haws.
3. Halsey Taylor.
4. Oasis.

WC-1	*Water closet,*
WC-2	*Water closet ADA accessible*
UR-1	*Urinal*
UR-2	*Urinal ADA accessible*
L-1	*Lavatory, wall hung, ADA accessible*
L-2	*Lavatory, countertop*
L-3	*Lavatory*
L-4	*Lavatory with hot water*
SH-1	*Shower, individual, ADA accessible*
SH-2	*Shower, group*
SK-1	*Sink, stainless steel, single compartment*
SK-2	*Sink, stainless steel, double compartment*
SSK-1	*Service sink*
MR-1	*Mop receptor*
ARSK-1	*Acid resistant sink*
EWC-1	*Electric water cooler,*
EWC-2	*Electric water cooler Hi-Lo ADA accessible*
PLSK-1	*Plaster sink*
FD-1	*Floor drain at finished areas*
FD-2	*Floor drain at equipment rooms*
FD-3	*Floor drain at kitchens*
FD-4	*Floor drain at kitchen with funnel*
FS-1	*Floor sink at kitchen*

2.2 FIXTURES

A. Water Closets:

1. Wall Hung Water Closet HC Accessible (WC -) with seat height as shown on drawings:

a. White vitreous china, top spud, siphon jet flush action, 1.28 gpf, elongated bowl, with ceramic bolt caps.

1) Afwall FloWise - 2294.011EC by American Standard, or other A/E approved equivalent by Kohler, Toto or Zurn.

b. Flush Valve: Sloan Royal 111-1.28 or other A/E approved equivalent by Kohler, Toto, or Zurn.

c. Seat: White, elongated, open front less cover, with self-sustaining, stainless-steel posts and pintles check hinges and antimicrobial agent.

1) As manufactured by Olsonite, Kohler, Toto or Zurn.

2. Wall Hung Water Closet not HC Accessible (WC -): Same as (WC -) above, but mount with seat height as shown on drawings.
3. Floor Mounted Water Closet HC and not HC accessible (WC -):

a. White vitreous china, top spud, siphon jet flush action, 1.28 gpf, elongated bowl, with ceramic bolt caps.

1) Madera FloWise 2259.001 (14 inches high); 2855.128 (15 inches high) or 2854.128 (16-1/2 inches high) model suited to the seat height shown on drawings, or other A/E approved equivalent by Kohler, Toto or Zurn.

b. Flush Valve: Sloan Royal 111-1.28 or other A/E approved equivalent by Kohler, Toto, or Zurn.
c. Seat: White, elongated, open front less cover, with self-sustaining stainless-steel posts and pintles check hinges, and antimicrobial agents.

1) As manufactured by Olsonite, Kohler, Toto or Zurn.

B. Urinals:

1. Urinal HC accessible (UR -)

a. Wall Hung, white vitreous china, siphon jet flush action, 3/4" top inlet spud, 0.5 gpf. Install with rim height of 17 inches above finished floor.

1) Allbrook Flowise 6550.501 by American Standard, or other A/E approved equivalent by Kohler, Toto or Zurn.

b. Flush Valve: Oscillating non hold open handle. 186-05 by Sloan Royal, or other A/E approved equivalent by Sloan Kohler, Toto or Zurn.

2. Urinal (UR-) not HC accessible same as (UR-) above but mounted with rim height as shown on drawings.

C. Lavatories:

1. HC and not HC accessible (L- , L-):

a. Wall Hung enameled cast iron, 20 inches x 18 inches, with lug holes for concealed carrier arms.

1) Hudson K-2812 for cold water or K-2867 for hot and cold water. By Kohler or other A/E approved equivalent.

b. Cold Water Fitting: Accessible, single lavatory fitting, self-closing metering, adjustable time cycle, push handle, vandal resistant aerator 0.5 gpm maximum flow.

1) Chicago Faucets 333-E2805 or other A/E approved equivalent by Kohler, Moen or Symmons.

c. Hot and Cold-water Fitting: Accessible, 4-inch centers, 5-inch spout, lever handle, vandal resistant aerator 0.5 gpm maximum flow, with temperature and pressure compensation, ASSE 1070 compliant.

1) Powers TempTAP, Series 105/115, or other A/E approved equivalent by Kohler, Moen or Symmons.

d. Supply Pipes: 3/8” chrome plated flexible, with loose key control, by McGuire or other A/E approved equivalent.
e. “P” Trap: Adjustable with offset at HC accessible lavatories, and tubing drain to wall, cleanout plug and wall escutcheon, by McGuire or other A/E approved equivalent.
f. Grid Strainer: Perforated, chrome plated, 1-1/4" diameter offset tailpiece, swivel joint, HC compliant at accessible lavatories. By McGuire or other A/E approved equivalent.
g. Under sink Safety Covers: Shall conform to ADAAG.

1) Handi Lav-Guard Insulation Kit 101/106 as required, white, by Truebro or other A/E approved equivalent.
2) Use manufacturer fastening system.

2. Countertop Mounted Lav (L-):

a. White enameled cast iron, 19 inches x 16 inches, self-rimming centers.

1) Farmington K-2905-1 or -4 by Kohler, or A/E approved equivalent by American Standard or others.

b. Cold Water Fitting: Accessible, single lavatory fitting, self-closing metering, adjustable time cycle, push handle, vandal resistant aerator 0.5 gpm maximum flow.

1) Chicago Faucets 333-E2805 or other A/E approved equivalent by Kohler, Moen or Symmons.

c. Hot and Cold-Water Fitting: Accessible, 4-inch centers, 5-inch spout, lever handle, vandal resistant aerator 0.5 gpm maximum flow, with temperature and pressure compensation, ASSE 1070 compliant.

1) Powers TempTAP, Series 105/115, or other A/E approved equivalent by Kohler, Moen or Symmons.

d. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
e. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.
f. Grid Strainer: Perforated, chrome plated, 1-1/4” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.
g. Under sink Safety Covers: Shall conform to ADAAG.

1) Handi Lav-Guard Insulation Kit 101/106 as required, white, by Truebro, or other A/E approved equivalent.
2) Use manufacturer's fastening system.

3. Wash Fountain (WSHF -):

a. Resin and filler composition, 3 station unit with air valve, hand control, cold water only, and soap dispenser.

1) Terreon Wall-Hung Tri-Fount by Bradley or other A/E approved equivalent by Acorn.

D. Shower (SH-):

1. Individual Showers:

a. Thermostatic mixing valve with integral service stops and handheld showerhead, 48-inch minimum wall bar, 5-foot-long chrome plated hose.

1) Series 450-e700 with temperature and pressure compensation, ASSE 1016 compliant, by Powers Process Controls or other A/E approved equivalent by Symmons.

E. Sinks:

1. Single Compartment Stainless Steel Sink with Bubbler (Service Center):(BSK-)

a. (BSK -) 25 inches x 17 inches, (5.0) inches deep, 18 gage, Type 304 stainless steel, self-rimming, double ledge.

b. (BSK -) 25 inches x 17 inches, ( ) inches deep, 18 gage, Type 304 stainless steel, self-rimming, double ledge.

1) DRKAD-2517 by Elkay, or other A/E approved equivalent.

c. Bubbler: With flexible guard and HC accessible push button valve.

1) LK-1141A by Elkay or other A/E approved equivalent.

d. Fitting: Accessible gooseneck fixed faucet, single hole inlet, 5-1/4-inch spout, lever handle, vandal resistant aerator.

1) Chicago Faucets 350-E35VPABCP or other A/E approved equivalent by Elkay, or American Standards.

e. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
f. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.
g. Grid Strainer: Perforated, chrome plated, 1-1/2” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.

2. Countertop (SK-):

a. Single compartment, type 304 stainless steel, 18 gage, self-rimming. One or three holes, to suit faucet.

    1) LRAD 2522 by Elkay or other A/E approved equivalent.

b. Cold Water Fitting: Accessible gooseneck fixed faucet, single-hole inlet, 5-1/4-inch spout, lever handle, and vandal-resistant aerator.

    1) Chicago Faucets 350-E35VDABCP, or other A/E approved equivalent by Elkay or American Standard.

c. Hot and Cold-Water Fitting: Accessible, 8-inch centers, 6-inch spout, lever handle, 0.5 gpm maximum flow, vandal resistant aerator, with temperature and pressure compensation, ASSE 1070 compliant.

    1) Powers TempTAP, Series 205/215 or other A/E approved equivalent by Kohler, Moen or Symmons.

d. Hot and Cold-Water Fitting at Clinic: Accessible gooseneck faucet with restricted swing, 5-3/8-inch spout, lever handle, vandal resistant aerator.

    1) Chicago Faucets 786-GR or other A/E approved equivalent by American Standard, or Kohler.

e. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
f. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.
g. Grid Strainer: Perforated, chrome plated, 1-1/2” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.

3. Countertop (SK-):

    a. Double compartment Type 304 stainless steel, 18 gage, self-rimming. (33 inches X 22 inches X ( ) inches deep), One or three holes to suit Faucet.

        1) LRAD 3322A by Elkay, or other A/E approved equivalent.

    b. Cold Water Fitting: Accessible gooseneck faucet with restricted swing, single hole inlet, 5-3/8” spout, lever handle, and vandal-resistant aerator.

        1) Chicago Faucets 786-GR or other A/E approved equivalent by American Standard or Kohler.
        2) Connect cold water service to both faucet inlets.

    c. Hot and Cold-Water Fitting: Same as specified for Cold Water above. Provide complete with lavatory tempering valve, Powers LFe480, ASSE 1070 compliant, 0.5 gpm maximum flow.
    d. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
    e. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.

f. Grid Strainer: Perforated, chrome plated, 1-1/2” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.

4. Wash Sink (WS -):

   a. Enameled cast iron, 72 inches x 18 inches x 7 inch (water depth), drilled back.

      1) Brockway K-3204 by Kohler, or other A/E approved equivalent.

   b. Fitting: Three exposed yoke faucets, wall mounted, vacuum breaker, stops in shanks.

      1) Cannock K-8892-RP by Kohler, or other A/E approved equivalent.

   c. Solids Interceptor: Gasketed cover, stainless steel screens

      1) Josam 61030 or other A/E approved equivalent.

   d. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
   e. "P" Trap: Adjustable with tubing drain to wall, cleanout plug and wall escutcheon. By McGuire or other A/E approved equivalent.
   f. Grid Strainer: Perforated, chrome plated, 1-1/2” diameter offset tailpiece, swivel joint. By McGuire or other A/E approved equivalent.

5. Service Sink (SSK -):

   a. Enameled cast iron, 22 inches x 18 inches, plain back, stainless steel rim guard.

      1) Kohler 6718 or other A/E approved equivalent by American Standard or Zurn.

   b. Fitting: Accessible exposed yoke faucet, wall mounted, vacuum breaker, top brace, pail hook, stops in shanks and 3/4" hose threaded spout, rough plated.

      1) Heritage 8354.112 by American Standard or other A/E approved equivalent by Chicago faucet, Fiat, Kohler or T & S Brass.

   c. Supply Pipe: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
   d. 3-inch "P" Trap: Standard and Strainer, with outlet to wall, by sink manufacturer.

6. Mop Receptor (MR -):

   a. Molded resin, 24 inches x 24 inches x 10 inches, rim guards, center drain. Install in room corner.
   b. Model MSR-2424 by Florestone or other A/E approved equivalent by Fiat.
   c. Fitting: Same as Service Sink (SSK).
   d. MR 370 5/8" diameter Hose.
   e. MR-372 Mop hanger with 3 clamps.
   f. Two MR 373 stainless steel 20 Gauge, 24" rim guards.
   g. Two MR-377 stainless steel splash panels.

F. Drench Hose Speakman SE-921 countertop mounted, with self-closing valve, aerated spray, 6-inch hose and flip top dust covers.

G. Hose Reel (HR-)

1. 35 feet of retractable 3/8” I.D. hose, hose bumper with hose spring and push lock hose end, for concealed installations, backflow preventer, shut-off valve, VOC concealed 2 valve fitting, loose key check valve, volume control with coupling.

    a. 536-537WCNF with 548 stainless steel housing and main shaft and swivel, by Chicago Faucets or other A/E approved equivalent.

H. Undercounter Tempering Value:

1. Powers LFe480, ASSE 1070 compliant, 0.5 gpm minimum flow.

2. Water Supplies: 3/8" chrome plated flexible, with loose key control. By McGuire or other A/E approved equivalent.
3. Gas Supplies: 3/8" galvanized pipe, gas cock with loose key control, dirt leg and union.
4. P-traps: 1-1/2" acid resistant material same as piping used. Installation according to manufacturer’s recommendations.

I. Washing Machine Utility Connection Box:

1. Recessed metal box with hot and cold-water hose bibbs, vacuum breakers, and 2-inch diameter drain where indicated on drawings.
2. Model WB-200 by Guy Gray with Watts Model 2T "Duo Cloz" ball type valve or other A/E approved equivalents.

J. Modular Shower Privacy Compartments:

1. Wall mounted 16 gage stainless steel with No. 4 satin finish.
2. Provide 1106 white vinyl shower curtain, 1104-2 chrome plated brass double hook and 1102-1 hardwood seat.
3. Furnish one compartment without seat for location by A/E of a fold down seat for handicapped use.
4. Diana Series, Model 1110 by Acorn Engineering or other A/E approved equivalent.

K. Electric Water Coolers HC Accessible (EWC -):

1. Single-Level:

    a. Wall Mounted, with bottle filling station, self-closing valve with automatic stream regulator, vandal resistant polished chrome plated brass bubbler, push bars in front and both sides, for handicapped and standard use, equipped with lead reduction filter at interior locations only, satin stainless-steel sides. Refer to Drawings for mounting height.

        1) Elkay model LZS8KWSVRSK or other A/E approved equivalent by Halsey Taylor, Haws or Oasis.

2. Bi-Level:

    a. Wall Mounted, with one bottle filling station, self-closing valve with automatic stream regulator, vandal resistant polished chrome plated brass bubbler, push bars in front and both sides, for handicapped and standard use, equipped with lead reduction filter at interior locations only, satin stainless-steel sides. Refer to Drawings for mounting height.

        1) For Interior locations ONLY: Elkay model LZSTL8WSVRSK (Basis of Design) or other A/E approved equivalent by Halsey Taylor, Haws or Oasis.
        2) For all Exterior locations: Elkay model VRCTL8WSK (Basis of Design) or other A/E approved equivalent by Halsey Taylor, Haws or Oasis

3. No lead shall be allowed in the manufacture of any piece of equipment within water coolers or in any piping joint or connection within the unit or pipe leading to it.

L. Drinking Fountains (DF -):

1. Wall mounted, solid one-piece molded satin stainless-steel construction, with self-closing valve and automatic stream regulator, front pushbutton, vandal resistant polished chrome plated brass bubbler. See Drawings for mounting elevations.

    a. Halsey Taylor: Model HRFE with 45392C bubbler (Basis of Design) or other A/E approved equivalent by Elkay, Haws or Oasis.
    b. No lead shall be allowed in the manufacture of any piece of equipment within water coolers or in any piping joint or connection within the unit or piping leading to it.

M. Interceptors:

1. Trap type, solids interceptor, bottom access, 1-1/2" slip joint, gasketed covered, removable stainless steel strainer basket, chrome plated.

    a. Series 61000 by Josam, or other A/E approved equivalent.

2. On floor type, solids interceptor, top access, 2-inch threaded connections, gasketed cover, coated cast iron, galvanized steel basket with stainless steel screens.

    a. Series 61040 by Josam or other A/E approved equivalent.

3. Hair/Lint interceptor, Dura-Coated cast iron hair and solids interceptor with slip joint inlet and threaded outlet, 16X16 mesh stainless steel basket removable from top, with flanged and gasketed cleanout cover with raised hex head.

    a. Series 61800 by Josam or other A/E approved equivalent.

N. Plaster Interceptors:

1. Low Volume: Z 1180 by Zurn or other A/E approved equivalent.
2. High Volume: Z 1181 by Zurn or other A/E approved equivalent.

2.3 CARRIERS

A. All carriers shall be fully bolted to floor and installed as recommended by manufacturer.

1. Lavatory/Lavatory HC:

a. Rectangular structural steel uprights with integral welded heavy steel foot, cast iron concealed arms. Model 17100 by Josam or other A/E approved equivalent.

2. Urinal:

a. Rectangular structural steel uprights with integral welded steel foot, hanger bracket and lower bearing plate. Model 17560 by Josam or other A/E approved equivalent.

3. Water Closet:

a. 4-inch pipe size, with pylon feet, adjustable, provided with vandal resistant trim, supply pipe support and adjustable chase extensions. Josam 12000 Series Chase-Saver II or other A/E approved equivalent.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected.

3.2 EQUIPMENT AND FIXTURE CONNECTIONS

A. Provide necessary material and labor to connect fixtures and equipment having plumbing connections including fixtures and equipment specified and furnished in other sections.

B. Supply Pipe Cut-off Valves: On supply pipes to each item of equipment or fixture (except faucets furnished with an integral stop) install a cutoff valve to enable isolation of the item of equipment or fixture for repair and maintenance without interfering with operation of other items of equipment or fixtures

C. Anchor supply piping serving all items of equipment or fixtures to structure, to prevent pipe or fixture movement.

D. Templates: Furnish templates and rough opening dimensions to fabricators of countertops and case work for location and sizes of openings for faucets and sink.

END OF SECTION

15450 PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15410 - Piping (Plumbing).
2. 15430 - Piping Specialties (Plumbing)
3. Division 16 - Electrical Wiring and Connections.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts and technical data before starting work.

B. Shop Drawings:

1. Domestic Water Pumps: Catalog cuts, characteristics, performance curves, and controllers.
2. Air Compressors: Catalog cuts, performance curves, characteristics, and controllers.
3. Air Dryers: Catalog cuts, capacity and characteristics.
4. Recirculating Pumps: Catalog cuts, performance curves, and characteristics.
5. Sump Pumps: Performance curves, characteristics, and controls.
6. Sewage Ejector Pumps: Characteristics, catalog cuts, performance curves, holding tanks, and controls.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Domestic Water Pumps:

1. Manufacturers:

a. Armstrong Pump Co.
b. Syncroflo Inc.
c. Patterson Pumps.
d. Peerless Pump Co.

2. Provide a multi pump, prefabricated, water pressure booster system designed to maintain a constant pressure automatically without regard to system demand; with a minimum suction pressure of 10 psi. System shall have inlet and discharge pressure gages. Systems serving EHPA facilities shall have a stand-by booster pump.
3. Each pump shall be single stage, end suction type with 150-pound casing, bronze impeller, and wearing rings, stainless steel sleeves, steel shaft, mechanical seals, and grease lubricated ball bearings. The packaged system and controller shall be mounted on a steel skid. Connect pumps through a flexible coupling to a drip proof motor
4. Rate system, excluding stand-by pump, for required flow and pressure.

5. The controller shall be housed in a NEMA 1 skid-mounted cabinet with mechanical door interlocks. Panel shall include fused disconnects, across-the-line starters with thermal overload protection, control transformer, automatic alternator with manual override switch, magnetic contactors, high- and low-pressure limit switches, green running lights. Power leads to the panel, from panel to motor and monitor, shall be connected to terminal strips provided in the panel.

B. Air Compressors:

1. Manufacturers:

    a. Ingersoll-Rand.
    b. Joy.
    c. Quincy.

2. Single stage, single acting, air cooled, noncontinuous duty units, mounted on a receiver. Units motor driven through a V-belt drive. Units shall have stainless steel valves, separate cast cylinders, finned intercooler, and low oil level protection.
3. Provide pressure gages, safety valves, service valves and drain valves, automatic condensate trap, air cooled aftercooler, magnetic motor starters, inlet filters, and silencers.
4. Units shall be controlled by an automatic start and stop control which starts compression when pressure drops to a predetermined level and stops compression when desired pressure is reached.
5. Receiver shall be galvanized steel inside and outside and ASME rated.
6. Complete assembly shall be factory prepackaged, piped, wired, and engineered. Characteristics as shown on Construction Documents.

C. Air Dryers:

1. Manufacturers:

    a. General-Zurn Industries.
    b. Honeywell.
    c. Ingersoll-Rand.

2. Refrigerated air type with precooler reheater, heat exchanger, and water separator.
3. Unit shall have magnetic starter and fused disconnect switch.
4. Complete assembly shall be enclosed in a steel cabinet with support frame.
5. Characteristics as shown on Construction Documents.

D. Hot Water Recirculating Pump:

1. Manufacturers:

    a. Bell and Gossett.
    b. Taco.
    c. Armstrong.
    d. Grundfoss.

2. Pump shall be in-line flanged, all bronze construction, close coupled, single stage, centrifugal type with characteristics as shown on Construction Documents, designed for continuous operation.

3. Impeller shall be of enclosed type, hydraulically and dynamically balanced, keyed to the shaft and secured with suitable locknut.
4. Provide mechanical seals with stainless steel springs and carbon seal rings.
5. Motor shall be non-overloading at any point-on-point curve with built-in thermal overload protectors, drip-proof sleeve bearing, quiet operation, rubber mounted construction.

E. Elevator Sump Pumps: 1/2 hp., 115V, 1 ph., 60 cycle, 1725 rpm, cast iron construction. 262 Series by Zoller Pump Co. or A/E approved equivalent.

F. Storm or Sewer Ejector Pumps:

1. Manufacturers:

   a. PACO Pumps.
   b. Weil Pump Co.
   c. Weinman Pump Co.

2. Submersible dual pump, package, close coupled, permanently sealed motor, stainless steel shaft, cast iron casing with integrally cast legs, cast iron impeller, cast iron strainer, 30 feet of waterproof cable.
3. Provide Control panel with visual and audio alarm, mechanical alternator, high water alarm and level controls.
4. Provide cast iron basin cover with pump access openings, manhole and mechanical alternator mounting.
5. Characteristics as called for on Construction Documents.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pad Mounted Equipment: Erect equipment on 4-inch-high concrete pads a minimum 6 inches beyond equipment outline area unless otherwise specified.

B. Unless otherwise specified, equipment mounted on vibration isolated bases shall have a minimum operating clearance of 2 inches between the structural steel frame and the concrete housekeeping pad or floor beneath the equipment.

C. Manufacturers shall verify with the Contractor that housekeeping pad size, shapes, and locations are correct.

D. Piping shall not be suspended from one another or physically contact one another. Vibrating systems shall be kept free from non-vibrating systems.

E. Isolator manufacturer shall include with shop drawings submittals, a tabulation of spring outside diameter, free height, operating height, solid height and deflection to springs.

F. Provide start-up by equipment manufacturer representative. Procedure shall include a load test as recommended by manufacturer.

G. Recirculator Pumps: Support pump independently of the installed pipeline.

3.2 FIELD QUALITY CONTROL

A. Domestic water pumps system shall be run for a minimum of 30 minutes. During that time the following will be demonstrated:

1. Automatic start and stop.
2. Manual start and stop.
3. Setting and adjustment of pressure switches and controls.
4. Sequential operation of lead and lag pumps and pump alteration.
5. Constant pressure with various demands.

B. Air compressors shall be run with controls on line to demonstrate the following:

1. Automatic start and stop.
2. Manual start and stop.
3. Alternation of compressor motors.
4. Operation of condensate trap.
5. Operation of high-pressure controls to verify safe stopping of equipment.
6. Setting of relief valve.

C. Sewage ejector pumps shall be run with controls on line to demonstrate the following:

1. Automatic start and stop with water level switches.
2. Manual start and stop.
3. Alternation of motors.
4. High water level alarm operation.

END OF SECTION

15457 WATER HEATERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: A complete domestic hot water generating system with necessary accessories as indicated on Construction Documents, as specified, and as required by code.

B. Related Sections:

1. 15180 - Mechanical system insulation.
2. 15410 - Piping (Plumbing).
3. 15430 - Piping Specialties (Plumbing).

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature before starting work.

B. Shop Drawings:

1. Water Heaters: Catalog cuts, performance characteristics.
2. Pressure and Temperature Relief Valve: Catalog cuts, capacity.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Gas Fired - Storage Water Heaters:

1. The work includes labor, materials, and equipment to furnish and install a domestic hot water supply system guaranteed to provide 80 percent draw without temperature drop. The system shall be installed and connected according to drawings furnished by the manufacturer.
2. The system shall contain the following: Heaters, storage tank, pump, tank thermometer, temperature pressure relief valve, and tankstat.
3. Manufacturers: Lochinvar or accepted equivalent.
4. Heaters shall be AGA certified and ASME inspected and stamped for 160 psi working pressure using natural or LP gas at zero feet elevation.

    a. The water tube heat exchanger shall be horizontal grid gasket less and constructed of at least 1-inch O.D. x 0.065" wall thickness integral copper finned tubes securely fitted to glass lined cast iron headers in a manner to prevent water from contacting the tube sheets.
    b. Heaters shall be heavy cast bronze with integral cast bronze baffles.
    c. Heat exchanger shall be explosion proof on the water side and have 100 percent copper and bronze waterways and shall be guaranteed for 5 years.

5. Equip heater with electric high limit control adjustable to 140 degrees F. Main electric gas valve to be 24-volt with 120/24-volt transformer.

6. Burners shall be quiet on ignition and extinction and fabricated from titanium stainless steel with round raised ports or cast iron with bronze burner tips. Burners shall be equipped with fixed primary air openings and mounted in a slide-out type drawer for ready access.
7. The storage tank shall be as shown on Construction Documents with 125 psi working pressure and shall be glass or epoxy lined. The tank shall be furnished with legs and guaranteed for 5 years.
8. The system circulating pump shall be wired for continuous operation or interlocked with boiler gas valve for intermittent operation with gas valve on call for heat from the tankstat.
9. Necessary controls and accessories including pump, tankstat, thermometer, temperature-pressure relief valve, operating and diagnostic data in descriptive words, not code numbers, shall be furnished by the manufacturer and be factory installed on the system.

B. Electric - Storage Water Heaters:

1. 6-, 12-, 20-, 40-, or 60-gallon sizes, as indicated on Drawings.
2. Double element, drain pan, wired for simultaneous use.
3. Insulation jacket to meet current FBC energy code.
4. Ruud, Lochinvar, A.O. Smith or other A/E approved equivalent.

C. Instantaneous-Type Gas Fired Water Heaters (Tankless):

1. Gas fired instantaneous water heaters shall be tankless type with a flow activation switch operating only when hot water demand is called for.
2. Heat exchanger shall be constructed of a corrosion resistant alloy and shall have thermal controls to request output temperature at 110˚F with a thermal cut off to limit maximum temperature to 140˚F to shut down heating to prevent a scalding causing situation.
3. Minimum flow activation shall occur at 0.4 gpm and minimum required operating pressure is 40 psig.
4. Heater shall be condensing type and shall be guaranteed for 5 years.
5. Provide heater as manufactured by Rinnai or other A/E approved equal.

D. Instantaneous-Type Electric Water Heaters (Tankless):

1. Electric instantaneous water heaters shall be tankless type with a flow activation switch operating only when hot water side of faucet is turned on.
2. The heat exchanger shall be constructed of a noncorrosive metal alloy. The units shall have high temperature thermal cutoffs for a maximum temperature of 140 degrees F. to shut down the heating elements and avoid a scalding causing situation.
3. The minimum flow activation shall be 0.5 GPM and minimum operating pressure requirements shall be 25 psi.
4. Maximum operating pressure of 150 psi. Units shall be tested to UL 499.
5. Controls shall not allow water temperature to exceed 110 degrees F.
6. Provide 15-year warranty.
7. Manufacturers:

    a. Cronomite Laboratories, Inc., Model S-90-1 or other A/E approved equivalent by Eemax Inc., Botsford, CT., or Hot Aqua Inc., Culver City CA.

PART 1 EXECUTION

1.1 INSTALLATION

A. Provide a gate valve and union at cold water connection to heater. A union shall be provided at hot water connection.

B. On storage type heaters, provide on cold water supply to heater a vacuum relief valve of sufficient size to protect tank from siphonage.

C. On storage type heaters, pressure relief valve and drain pan drain shall discharge to an approved location in accordance with Code.

D. At other than instantaneous electric water heaters provide thermometer on top of heater in oversized tee and nipple on outlet piping of heater.

E. On storage type heaters adjust individually controlled elements to start at 5 degrees F. temperature differential for each heater element.

F. The water heater shall fit properly in the floor space provided. Installation shall be according to local, municipal, state, and national codes.

END OF SECTION

15484 FUEL OIL SYSTEM (PLUMBING)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. Division 2 Excavating, Backfilling, and Compaction for Utilities.
2. Division 3 Cast-In-Place Concrete.
3. 15410 - Piping (Plumbing).
4. Division 16 - Electrical.

1.2 REFERNCES

A. Fuel Oil Systems shall comply with Underwriters Laboratory (UL) or other OSHA approved Nationally Recognized Testing Laboratories (NRTL).

1.3 SUBMITTALS

A. Submit properly identified manufacturer's catalog cuts and technical data before starting work, including, but not limited to, the following:

1. Storage Tanks: Manufacturer's data, catalog cuts.
2. Accessories, Appurtenances, and Controls: Catalog cuts.
3. Pumps: Catalog cuts and performance characteristics.

B. Shop Drawings: Submit complete shop drawings for A/E's review showing necessary data, plans, details, sections, manufacturer's recommendations, and explanatory notes to indicate compliance with the requirements of this section.

1.4 QUALITY ASSURANCE

A. Tank Installer: Must have been exclusively engaged in the installation of fuel handling systems for the last five years. Installer must have a "Pollutant Storage System" contractor's license and if required, prior to contract award, shall furnish at least three letters of reference, from different clients for projects completed during the previous five years.

B. Rigidly anchor units installed outdoors to withstand wind velocities determined by American Society of Civil Engineers (ASCE) 7.

1. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to ASCE 7 using a wind a Risk Category III, speed of 186 mph, and Exposure Category "C".

1.5 WARRANTY

A. Aboveground Storage Tank: Provide a minimum manufacturer standard guarantee period of 20 years against internal or external defects.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Aboveground Storage Tanks:

1. Insulated, secondary containment type, UL-2085, ULC-142.16 and ULC-142.23 compliant; meeting FBC, NFPA 30, UFC, BOCA and IBCC requirements. Made specifically for the service by a firm engaged in the manufacture of the product for at least 20 years. Tank shall be labeled by the manufacturer to show manufacturer's name, product stored, tank size and the word "FLAMMABLE". Tank shall have a minimum 6" concrete total encapsulation made in one pour without cold joints. Tank shall be provided with direct reading level gauge visible from fill location, and an interstitial leak detector gauge monitor with aluminum guard. Fill pipe with 8-gallon spill containment reservoir and overfill prevention valve within tank. Fill pipe to close automatically at 90% fill level, drop pipe with anti-siphon valve and strainer. Additional accessories as shown on the Drawings. Cap tank nipples that are not used. Tank shall be as manufactured by Convault or other A/E approved equivalent.

B. Packaged Day Tank and Pump System:

1. Day tank manufacturer shall have a minimum of twenty years experience in the design and construction of Underwriters Laboratories listed day tank systems.
2. Provide secondary containment type day tank, UL 142 labeled. Tank shall be constructed of minimum 12-gauge steel. Tank shall be fitted with a drain, a removable gasketed 4" square inspection plate, fuel level gage, level control probe, vent cap (shipped loose), and a 2" gasketed manual fill cap. Fuel inlet and return must be supplied with factory installed drop tubes to prevent surging and foaming in the day tank. Finish exterior in an oil enamel, finish interior with a rust resisting enamel. Secondary basin shall be capable of holding 160% of the primary tank capacity. Where day tank is located indoors, the secondary containment may be a rupture basin.
3. Tank may be standard (no pump) or it may be fitted with one or more pumps, as required by the installation and as shown on Drawings.
4. Tanks shall be complete with a control cabinet. Controls shall operate at 120 volts, 1 phase, 60 hertz and shall include level controls, safety interlocks a microprocessor-based logic panel to sequence 4 level control switches and a minimum of 2 hi-lo safety controls. Controls shall include alarm activation. Control cabinet shall be labeled UL 508A. Cabinet front door will have an operator interface which will provide at a minimum, alarm silencing, manual reset lamp/alarm test buttons, lead pump selector, HOA switches for each pump, pump status indication, tank leak alarm, high- and low-level alarms and tank level indication. All alarm bells and lights shall be factory installed. Entire tank control system shall be tested at the factory before shipping.
5. Provide safety interlocks to shut down all pumps on detection of leaks, high fuel level or low fuel level. Interlocks must be capable of operating even when control panel fails or is out of service.and the pumps are operating in manual "Hand" mode.
6. Approved Manufacturers: Simplex, Inc, Tramont, PRYCO, Inc, or other A/E approved equivalent

C. Fuel Oil Pumps:

1. Pumps shall be of the positive displacement, rotary type with cast iron housing and self adjusting mechanical carbon ring seals. Pump and motor shall be connected through a flexible coupling, provided with a steel guard. Pump voltage shall be 120 volts, 1 phase, and shal be factory wired to a terminal block in the control panel.

D. Fuel Oil System Valves:

1. Gate Valves:

a. All bronze construction with union bonnet, rising stem, double wedge disc and threaded ends, 150 psi WOG.
b. Manufacturers: Stockham B-120, or other A/E approved equivalent.

2. Check Valves:

a. Vertical:

1) Silicon bronze, cast body, bronze trim, threaded ends, spring-loaded 400 psi WOG, non-shock.
2) Manufacturers: Symmons 500SB, or other A/E approved equivalent.

b. Horizontal:

1) Swing check, all bronze construction, regroundable bronze disc, Y pattern, threaded ends 150 psi WOG, non-shock.
2) Manufacturers: Crane 137 or other A/E approved equivalent.

E. Piping Details, Venting, and Valving:

1. Above ground Pipe: Provide per section 15410.
2. Underground Pipe: Provide fiberglass product and secondary containment piping "Red thread IIa Piping Systems" as manufactured by A. O. Smith Fibercast or other A/E approved equivalent.

F. Tank Fittings:

1. Vent Protectors: Fill connection, overfill prevention valve, vent caps and as called for on Drawings; OPW or other A/E approved equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

A. Anchorage: According to applicable building codes and in consideration of local ground conditions, as shown on the accepted shop drawings, as specified in this section, and as detailed on Drawings.

B. Required Tank Openings: Locate on centerline of shell according with manufacturer's recommendations and accepted shop drawings.

3.2 FIELD QUALITY CONTROL

A. Tank Leak Test: Test pressure 5 psi.

B. Piping System Leak Test:

1. Apply dry nitrogen to piping system before concealing pipe and connecting equipment.
2. Test piping system to 50 psig pressure to hold for 4 hours. Test to be witnessed by A/E.

END OF SECTION

15510 PIPING (HVAC)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 15515 - Valves, Hangers, and Specialties.
3. 15970 - HVAC Control System.
4. 15990 - Tests (HVAC).

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A47-90(95) Specification for Ferritic Malleable Iron Castings.
2. A53-96 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A183-83(90) Specification for Carbon Steel Track Bolts and Nuts.
4. A197-87(92) Specification for Cupola Malleable Iron.
5. A234/A-96b Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
6. B32-96 Specification for Solder Metal.
7. B88-96 Specification for Seamless Copper Water Tube.
8. D1784-96 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.3 SUBMITTALS

A. Pipe and Fittings: Manufacturer's name and mill test reports.

B. Piping Systems: 1/4" to 1 foot scale shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. PIPING TYPE "A":

1. Pipe: Up to 16" - Schedule 40, black steel per ASTM A53 Grade A or B seamless.
2. Fittings:

a. Up to 2" - 150 PSI malleable iron per ASTM A197, screwed.
b. 2-1/2" and above - Schedule 40, black steel, seamless welding per ASTM A234.

3. Unions: Up to 2" - ASTM A47, 300 PSI wsp malleable iron, screwed, ground joint type.
4. Flanges: 2-1/2” and above - Welded, ANSI B16.5, 150 PSI primary steam rated, black steel, flat-faced, weld neck ir skip on.

B. PIPING TYPE "B":

1. Pipe: Up to 2" - Copper per ASTM B88, Type "L" hard drawn.
2. Fittings: Up to 2" - Wrought copper, solder joint type per ANSI B16.22 made with 95-5 or silver solder per ASTM B32, as specified.

C. PIPING TYPE "C":

1. Pipe: All sizes PVC, Schedule 40, ASTM D1784.

D. PIPING TYPE "D" (Underground-Exterior):

1. Underground piping system shall consist of integral sealed units insulated with rigid polyurethane foam sealed with outer jacket and compression fitted rubber end seals:
2. Pipe: All sizes - Pipe shall be as specified for Type "A" or "B" piping as indicated.
3. Insulation: All sizes - Rigid 90 to 95 percent closed cell 2-1/2” thick polyurethane. See section [15180].
4. Jacket: All sizes - Type I, Grade 1 PVC or with a minimum wall thickness of 0.060 inches, HDPE, or FRP.
5. Fittings: All sizes - ASTM A234, Schedule 40. For insulation of fittings see Section 15180.

E. PIPING TYPE "E" (Refrigerant):

1. Pipe: Up to 3" - Copper tubing marked ACR per ASTM B88 a, type "K" hard drawn, with silver soldered connections.
2. Fittings: Up to 3" - Wrought copper, soldered type. Where required for connection to gauges and control devices tubing not larger than 3/8" o.d. may be Type K soft (annealed) with flared tube or double ferrule compression fittings suitable for high pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Furnish and install a system of piping and valves to control and isolate apparatus and appurtenances as shown on Construction Documents, or as necessary to complete working systems according to Construction Documents.

1. Construction Documents are diagrammatic and indicate general location and connections.
2. Piping may be offset, lowered, or raised as required or as directed at site. This does not relieve Contractor from responsibility for proper erection of systems of piping in every respect suitable for the work intended according to specifications and accepted by A/E.

B. Arrangement:

1. Piping shall not interfere with removal of other equipment or devices.
2. Piping shall not block access to doors, windows, panels, or other access openings. Piping shall be arranged to facilitate removal of heat exchanges.

3. Provide flanges or unions, as applicable for type of piping specified at connections to equipment and piping interfering with access or tube pull space.
4. Place and install piping to not interfere with installation of equipment and ducts.
5. Piping shall be installed to ensure noiseless circulation.
6. Place valves and specialties to allow easy operation and access. Valves shall be regulated, packed and have glands adjusted at completion of work before acceptance.
7. Piping shall be erected and pitched to ensure proper drainage.

C. Connections:

1. Install piping connections to pumps and other equipment without strain at piping connection.
2. Contractor shall be required as directed to remove bolts in these flanged connections or disconnect piping to demonstrate that piping has been so connected.
3. Provide flexible connections with at pump suction and discharge ends to match connecting pipe.

D. Where equipment requiring different arrangement or connections from those shown is accepted, it shall be responsibility of Contractor to install equipment to operate properly and with intent of Construction Documents and specifications.

1. When directed by A/E, submit documents showing proposed installation.
2. If proposed installation is accepted, make incidental changes in piping, duct work, supports, insulation, wiring, heaters, panelboards, etc. Provide additional motors, controllers, valves, fittings, and other additional equipment required for proper operation of system resulting from selection of alternate equipment, including required changes in affected trades.

E. Cut pipe accurately to measurements established at building, work into place without springing or forcing, and properly clear windows, doors, and other openings. Cutting or other modifications to building structures to facilitate piping installation will not be allowed unless accepted by A/E.

F. Install piping mains, branches and run-outs to allow for free expansion and contraction without developing leaks or undue stressing of pipe. Stresses to be within allowable limits of ANSI Code B31.1-73 for pressure piping.

G. Pipe Sizes: If size of any piping is not evident in Construction Documents, request instructions from A/E as to proper sizing. Changes resulting from Contractor's failure to request clarification shall be at his expense.

H. In mechanical rooms, avoid piping runs over electrical panels and other electrical equipment. If necessary, provide a suitable sheet metal shield or gutter. Submit shop drawings showing proposed shielding at each location.

I. Each mechanical trade is responsible for lines and levels of ductwork and piping based on reference lines and benchmarks established by General Contractor for general work.

J. Provide the following:

1. Di-electric couplings between dissimilar metals.

2. Drain valves at low points of each system to enable complete drainage. Valves shall be full line size.
3. Drain piping from pump glands and relief valves, to spill over open sight drains, floor drains, or other acceptable discharge points terminating drain line with plain end (unthreaded) pipe.
4. Caps open ends of pipe lines and equipment during installation to keep dirt and other foreign matter out of pipe and equipment.
5. Temporary cross-connections, valves, oversize flushing connections, and pumps required to thoroughly flush systems.
6. Shut-off valves and unions or flanges at each branch and in supply and return to each item of equipment such as pumps, coils, automatic valves, etc., for isolation of equipment without complete system shutdown.
7. Gate valve on capped services for extension to equipment furnished under other sections or by the City of Key Colony Beach when shown on Construction Documents.
8. Expansion loops with adequate anchors and guides to absorb pipe expansion as shown on Construction Documents or as required. Expansion joints are acceptable if accepted in advance by A/E.
9. Safety relief piping from fusible plugs, safety valves, relief valves, etc., full relief port size from equipment equipped with these devices, whether shown on Construction Documents or not. Discharge pipe safety relief piping to the building exterior in an accepted manner.
10. Auxiliary cooling piping and connections for compressors, etc., whether shown on the Construction Documents or not.

K. Cleaning and Flushing: Take every precaution to remove dirt, grease, and other foreign matter from each length of piping before making connections in field. After each section of piping is installed, flush with clean water, except where specified otherwise. A temporary flushing connection shall be arranged for each section of piping and flushing arranged for all piping. Water required for flushing shall be furnished by Contractor.

L. Threads on screwed piping shall be clean cut to exact length. Ream piping after cutting threads. Accepted joint compound shall be applied to male thread only. Lamp wick in joints is prohibited.

M. Welded piping shall be cleaned free of rust, scale and oxide. Pipe shall be beveled at each end and backing rings shall be used on systems with 2-1/2" and greater pipe size. After welding, pipe shall be hammer cleaned and flushed to remove scale, welding slag and other debris. If weld contains any defects, it shall be repaired to satisfaction of A/E.

N. Welded piping shall be according to ANSI B31.1-73, Power Piping, Chapter 4, Section VI. Welder shall be qualified per Section IX of the A.S.M.E. Boiler and Pressure Vessel Code. List of welders with date of last certification shall be available at job site. Safety procedures shall conform to ANSI Z49.1-73.

O. Long radius elbows shall be used except where space conditions do not allow and where indicated.

P. Reduction in pipe sizes shall be made with eccentric reducers or reducing elbows. Bushings are not allowed. Reducers in water piping shall have flat side up to facilitate venting.

3.2 PIPING TYPE

A. Above or below ground chilled water, hot water and condenser water piping shall be Type "A".

B. Above ground condenser water piping shall be Type "C".

C. Below ground chilled water and hot water piping shall be Type "A" or Type ‘D’ at the contractor’s option.

D. Make-up water and pump drainage piping shall be Type "B".

E. Chemical treatment piping shall be Type "C".

F. Refrigerant piping shall be Type "E".

3.3 OPTION: At the Contractor's option, subject to approval by the City of Key Colony Beach, the following type connections may be used for aboveground chilled water pipe in chiller plant equipment rooms and condensing water systems only, instead of the screwed/welded connections specified for Type "A" pipe and fittings.

A. Mechanical Pipe Couplings:

1. Mechanical pipe couplings may be used instead of unions or welded, flanged, or screwed pipe connections.
2. Couplings shall be self-centering and shall engage and lock in place grooved or shouldered pipe and pipe fitting ends in a positive watertight couple. Fittings shall provide some degree of angular pipe deflection, contraction and expansion.
3. Coupling housing clamps shall consist of 2 or more malleable iron castings complying with ASTM A47. Housing clamps shall hold in place a composition water-sealing gasket designed to allow internal water pressure increase the seal's water-tightness.
4. Coupling assembly shall be securely held together by 2 or more track-head, square or oval neck, steel bolts. Bolts and nuts shall be heat treated carbon steel and shall be according to ASTM Al83.
5. Pipe fittings connected to mechanical pipe couplings shall have grooved or shouldered ends and shall be fabricated of malleable iron casting according to ASTM A47 or ductile iron Grade 60-45-10 according to ASTM A536.
6. Before couplings are assembled, pipe ends, and outsides of gaskets shall be lightly coated with cup grease or graphite paste to ease installation.
7. Pipe grooving shall be according to pipe coupling manufacturer's specifications. Pipe sizes 3/4" through 24 inches may be cut-grooved or roll-grooved, except that pipe and tubing with wall thicknesses less than minimum recommended by manufacturer for cut-grooving shall be roll-grooved without removal of any metal.
8. Pipes, fittings and valves shall be provided with grooved or shouldered ends according to pipe coupling manufacturer's guidelines. Flanged or threaded end valves may be used with grooved adapters.
9. Couplings and fittings shall have a working pressure of 125 psig or 150 percent of system operating pressure, whichever is greater.
10. Entire coupling installation shall be according to manufacturer's guidelines.
11. Couplings shall be manufactured by Victaulic or approved equivalent.

3.4 PIPE JOINTS, FITTINGS, AND CONNECTIONS TO VALVES AND EQUIPMENT AND BENDS IN PIPING

A. 2 inches and smaller shall be made with screwed fittings and

B. 2-1/2" and larger shall be made with welded and flanged fittings.

3.5 REFRIGERANT PIPING

A. Install refrigerant piping to insure continuous automatic return of oil to compressors at system capacities. Oil traps shall be properly sized, located, and installed. Install piping according to standard engineering practice as recognized by ASHRAE.

B. Refrigerant piping shall be installed to allow removal of DX coil.

C. Underground refrigeration piping runs shall be minimized. Where required, piping shall be installed inside a polyethylene or PVC sleeve having a diameter suitable to house the piping, insulation thicknesses and provide an additional nominal 1 inch clearance, but in no case shall sleeve be less than 4 inches in diameter. Pipe sleeve shall have watertight joints and shall use a maximum of two (2) 45-degree bends for changes in direction. Sleeve ends shall be sealed using a compound compatible with copper to prevent water intrusion and piping damage from thermal movement

D. Refrigerant pipe shall be cut with an accepted type of pipe cutter and reamed before brazing. Pipe shall pitch sharply toward the reamer during reaming and cutting. Metal filings shall be carefully removed after reaming. Moisture and dirt shall be removed from piping before joining as follows:

1. A clean, lint-less cloth shall be drawn through the tubing by means of wire or an electrician's tape, to remove coarse particles of dirt and dust.
2. A clean, lint-less cloth saturated with trichloroethylene shall be pulled through pipe, until the saturated cloth is not discolored by dirt.
3. A clean, lint-less cloth saturated with compressor oil, squeezed dry, shall be drawn through the tubing. A visual inspection shall be made to see that tubing is perfectly clean.
4. Cleaning shall be completed by pulling through a clean, dry, lint-less cloth.

E. Joints shall be brazed with silver solder containing 49 percent silver and having a melting point of 1,120 degrees F or higher.

F. Pressure test lines before charging. When testing is complete, evacuate lines by the double evacuation method, breaking each vacuum with the system refrigerant to 5.16 mm of pressure absolute. Bring first vacuum break to 2 psig and final break to normal operating pressure. The compressor shall not be used to evacuate the system.

3.6 PIPING PENETRATIONS TO FLOORS AND FIRE WALLS:

A. Joints around pipe penetrations shall be packed with fire safing insulation and sealed with fire and smoke barrier caulk as specified in Section 07270 Firestopping and Fire and Smoke Barrier Caulking.

3.7 UNDERGROUND CHILLED AND HOT WATER PIPING:

A. Fittings shall be installed according to manufacturer's recommendations.

B. The services of a factory trained field service instructor shall be required during critical stages of installation and testing.

C. After thrust blocks are poured and cured, a hydrostatic test of 125 psig (1-1/2 times operating pressure) shall be required for 4 hours.

After hydrostatic test, a final backfill of selected earth shall be hand-placed and hand-tamped in 4-inch layers to 12 inches minimum over the top of the jacket. Remainder of the backfill shall be free of large boulders, rocks over 6 inches in diameter or foreign matter. The backfill operation can now be completed by any convenient means. Do not use tracked or wheeled vehicles for tamping.

END OF SECTION

15515 VALVES, HANGERS, AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15090 - Supports, Anchors, and Seals.
2. 15047 - Identification
3. 15410 - Piping (Plumbing).
4. 15510 - Piping (HVAC).
5. 15540 - Pumping Equipment (HVAC).
6. 15855 - Air Handling Units.
7. 15970 - HVAC Control System.
8. 15990 - Tests (HVAC).

1.2 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications: ASME Boiler and Pressure Vessel Code - Current edition.

1.3 SUBMITTALS

A. Submit the following:

1. Thermometers and Pressure Gages: Catalog cuts, proposed range, and calibrated accuracy.
2. Strainers: Catalog cuts, pressure drop curves.
3. Pressure Relief and Reducing Valves: Catalog cuts; pressure range, and settings.
4. Air Vents: Catalog cuts.
5. Flexible Connectors: Catalog cuts.
6. All Valves: Catalog cuts, schedule of proposed installation locations, pressure ratings, and materials of construction.
7. Inserts: Catalog cuts and load tables.
8. Supports: Catalog cuts or drawings.
9. Anchors: Drawings and details of installation.
10. Water Flow Tube Station: Catalog cuts, pressure drop charts, and engineering information.
11. Expansion Tank: Shop drawings, catalog cuts of accessories and shop drawings of tank support.
12. Shop Drawings of support equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Valves:

1. DeZurik.
2. Grinnell.

3. Homestead.
4. Hammond.
5. Kennedy
6. Mueller.
7. Milwaukee.
8. Nibco.
9. Stockham.

B. Expansion Tanks:

1. Taco.
2. Bell & Gossett.
3. Accepted equivalent.

2.2 VALVES.

A. General:

1. Gate and globe valves shall not be installed with the stem pointing downwards. Valves may be installed with the stem at or above a horizontal plane. Provide adequate clearance for stem rise.
2. Check valves may be installed either in the horizontal or vertical position. Non-spring-loaded check valves shall only be installed in the vertical position when the flow is upwards.
3. Butterfly valves may be installed with the stem in any position. Whenever possible the stem shall be installed as outlined for gate and globe valves.
4. Valves: Provide all valves with a 1-1/2" diameter brass tag having 1/2" high black filled numbers and 1/4" high letters, as manufactured by Seton or accepted equivalent.

    a. Service shall be identified by abbreviations such as: CHW (Chilled Water), CW (Condenser Water), HW (Hot Water), DW (Domestic Water), GAS, etc.
    b. Valve tag fasteners shall consist of No.6 brass beaded chain. The use of color-coded one-piece nylon ties is acceptable instead of beaded chain fasteners.
    c. Prepare schematic piping diagrams of systems controlled by valves with a schedule identifying all valves. Diagram and Valve Schedule shall be posted in the mechanical room where system depicted is located. All diagrams shall be printed on non-fading media and framed under a plastic laminate surface.

5. Provide ease of access to valve handwheel or lever to maintenance personnel.

    a. Valves installed above a ceiling shall have the stem placed 15 degrees above the horizontal position whenever possible.
    b. Provide colored thumbtack indexes at all ceiling tiles where valves are installed directly above.
    c. Index all colored thumbtacks in the as-built drawings.

6. Provide chain actuators for all valves in mechanical equipment rooms installed at a centerline height at or above 7 feet above the floor.

    a. Actuators shall consist of a cast iron sprocket rim attached to the valve, malleable iron chain guide, and chain of sufficient length to descend to a floor height of not more than 3'-6".

b. Valves larger than 12 inches and valves not suitable for chain actuators shall be provided with electrical actuators, motors, and switches.
c. Install switches where directed.

B. Gate Valves:

1. Up to 2": Class 150, bronze, union bonnet rising stem, inside screw, solid wedge disc, non-asbestos packing, soldered ends.
2. 2-1/2" and above: Class 125, outside screw and yoke, iron body, bronze trim, (IBBM), rising stem, solid bronze wedge disc up to size 3-1/2" and cast iron with bronze wedge face rings in larger sizes, non-asbestos packing, flanged ends.

C. Globe and Angle Valves:

1. Up to 2": Class 150, bronze, union bonnet rising stem, inside screw, integral seat, renewable Teflon discs, non-asbestos packing, soldered or threaded ends.
2. 2-1/2" & above: Class 125, bolted bonnet, outside screw, iron body, bronze trim, (IBBM), rising stem, renewable bronze seat ring and disc up to 3" or 4" size and iron disc with bronze disc face rings in larger sizes, non-asbestos body gasket, flanged ends.

D. Check Valves:

1. Up to 2": Class 125 or Class 200, bronze, screwed bonnet, Y pattern, renewable Teflon discs, soldered or threaded ends.
2. 2-1/2" & above: Class 125, silent, non-slam type spring loaded, iron body, bronze seat and plug, single disc, stainless steel spring, guided disc top and bottom, wafer or lug type.

E. Butterfly Valves:

1. 2-1/2" to 6": 200 psi WOG, cast iron body with extended neck for insulated piping, lugged, with lugs drilled and tapped according to ANSI B-16, silicon bronze or aluminum bronze disc, EPDM seat, and 416 stainless-steel stem.

    a. Valve shall comply with API-609 and MSS-SP-67.
    b. Provide valves with lever-lock operator having position lock and 10-degree balancing notches.
    c. Provide a memory stop capable of allowing valve closing and reopening to previously balanced position.

2. 8" and above: 200 psi WOG, sizes 2"-12" and 150 psi WOG for larger sizes. Cast iron body with extended neck for insulated piping, lugged, with lugs drilled and tapped according to ANSI B-16, silicon bronze or aluminum bronze disc, EPDM seat, and 416 stainless-steel stem. Valve shall comply with API-609 and MSS-SP-67. Provide valves with hand cranked heavy-duty weatherproof gear operator with indicator and adjustable stops at all locations.

F. Balancing Valves: Up to 2": 175 lb. WOG, non-lubricated, eccentric plug type, nickel seat, semi-steel body, neoprene or Teflon coated resilient plug, Buna filled Teflon U-ring seal or Buna (Vee) packing. Provide memory stop and lever handle.

G. Ball Valves:

1. Plumbing: Allowed for all plumbing systems.
2. HVAC: Allowed only for shut-off, not for balancing service. Provide 3-inch stem extensions for insulated line.
3. Porting: No reduced ports shall be acceptable in any ball valve.
4. Up to 2": Class 150, 400/600 psi WOG, full port, three-piece construction, blowout-proof stem, non-asbestos packing, bronze body, silicone bronze stem, bronze/ brass/chrome plated ball, Teflon resilient seat, and EPDM O-ring seal.

H. Hose Bibb (Wall Hydrant):
1. Quarter-turn wall hydrant with 3/4" hose connection. Full flow with integral vacuum breaker and removable “T” handle key.
2. Flush-type 304 stainless steel frame, cover, and housing, with cylinder locking hinged cover that opens 180°.
3. Provide isolation valve in branch.
4. Jay R. Smith Model #5509QT or other A/E approved equal.

2.3 Piping Accessories

A. Strainers:

1. Design Flow Rate: Clean strainer shall not exceed 2 psi at the design flow rate.
2. Drain Valve and Reducer: Furnish each strainer for use in equipment rooms and at each AHU with a drain valve and reducer to 3/4" hose thread, capped.
3. Up to 2": "Y" type, cast iron body with 20 mesh stainless steel screen, 250 lb. w.s.p. with blow-off outlet and plug, threaded ends. Mueller #11M, or accepted equivalent.
4. 2-1/2" to 4": "Y" type, cast iron flanged body, 125 lb. w.s.p. with blow-off tapping and plug and stainless-steel screen with 1/16” perforations, Mueller #758 or accepted equivalent.
5. 4" and above: "Basket" type, heavy gage perforated brass basket, 0.057" diameter perforations in sizes to 4 inches and 0.125" diameter perforations in sizes larger than 4 inches. Muessco #165 or accepted equivalent.

B. Flexible Connectors: All sizes - Full line size with floating flanges. Rated 150 psi at 180 degrees F., wire reinforced, double arched, and with control rods and rubber washers. Mason Industries or accepted equivalent.

C. Pressure Relief Valves: 3/4", Brass body, micro finished bevel for seats, cadmium plated springs, manual chilled lift ring, ASME Std. Bell and Gossett or accepted equivalent.

D. Pressure Reducing Valves: 3/4", Brass body and brass working parts with built-in strainer, 125 W.S.P. Bell and Gossett or accepted equivalent.

E. Air Vents:

1. Provide manual air vents at high points in chilled water systems.
2. Manual air vents shall be bronze needle or ball valves.

F. Thermometers:

1. Industrial, mercury filled, glass thermometers with 9-inch scale, "V" shape, and adjustable angle separable socket well.
2. Operating temperature shall display at midpoint of thermometer range.
3. Accuracy shall be $\pm$0.5 degrees F.

4. Casings shall be brass or aluminum.
5. Manufacturers: H.O. Trerice, Marshalltown, Ashcroft, or Taylor.

G. Thermometer Wells:

1. Brass construction with cap and chain.
2. Manufacturers: H.O. Trerice, Marshalltown, Ashcraft, or Taylor.
3. Provide extended neck wells in insulated piping.
4. Provide tees at lines 3 inches or smaller for thermometer wells.

H. Pressure Gages:

1. Standard depth, cast aluminum, black finished, chrome plated close type ring, clear glass window, bronze bourdon tube, precision movement and ±0.5 percent accuracy.
2. Gage shall have a minimum 4-1/2 inch diameter face and with the operating pressure displaying at the middle range of the scale. Bottom connection shall be at least 1/4" diameter.
3. Manufacturers: H.O. Trerice, Marshalltown, Ashcroft or Taylor.

I. Gage valves:

1. Brass, 1/4" needle valve type.
2. Manufacturers: H.O. Trerice, or accepted equivalent.

J. Dielectric Pipe Fittings:

1. Dielectric pipe fittings shall consist of insulators, insulating gasket, pipe connector and nut or flange as required.
2. Pipe connectors shall be suitable for soldered, screwed, or welded joints as required.
3. Dielectric unions shall be rated at 250 psi and cast-iron flange unions at 175 psi.
4. Dielectric fitting shall be plated according to Federal Specifications of 0.005".
5. Fittings shall be as manufactured by Epco.

K. Water Flow Sensors:

1. As manufactured by Annubar ANR-75, stainless steel.
2. Instrument connections shall be No.C-22.
3. 1/4" valves on 1-3/8" square head.
4. Valve rating shall be maximum 5,000 psi at 100 degrees F.
5. Flow sensor in steel pipe shall be weld nipple mounted.
6. Flow sensor in PVC pipe shall be saddle mounted.
7. Manufacturers: Dietrich Standard Corp or accepted equivalent.

L. In-line type air purger with tappings for an air vent and a makeup water line, as indicated, shall be Amtrol, 125 psi, flanged, cast iron.

M. Provide and install immersion wells and pressure taps as required for automatic control system.

N. Venturi Flow Meters:
1. Provide with quick disconnect valves, safety shut-off valves, and metal identification tags on chain giving pipe size, Venturi series, station identification, and meter reading at specified flow rate at locations where shown on Construction Documents.

2. Sizes:

    a. 2-1/2" Through 8 Inches: Plated cast iron with slip on flanges.
    b. 10 Inches and Above: Fabricated steel plate with welding ends.

3. Venturi Size: Same as pipe size
4. Manufacturers: Amity industries, Robertson or accepted equivalent.

2.4 EXPANSION TANKS

A. Size, capacity, and arrangement as shown on Construction Documents.

B. Designed, constructed and stamped according to ASME Code for 125 psig.

C. Welded black steel construction, rustproof coated, with base mount for vertical installation.

D. Provided with lifting ring and connection tappings.

E. Sealed in elastomer diaphragm suitable for 240 degrees.

F. Built-in air charger valve. Precharge tank to 20 psi.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers, supports, and supplementary steel as required for the different applications.

B. Support spacing shall be as required by the appropriate Tables found in the FBC – Mechanical, Plumbing and Gas.

C. Inserts, Hangers, Rods, and Clamps: Fee and Mason, or Michigan Hanger Co. Fig. numbers used refer to Grinnell.

1. Inserts: (Galvanized or stainless steel, except as noted.)

    a. Universal concrete insert, Fig.282.
    b. Wedge type concrete insert, Fig.281.
    c. Expansion case, Fig.117.

2. Clamps:

    a. UFS beam clamp with weldless eye nut, Fig.292, clamp size 1, rod size 3/4".
    b. C-clamp with retaining clip, Fig.87.
    c. I beam clamp, Fig.131.
    d. Universal side I beam clamp, Fig.225.
    e. C-clamp, copper finish, Fig.CT-88.

3. Hangers: Use adjustable clevis type hangers as specified. Hangers for insulated pipes shall have a diameter large enough to include insulation and a protection shield shall be installed with each hanger.

    a. Copper tubing: Fig.CT-65.
    b. Insulated steel pipe: Fig.300.

c. Uninsulated steel pipe: Fig.260.
d. Trapeze.

4. Rods: Continuous thread, Fig.146. Sizes shall be as specified.
5. Riser Clamps:

a. Black steel, Fig.261.
b. Plastic coated, Fig.261C.
c. Copper finish, Fig.CT121.

D. Diameter of Hanging Rods shall be as listed below:

Pipe Size	Rod Diameter
Up to 2"	3/8"
2-1/2" & 3"	1/2"
4" & 5"	5/8"
6"	3/4"
8" & 12"	7/8"
14" & 16"	1"

E. Insulation Protection Shield: Fig.167.

F. Access Panels: As specified in Division 8.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide shut-off valves at inlets and outlets of equipment and branch connections to mains and as shown on Construction Documents.

B. Final connections to apparatus, equipment, automatic control valves, and pressure reducing valves shall be made with flanges or unions between shut-off valve and connection.

C. Connections to cooling coils and refrigeration machines shall have flanges or unions next to equipment to allow tube removal without extensive dismantling of piping.

D. Strainers shall be full line size and shall be full size valved for servicing. Strainers shall be installed upstream of automatic control valves and other locations as shown on Construction Documents.

E. Pressure Relief Valves: Provide at cooling coil side of shut-off valves and where shown on Construction Documents.

F. Flexible Connectors: Provide between vibrating equipment and piping.

G. Location of Valves and Chain Operators:

1. Install valves to be accessible for operation and free from interferences when operated.
2. Position so leakage will not contact any electrical equipment located below.

3. Provide valve chain operators for valves 4 inches and larger if the valve handle is more than 6 feet above the operating equipment room floor level.

H. Thermometer Wells: Provide for thermometers and at the inlet and outlet of each cooling coil, next to sensing bulbs of controllers and remote temperature indicators, and as shown on Construction Documents.

I. Thermometers: Provide at the inlet and outlet of each air handling unit coil bank and as shown on Construction Documents.

J. Pressure Gages: Provide as shown on Construction Documents and at following locations:

1. At suction and discharge of circulating pumps.
2. At inlet and outlet of evaporator and condenser.
3. At makeup water inlet to expansion tanks and equipment.

K. Pipe Hangers and Supports:

1. Provide adjustable hangers, inserts, brackets, rolls, clamps, and supplementary steel as required for proper support of pipes.
2. Design hangers to allow for expansion and contraction of pipes and of adequate size to allow covering to run continuously through hangers.
3. Support piping independently of equipment.
4. Coordinate location of hangers with light fixtures.
5. Wire brush steel or iron supports and prepare surfaces under this section for painting.
6. Install plastic pipe loose to allow for contraction and expansion.
7. Hangers for PVC piping in storage tanks do not need rollers and hangers can be shop fabricated from stainless steel strap and anchor bolts.
8. Pipes supported by trapeze hangers and not mounted on pipe rollers shall be secured to the trapeze with pipe clamps or "U" bolts.
9. Hangers shall be placed at each change of direction, within 1 foot of valves and other appurtenances installed in horizontal piping and not more than 3 feet from end of each branch runout.
10. Special Supports: Provide clamps, hangers, and supports according to equipment manufacturer's recommendations.
11. Supports of wire, rope, wood, chain, strap, perforated bar, or any other makeshift devices are not allowed.
12. Where overhead construction does not allow fastening hanger rods in required locations, provide additional steel framing as required.
13. Refer to "Vibration Isolation" Section for supports requiring vibration isolators.
14. Maximum loading on inserts shall not exceed 75 percent of catalog rating.
15. Floor supports, wall brackets, and expansion tank supports as shown on Construction Documents or as required to support equipment. Submit shop drawings.
16. Buckling of piping due to inadequate provision for expansion shall be Contractor's responsibility. Piping shall be properly guided between expansion joints and anchor points.

L. Expansion Tanks:

1. Suspended from structure (horizontal type).
2. Connect to makeup water piping provided under plumbing work.
3. Pipe relief valve to nearest drain.

M. Water Flow Sensors: Install water flow tube stations according to manufacturer's published recommendations and as shown on Contract Documents.

N. Dielectric Fittings: Provide dielectric fittings between piping of dissimilar metals.

END OF SECTION

15670 AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Submit catalog cuts on unit showing fabrication details, capacity at scheduled conditions ratings and labels, and all information necessary to demonstrate compliance with requirements of construction documents.

B. Related Sections:

1. 15240 - Vibration Isolation.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.
4. 15855 - Air Handling Units.

1.2 SUBMITTALS

A. Submit properly identified product data before starting work.

B. Unit Schedule: Provide air cooled condensing units of type, size, efficiency rating, and capacity shown in unit schedule.

1.3 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any component and/or accessory that fails (except for items replaced under normal maintenance), for a period of two (2) years from the date of Substantial Completion of the project. In addition, condensing units shall have a minimum of 5-year parts warranty from the manufacturer from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Cooled Condensing Units:

1. Carrier.
2. Daikin.
3. Trane.
4. York.
5. Rheem.
6. American Standard.
7. Luxaire-Guardian.
8. Quantech.
9. TempMaster.

2.2 EQUIPMENTS

A. Air Cooled Condensing Units:

1. Compressor and Casing:

    a. Fully weatherproof unit, suitable for outdoor installation.
    b. Fabricate casing of galvanized or zinc-coated steel and finish with baked enamel.
    c. Fabricate structural members of continuous galvanized steel with steel channel.
    d. Provide openings for power and refrigerant connections and adequate removable panels for service access.
    e. Unit shall be welded hermetic type with internal vibration isolation and be covered with a shield to muffle operating sound.
    f. Compressors shall be scroll-type, having both thermal and current sensitive overload devices and internal high-pressure protection.

2. Condenser Fans:

    a. Direct drive, propeller-type fans arranged for vertical discharge.
    b. Resilient mount fans factory statically and dynamically balanced and provided with heavy gage safety guards.

3. Condenser Coils:

    a. Copper or Aluminum Plate Fins, mechanically bonded to copper or aluminum tubes.
    b. Adequately protect fins against hail damage.
    c. Fin Coating: Factory applied heresite or Bronze Glow epoxy coating.

4. Control Center and Accessories:

    a. Factory wired controls within a weatherproof cabinet.
    b. Provide 3-phase overload monitors.
    c. Accessories:

        1) Heating/cooling thermostat with sub-base suitable for continuous or automatic fan operation.
        2) Head pressure control to maintain proper condensing temperature at low ambient temperature.
        3) Low voltage control transformer.
        4) Indoor fan relay.

5. Capacity Control:

    a. Units up to 5 Tons: Provide a dual-stage scroll-type compressor.
    b. Units greater than 5 Tons: Provide multiple compressors, one being either a digital scroll-type compressor or a variable-speed scroll-type compressor. Evaporator coils shall be intertwined, split by rows and maintain a full energized face at all times. Coils split by face are not acceptable.

6. Provide low and high-pressure safety cutoff switches.
7. Provide pump down control when available from the manufacturer.
8. Provide five-minute time delay to prevent short cycling.

9. Refrigerants:

a. HCF 134a.
b. HFC 410A.

10. Efficiency Rating: Air cooled condensing unit shall comply with Energy Efficient Ratio (EER) per FPL Commercial/Industrial Energy Conservation Program Standards.
11. Provide a copy of the AHRI sheets showing minimum equipment efficiency compliance.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's recommendations, accepted Shop Drawings, and as indicated on Construction Documents.

B. Refrigerant circuit shall include a liquid line solenoid, sight glass and moisture indicator.

END OF SECTION

15770 ROOF MOUNTED SINGLE PACKAGED AIR-CONDITIONING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: One-piece factory-assembled, pre-charged, pre-wired, tested, and ready to operate roof mounted single packaged air-conditioning units. Complete with factory fabricated roof curb, discharge plenum, platform, and remote-control panel in size and performance requirements as indicated on Construction Documents.

B. Related Sections:

1. 15240 – Vibration Isolation.
2. 15890 - Ductwork.

1.2 SUBMITTALS

A. Shop drawings.
B. Submit wind load calculations and connection details for the air-conditioning unit(s), framework and supports, all signed and sealed by a Florida registered engineer, demonstrating compliance with FBC and American Society of Civil Engineers (ASCE) 7.

1.3 QUALITY ASSURANCE

A. Efficiency Rating: Comply with FPL Commercial/Industrial Energy Conservation Program Standards.

1.4 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any component and/or accessory that fails (except for items replaced under normal maintenance), for a period of two (2) years from the date of substantial completion of the project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roof Mounted Single Packaged Air-conditioning Units.

1. Trane.
2. Carrier.
3. Lennox.
4. Daikin.
5. Petra.

6. TempMaster.

2.2 EQUIPMENT

A. Unit Casing:

1. Cabinet: Single, enclosed, and weatherproof casing constructed of heavy gage zinc coated steel, bonderized. Unit casing shall be capable of withstanding a 500-hour salt spray test exposure as per ASTM B117.
2. Cooling Section: Fully insulated to prevent condensation and to attenuate sound. Section shall have a sloped condensate pan with a steel drain connection.
3. Provide opening for electrical power connections. Side panels and top cover shall be removable for service access.
4. Finish: Baked enamel.
5. Fiberglass is not allowed in contact with airstream. The entire air path of this unit shall be lined with closed cell elastomeric foam material of sufficient thickness to prevent condensation either inside or outside of unit cabinet. Double wall construction is acceptable In lieu of the lining specified.
6. Electrical point of connection for the unit shall be protected from the weather, electrical feed shall rise to the unit from the attic space below through a chase in the unit, which is external to and does not penetrate the unit floor pan to avoid leakage through accidental carry-over of condensate.

B. Fans:

1. Evaporator: Forward curved centrifugal, belt driven type. Fan bearings shall have a 200,000-hour operating life in accordance with ANSI B3.15.
2. Condenser: Propeller, direct driven type discharging up. Fan blades shall be corrosion resistant.

C. Coils:

1. Coils: Non-ferrous construction with mechanically bonded plate fins.
2. Evaporator and Condenser Tubes: Copper.
3. Condenser coils to be factory coated with Heresite, Bronze Glo, Adsil, or an alternate City of Key Colony Beach approved epoxy coating.
4. Provide hail guards for condenser coils.

D. Compressor: Welded hermetic type with internal vibration isolation, overload, reverse rotation and short cycling protection. Scroll or reciprocating type.

E. Plenums:

1. Discharge Plenums: Complete with services access door.
2. Suction Plenums: Intake hood for outside air with volume damper.

F. Filter: As indicated on drawings.

G. Accessories:

1. Controls: Factory wired and located in a readily accessible location.

    a. Overload Devices: Provide compressor and fan motor with both thermal and current sensitive devices.
    b. Capacity Control: Units up to 5 Tons refrigeration capacity shall be single compressor with 100%-0% capacity steps. Units 6 Tons capacity and above shall be provided with multiple compressors. Units 6 to 20 Tons capacity will be capable of 100% 75% 50% 25% and 0% capacity steps. Units 21 to 50 Tons capacity will be capable or operating at 100%, 87.5%, 76%, 67.5%, 50%, 37.5%, 25%, 0% capacity steps. Capacity reduction may be accomplished by shutting down compressors, unloading cylinders, varying speed, hot gas bypass, or a combination of the above. Evaporator coils shall be intertwined, split by rows and maintain a full energized face at all times. Coils split by face are not acceptable.
    c. Safeties shall include low and high-pressure cutouts. Provide pump down control where available from the manufacturer.
    d. Time Delay: Provide five-minute time delay to prevent compressor short cycling.
    e. Operation of the unit's outside air damper shall be interlocked with the evaporator fan.
    f. A moisture sensor in the condensate pan shall stop the unit's operation in case of backup in the condensate drainage line

2. Transformer: Factory installed 24V control circuit transformer.
3. Refrigerant circuit shall include a liquid line solenoid valve, sight glass and moisture indicator.

H. Refrigerants:

1. HCF 134a.
2. HCFC 410A.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Locate foundations, platforms, curbs, and hangers for the proper installation of equipment.

B. Coordinate locations of equipment foundations and anchor bolts with concrete work specified elsewhere.

C. Install units on vibration isolators, as indicated, according to Section 15240:

1. Mount factory assembled air handling units directly on stable bare steel spring isolators, except where units are furnished with internal structural frames and external lugs, both of suitable strength and rigidity. Additional structural frames are not required beneath units without any severe overhangs.
2. Motor: Integrally mount to unit on slide rails.
3. Mountings shall provide static deflection shown on drawings.
4. Vibration: After installation, adjust equipment to operate without noticeable vibration.
5. Belt Guards: Arrange to allow the use of tachometer, oiling, and testing with the guards in place.
6. Rigidly anchor unit to roof slab to withstand wind velocity pressures as determined by FBC – American Society of Civil Engineers (ASCE) 7.
7. Unit and roof curb shall be certified to meet the Monroe County High Velocity Zone criteria for large missile impact resistance, air and water infiltration and wind load resistance as required by FBC.
8. Fit equipment and accessories to the space provided. Install level and locate equipment and accessories to provide working clearance space under overhead equipment, and working space for servicing, replacing and adjusting drives and motors, lubricating, and gaining access to controls.

END OF SECTION

15835 UNIT HEATERS

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15047 - Identification.
2. 15240 - Vibration Isolation.
3. 15432 - Hot, Chilled and Condensing Water Piping (HVAC).
4. 15433 - HVAC Pumps.
5. 15510 - Piping (HVAC).
6. 15515 - Valves, Hangers, and Specialties.
7. 15540 - Pumping Equipment (HVAC).
8. 15555 - Horizontal Fire Tube Boilers.

1.2 SUBMITTALS

1.3 Submit properly identified manufacturer's catalog cuts and technical data before starting work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Unit Heaters:

1. Carrier.
2. McQuay.
3. Trane Co.

2.2 EQUIPMENT

A. Unit heaters shall be complete with baked enamel steel casings, headerless single serpentine coils with turbulators, louver fin diffuser, and motor.

1. Coils: Seamless copper tube with mechanically bonded (aluminum) (copper) fins tested at 300 psig with air under water.
2. Motors: Totally enclosed with Class B insulation, built-in overload protection, and permanent split capacitor.
3. Room Thermostat:

a. Control unit heater to operate on a drop in space temperature.
b. Thermostat shall not activate unit heater fan unless hot water aquastat senses hot water in the supply piping to unit heater.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install according to manufacturer's printed installation instructions, accepted shop drawings, and as indicated in Construction Documents.

END OF SECTION

15838 ELECTRICAL DUCT HEATER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes duct mounted electric resistance air coils.

B. Related Requirements:
   1. Section 15835 Unit Heaters
   2. Section 15890 Ductwork
   3. Section 15895 Duct Accessories

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
   2. Include rated capacities, operating characteristics, and pressure drops for each air coil.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Ductwork plans, drawn to scale, on which coil location and duct-mounted access panels are shown and coordinated with each other.

B. Field quality-control reports.

PART 2 PRODUCTS

2.1 DESCRIPTION

A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. COILS

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Brasch Manufacturing Co., Inc.
      b. Chromalox.

c. INDEECO.
d. Warren
e. Approved Equivalent.

2. Testing Agency Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Coil Assembly: Comply with UL 1995.
4. Heating Elements: Open-coil resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, and fastened to supporting brackets.
5. High-Temperature Coil Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box without removing heater from duct or casing.
6. Secondary Protection: Load-carrying, manually reset or manually replaceable, thermal cutouts; factory wired in series with each heater stage.
7. Frames: Galvanized-steel channel frame, minimum 0.064 inch thick for **[slip-in] [flanged]** mounting.
8. Control Panel: [Unit] [Remote] mounted with disconnecting means and overcurrent protection. Include the following controls:

   a. Magnetic contactor.
   b. Mercury contactor.
   c. Toggle switches; one per step.
   d. Step controller.
   e. Time-delay relay.
   f. Pilot lights; one per step.
   g. Airflow proving switch.

9. See Section 13810, Energy Management System, for method of control.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coils level and plumb.

1. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible", and “Ducted Electric Heat Guide”.
2. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.3 CONNECTIONS

A. Connect wiring according to Division 16.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, operate electric coils to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Prepare test and inspection reports.

END OF SECTION

15855 AIR HANDLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes Factory Packaged, Modular units, providing cooling and heating for air distribution systems.

B. Related Sections:

1. 15240 - Vibration Isolation.
2. 15885 - Air Filtration Equipment.
3. 15890 - Ductwork.

1.2 REFERENCES

A. Air Moving and Conditioning Association (AMCA): Standard 611 Fan Performance Testing.

B. American National Standards Institute (ANSI): ANSI 9 Roller Bearings, Load Rating, and Fatigue Life.

C. National Fire Protection Association (NFPA): NFPA 90A Air- conditioning and Ventilating Systems.

D. Air-conditioning and Refrigeration Institute: Standard 410 Air Cooling and Heating Coils.

E. Florida Building Code (FBC) - Mechanical.

F. Florida Building Code (FBC) - Energy Conservation.

1.3 SUBMITTALS:

A. Shop Drawings, list of materials, cooling coil performance data, fan performance data, and fan curves. Performance data shall be certified by unit manufacturer.

1.4 QUALITY ASSURANCE

A. Cooling coils shall meet ARI standard 410.l

B. Air handlers shall be ARI 430 certified.

1.5 WARRANTY

A. Provide all labor, materials and equipment necessary to repair and/or replace any air handling unit components and/or accessories that fail (except for items replaced under normal maintenance, such as belts), for a period of two (2) years from the date of substantial completion of the project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Handling Equipment:

1. Carrier.
2. Enviro-Tec.
3. Daikin.
4. Trane.
5. Temptrol.
6. York.
7. Krueger.

B. Reheat Coils:

1. Heat Pipe Technology, Inc., Gainesville, FL.
2. Accepted equivalent by unit manufacturer.

2.2 FACTORY FABRICATED MODULAR AIR HANDLING UNIT

A. Unit shall be of arrangement and type shown on Construction Documents with design capacities as scheduled. Design units for floor mounting. Central station air handler and components shall be ARI certified and complete with base frame fans, coils, motors, drives, belt guards where required, drains, filter sections, access doors and accessories as specified.

B. Casing:

1. Exterior casing walls shall be fabricated of minimum 0.08" aluminum, continuous hot dipped galvanized steel, or black steel phosphatized and coated with baked enamel finish not lighter than 18 gage. Removable panels shall provide access to the interior of the unit.
2. Interior walls shall be fabricated so that solid metal, aluminum, minimum 0.063", or other approved metal, separates the airstream from fiberglass, ductliners, and internal insulation. Casing panels shall have a minimum R value of 13.
3. The removal of access panels or doors shall not affect the structural integrity of the unit.
4. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 BTU Hr *FT2* °F.
5. All doors downstream of the cooling coil shall be provided with a thermal break construction of door panel and door frame.
6. Gasketing shall be provided around the full perimeter of the doors to prevent leakage.
7. Handle hardware shall be designed to prevent unintended closure.
8. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

C. Fan Section:

1. Fan section shall encase 1 double-inlet, double-width forward curved or backward inclined fan suitable for static pressures and air quantities indicated.

a. Fan wheel shall be dynamically and statically balanced at factory.

b. Maximum fan rpm shall be 25 percent less than the first critical speed. Fan wheel diameter shall be as indicated.
c. Fan outlet velocity shall not exceed 2500 RPM.

2. Fan shaft shall be solid or hollow, ground and polished steel, and coated with rust inhibitor.

a. V-belt driven fan shall have variable-pitch motor sheaves and drives shall be designed for 50% overload capacity.
b. Drives shall be selected for the mean rpm of the drive to match the fan operating rpm at design fan rpm.

3. Fan bearings shall be grease lubricated, ball bearings, self-aligning type. Bearings shall be designed for an average life of 200,000 hours. Provide extended lubrication lines with external grease fittings.

D. Coil Section:

1. Coil section shall encase cooling coils and drain pan.

a. Arrange coils for horizontal airflow.
b. Provide a minimum of 6 rows for chilled water service.
c. Provide intermediate drain pans for multiple coil installations.
d. Coil headers shall be completely enclosed within the insulated casing with only connections extended through the cabinet.

2. Drain pan shall be one of the following:

a. Stainless steel, double pan construction with the inner pan covered with a heavy coat of mastic, and thermally isolated from the exterior casing with 1-inch-thick fiberglass insulation.
b. Welded heavy gage stainless steel, thermally isolated from the exterior casing with insulation of 1-1/2-inch-thick polystyrene or non-moving air space with the equivalent R value.
c. Drain connections shall be of the same material as the drain pan and shall extend a minimum of 2-1/2” beyond the unit base.
d. Drain pan threaded connections shall be visible, external to the unit floor are not acceptable.

3. Tubing for coils shall be copper 1/2" to 5/8" outside diameter.

a. Fins shall be (aluminum) (copper) mechanically bonded by tubing expansion with a maximum spacing of 10 fins per inch unless noted otherwise.
b. Coils shall have supply and return connections on the same end.

4. Refrigerant coils shall have venturi type refrigerant distributor arranged for down feed.

a. Proof test coils at 450 psig and leak tested at 300 psig air pressure under water, cleaned, dehydrated and sealed with a dry nitrogen charge.
b. Coils shall be suitable for a working pressure of up to 300 psig.

c. Units with both a DX refrigerant and chilled water coils shall have a separate section for each.

5. Chilled water coils:

    a. Provide a minimum of 6 rows.
    b. Coils shall be tested by subjecting each coil to a minimum air pressure of 350 psig with the coil submerged in water.

E. Filters:

1. As specified under Section 15885 - Air Filtration Equipment.

2.3 PENTHOUSE AIR HANDLERS AND OUTSIDE AIR HANDLING UNITS

A. Units shall be of arrangement and type shown on Construction Documents with design capacities as scheduled. Units and components shall be ARI certified and complete with fans, coils, motors, drains, filter sections, and accessories as specified.

B. Casing:

1. Design casing for indoor or outdoor installation as required and leak tight against 2-inch negative static pressure.
2. Casing walls shall be fabricated of minimum 0.08" aluminum or continuous hot dipped galvanized steel, or black steel phosphatized and coated with baked enamel finish not lighter than 18 gage. Removable panels shall provide access to the interior of the unit. Casing shall be bolted or welded to a galvanized steel base channel designed for curb mounting.
3. Interior walls shall be fabricated so that solid metal, aluminum (min 0.063") or other approved metal, separates the airstream from fiberglass, ductliners, and internal insulation. Casing panels shall have a minimum R value of 13.
4. Seams shall be welded or bolted and sealed to prevent leaks.
5. If outdoor installation, cover external vertical seams with a "U" clip, welded in place, for additional weather protection.
6. If outdoor installation, aluminum and galvanized steel unit roofs shall be flanged on all four edges, pitched for drainage, and to overlap all 4 sides of units.
7. Roof shall be gasketed and secured to side panel flanges with stainless steel or self-tapping zinc coated screws.
8. Door sizes shall allow access to fan motor, coil, and inlet section.

C. Fan Section:

1. Multi-blade, forward curved or backward inclined fans shall be double width, double inlet.
2. Fans shall be statically and dynamically balanced as an assembly with motor.
3. Fan housings shall be constructed of die-formed, streamlined inlets and side sheets.
4. Fan bearings shall be grease lubricated ball bearings.
5. Flexible boots shall be installed between the fans and unit casings.
6. Fans and motor assemblies shall be isolated from unit casings. Isolators shall be of spring type.

D. Coil Section:

1. Coils shall have galvanized steel casings and be mounted in the coil casing with the same end connections accessible for service for coil removal from the unit through the roof or through the piping enclosure.
2. Tubing:

    a. Coils shall be copper 1/2" to 5/8" outside diameter.
    b. Fins shall be (aluminum) (copper) mechanically bonded by tubing expansion with a maximum spacing of 10 fins per inch unless noted otherwise.
    c. Coils shall have supply and return connections on the same end.

3. Refrigerant Coils:

    a. Provide with venturi type refrigerant distributor arranged for down feed.
    b. Coils shall be proof tested at 450 psig and leak tested at 300 psig air pressure under water.
    c. Clean, dehydrate, and seal with a dry nitrogen charge.
    d. Coils shall be suitable for a working pressure of up to 300 psig.

4. Chilled Water Coils:

    a. Provide a minimum of 6 rows.
    b. Coils shall be tested by subjecting each coil to a minimum air pressure of 350 psig with the coil submerged in water.

E. Dampers:

1. Return air, fresh air shall be aluminum parallel blade type and rotated on rustproof nylon bushings encased in a non-ferrous housing.
2. Damper motor mounting brackets shall be provided inside the unit casing for center driving of the damper sets.

F. Filters: As specified under Section 15885 - Air Filtration Equipment.

G. Penthouse air handlers shall have maximum dimensions as indicated.

H. Penthouse air handlers shall have roof curbs as indicated.

2.4 REHEAT COILS

A. Coordinate reheat coil installation with air handler manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Equipment shall be installed according to manufacturer's recommendation.

B. Casing seams shall be airtight.

C. Condensate drains shall prevent any accumulation of condensate inside air handlers. P-trap on condensate drain on unit shall have a vertical leg equal to the maximum static pressure of the air handler.

D. Seal coils at perimeter to prevent air bypass. Coils shall be installed to be completely drainable through header drains.

E. Rigidly anchor units to roof slab to withstand wind velocities pressures as determined by FBC - American Society of Civil Engineers (ASCE) 7.

F. Comply with calculations, signed and sealed by a Florida registered professional engineer, establishing wind velocity pressure values for the specific project according to FBC - ASCE 7.

END OF SECTION

15861 AIR MOVING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15240 - Vibration Isolation.
2. 15885 - Air Filtration Equipment.
3. 15890 - Ductwork.

1.2 REFERENCES

A. Air Moving and Conditioning Association (AMCA), Fan Construction and Testing Standards.

1.3 SUBMITTALS

A. Fans: Shop drawings, catalog cuts, and certified performance curves.

B. Inlet Vanes: Shop drawings, catalog cuts.

1.4 QUALITY ASSURANCE

A. Fans shall be constructed and rated according to AMCA standards.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fans:

1. ACME.
2. Greenheck.
3. Twin City.
4. Loren Cook.
5. Strobic Air.
6. Penn Ventilator.
7. Trane.

2.2 EQUIPMENT

A. Unless otherwise noted, fans shall meet the following characteristics:

1. Centrifugal type or axial, as scheduled.
2. Fan wheels shall be statically and dynamically balanced at the factory.
3. Fan brake horsepower ratings shall not exceed those scheduled.
4. Belt drives for fans shall be matched multiple V-belts rated for at least l.3 times motor horsepower.
5. Meter pulleys shall be cast iron adjustable pitch type.

6. Fan blades and housing of proper design, sufficient strength and rigidity to operate under installed conditions without objectionable noise and vibrations.
7. Surfaces provided with approved corrosion resistant coatings.
8. Provide drives to deliver design capacity at actual static pressures developed.

B. Propeller Fans:

1. Heavy-duty industrial type and designed for wall mounting.
2. Fans may be direct, or belt driven by an open drip-proof electric motor.
3. Direct driven fans shall have fan wheel mounted on extension of motor shaft.

    a. Mount motor in rigid streamlined frame designed to provide vibration isolation for motor and with concealed wiring run to motor.
    b. Mount fan on a steel frame and shall have aluminum or steel blades with heavy hubs.
    c. Bearings shall be of permanently lubricated type.
    d. Motor speed shall not exceed 1800 rpm.
    e. Provide fan with a heavy gauge wire personnel guard easily removable for servicing fan.

4. If standard mounting is not large enough to fit the opening provided, fabricate auxiliary mounting plates to not impair air flow to wheel at the opening provided.
5. Plates shall be made of zinc-coated steel.
6. Inline Centrifugal Fans:

    a. Fans shall be aluminum construction, centrifugal, with belt or direct drives.
    b. Fan wheels shall have aluminum airfoil blades, backwardly inclined non-overloading.
    c. Motors on belt driven units shall be supported on exterior of fan casing with bearings encased within fan tube.
    d. Support fan with vibration isolators.
    e. Extend bearing lubrication lines outside of casing.
    f. Provide variable inlet vanes as indicated.

C. Centrifugal Utility Vent Set:

1. Fan housing and scroll shall be steel with baked-on enamel finish inside and out.
2. Fan wheel shall be steel with forward curved blades.
3. Support fan shaft by resiliently mounted prelubricated ball bearings.
4. Fan motors shall be open drip-proof type with belt drives and adjustable pulleys.

D. Ceiling Mounted Cabinet Fans:

1. Fans shall have a centrifugal wheel enclosed in an acoustically insulated housing.
2. Units shall have integral back draft damper, disconnecting means and an inlet grille.
3. Motor shall be resiliently supported and shall be completely removable through the face of the unit.
4. Discharge position shall be changeable through use of interchangeable casing panels.

E. Power Roof Exhauster:

1. Fans shall be standard outlet or up blast as scheduled, centrifugal type with backward inclined non-overloading wheels, and belt driven by an electric motor.
2. Fan shall have weatherproofed, low profile aluminum housing suitable for curb mounting.
3. Fan shall have motor space accessible from outside and local disconnect switch.
4. Motor and fan shall be resiliently mounted.
5. Each fan shall be provided with aluminum or galvanized steel bird screen, disconnect switch, and multi-blade backdraft damper as indicated.
6. Belt drives shall be provided with not less than double belt pulleys and 2 belts.
7. Upblast fans shall be provided with a non-corrosive epoxy coating.

F. Kitchen Hood Exhaust Fan: Upblast, centrifugal, backward inclined blades, roof mounted, exhaust ventilator. UL 705 and AMCA 211 and 311 listed and labeled NFPA 96 with 16 Gauge spun marine alloy aluminum dome and wind band. Provide integral conduit chase into motor compartment to facilitate wiring connections. Provide Access to motor/drive compartment through a cap attached with quick release stainless steel latches. Motor shall be design B and class B insulation rated for continuous duty. Bearings shall be heavy duty re-greaseable ball bearings, minimum L50 life, in excess of 200,000 hours at maximum catalogued operating speed. Size drive for 150% of installed motor horsepower; factory set variable pitch motor drive to the scheduled RPM. Refer to Section 15371 - Kitchen Hood and Duct Fire Suppression System, for proper exhaust fan requirements.

G. Laboratory Fume Hood Fans: Fans shall be roof mounted, induced flow, vertical jet plume discharge, complete with curb, curb cap/plenum base, isolation and by-pass dampers, actuators, vibration isolators, motors and seal flanges. Fan type shall be mixed air flow, centrifugal in-line, centrifugal airfoil or centrifugal backward inclined, as scheduled on drawings. Fan shall have a minimum 75% peak efficiency performance. Fan shall be complete with motor and drive outside air stream, fan discharge nozzle and wind band. Fan shall meet and be tested to the Standards of ANSI/AIHA Z9.5, ASHRAE 110, NFPA 45, and shall bear the AMCA 260 certified rating seal and the UL 705 seal. Refer to Section 15891 - Fume Hoods, for proper hood requirements.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Provide roof or masonry openings required for proper fan installation.

B. Refer to Section 15240 - Vibration Isolation for proper isolator requirements.

C. Install fans according to manufacturer's recommendations and as shown on Construction Documents.

END OF SECTION

15870 VARIABLE AIR VOLUME TERMINALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bypass, single-duct air terminal units.
2. Shutoff, single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" .

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 BYPASS, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carnes.
2. Carrier Corporation.
3. Titus.
4. Trane.

B. Configuration: Diverting-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch steel, single wall.
1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric closed cell foam insulation complying with UL 181 erosion requirements and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlet: Round stub connection for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Diverter Assembly: Galvanized-steel gate, with polyethylene linear bearings Aluminum blade, with nylon-fitted pivot points.

E. Multioutlet Attenuator Section: With 6-inch, 8-inch, and 10-inch diameter collars, with locking butterfly balancing damper.

F. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Access door interlocked disconnect switch.
2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
3. Nickel chrome 80/20 heating elements.
4. Airflow switch for proof of airflow.
5. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
6. Mercury contactors.
7. Pneumatic-electric switches and relays.
8. Magnetic contactor for each step of control (for three-phase coils).

G. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, powered open with microswitch to energize heating control circuit.
2. Thermostat: Duct-mounted electric type with temperature display in Fahrenheit , and space temperature set point.

3. Changeover Thermostat: Duct-mounted, field-adjustable, electric type reverses action of zone thermostat when air temperature reaches 70 deg F .

H. Electronic Controls: Bidirectional damper operator and microprocessor-based thermostat. Control devices shall be compatible with temperature controls specified in Section 15900 “Control and Instrumentation for HVAC” and shall have the following features:

1. Damper Actuator: 24 V, powered closed, powered open.
2. Thermostat: Wall-mounted electronic type with the following features:

a. Temperature set-point display in Fahrenheit and Celsius.
b. Auxiliary switch to energize heating control circuit.
c. Changeover thermistor to reverse action.

2.4 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:

1. Anemostat Products; a Mestek Company.
2. Carnes.
3. Environmental Technologies, Inc.
4. Krueger.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Phoenix Controls Corporation.
8. Price Industries.
9. Titus.
10. Trane; a business of American Standard Companies.
11. Tuttle & Bailey.
12. Warren Technology.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch, single wall.

1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and City of Key Colony Beach Design Criteria.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140 deg F , shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.

2. Damper Position: Normally [**open**] [**closed**].

F. Attenuator Section: 0.034-inch (0.85-mm) steel sheet.

1. Lining: Adhesive attached, 1-inch- thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and City of Key Colony Beach Design Criteria.

G. Multioutlet Attenuator Section: With 6-inch- (150-mm-) 8-inch- (200-mm-) 10-inch- (250-mm-) diameter collars, each with locking butterfly balancing damper.

H. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Access door interlocked disconnect switch.
2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
3. Nickel chrome 80/20 heating elements.
4. Airflow switch for proof of airflow.
5. Fan interlock contacts.
6. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
7. Mercury contactors.
8. Pneumatic-electric switches and relays.
9. Magnetic contactor for each step of control (for three-phase coils).

I. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, spring return open .
2. Thermostat: Duct-mounted electronic type with clock display, temperature display in Fahrenheit, and space temperature set point.

J. Direct Digital Controls: Single-package unitary controller and actuator specified in Section 15900 "Control and Instrumentation for HVAC" Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Section 15900 “Control and Instrumentation for HVAC” and shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

a. Occupied and unoccupied operating mode.

b. Remote reset of airflow or temperature set points.
c. Adjusting and monitoring with portable terminal.
d. Communication with temperature-control system specified in Section 15900 "Control and Instrumentation for HVAC" Room Sensor: Duct mounted with temperature set-point adjustment and access for connection of portable operator terminal.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: [**Galvanized steel complying with ASTM A 603**] [**Stainless steel complying with ASTM A 492**].

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Controlling thermostat shall be mounted on wall or temperature sensor behind return air grilled as shown on Plans.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Connect ducts to air terminal units according to City of Key Colony Beach Specifications Section 15890 – Ductwork.

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 15047 "Identification " for equipment labels.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Air terminal unit will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train City of Key Colony Beach's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

15885 AIR FILTRATION EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15770 - Roof Mounted Single Packaged Air-Conditioning Units
2. 15836 - Unit Ventilators
3. 15850 - Air Handling Units
4. 15855 - Air Handling Units (indoor).
5. 15991 - Testing and Balancing

1.2 SUBMITTALS

A. Air filter catalog data and sample.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from damage and dirt during storage and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Filters:

1. American Air Filter Co.
2. Bioclimatic.
3. Circul-Aire.
4. Scott.
5. Purafil Clean Air Systems.
6. Camfill Carr.

2.2 EQUIPMENT

A. Air Handling Unit Filters:

1. Temporary Construction Filters:

a. Provide 2 sets of temporary 2-inch-thick fiberglass throwaway type filters for use during construction and start up. Construction filters shall be minimum MERV 6.
b. Construction filters shall be provided for all filter applications and air handing units shall not be operated at any time without filters.

2. Permanent Filters:

a. Unless otherwise indicated on the Contract Documents, provide disposable 2-inch multi-ply paperboard or synthetic fiber type filters with minimum ASHRAE 52.2 rating of MERV 13.
b. For existing HVAC equipment, provide filters with minimum efficiency of MERV 13, or highest MERV rating possible in accordance with manufacturer's recommendation.
c. Auditoriums: Provide minimum filtration efficiency, MERV 14.in accordance with ASHRAE.
d. Full-Service Clinics: Provide minimum filtration efficiency, MERV 14. In accordance with ASHRAE.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment and materials according to manufacturer's recommendations. Maintain proper access around equipment access doors for filter maintenance removal.

B. Execute work in a neat and professional manner.

C. Use construction filters during initial start-up periods to blow systems clean of construction dust without clogging coils.

D. Install the permanent type filters after cleanup period and before final test and balance of air systems. Do not use for temporary filters.

END OF SECTION

15887 AIR PURIFICATION SYSTEM (BI-POLAR IONIZATION)

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.

B. Only needle point Bi-Polar Ionization (BPI) devices are approved for the City of Key Colony Beach. The use of Ionization tubes is not allowed.

1.2 RELATED SECTIONS

A. Coordinate the work with the following Sections:

1. 13810 - Energy Management System (EMS)
2. 15510 - Piping (HVCA)
3. 15670 - Air Cooled Condensing Units
4. 15850 - Dedicated Outdoor Air Units
5. 15855 - Air Handling Units
6. 15885 - Air Filtration System
7. 15890 - Ductwork
8. 15900 - Controls and Instrumentation
9. 15910 - Duct Accessories
10. 15990 - Test (HVAC)
11. 15991 - Testing and Balancing
12. 15992 - Commissioning of HVAC
13. 16112 - Raceways and Conduits
14. 16120 - Wire and Cable

1.3 REFERENCED CODES & STANDARDS

A. Latest edition of the following Codes or Standards:

1. Florida Building Code (FBC)
2. ASHRAE Standards 62 & 52.
3. National Electric Code NFPA 70.
4. UL 867 including ozone chamber test requirements.
5. The ionization equipment and power supply shall be listed by UL or other Nationally Recognized Testing Laboratory (NRTL).
6. National Environmental Laboratory Accreditation Conference (NELAC)

1.4 QUALITY ASSURANCE

A. The Air Purification System shall be a product of an established manufacturer within the USA and shall be made of 100% USA sourced raw materials and components.

B. A qualified representative from the manufacturer shall be available to inspect the installation of the Air Purification System to ensure installation in accordance with manufacturer's recommendation.

C. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters are not acceptable. Uni-polar ion generators and “Plasma” particulate filters are also not acceptable.

D. Projects designed using ASHRAE Standard 62, Indoor Air Quality (IAQ) Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1, to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted. The manufacturer shall provide independent test data on previous installations of similar application, performed within the past two years, that proves compliance with ASHRAE 62 and the accuracy of the calculations.

E. The Air Purification Technology shall have been tested by UL or other NRTL to prove conformance with UL 867 – Standards for Electrostatic Air Cleaners requirements, including the ozone chamber testing and peak ozone test for electronic devices. Manufacturer shall submit independent UL 867 test data with ozone results to the A/E during the submittal process for their review and approval.

F. The maximum allowable ozone concentration per UL 867 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867 peak test as measured 2 inches away from the electronic air cleaner’s output shall be no more than 0.0042 PPM.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for ion generators including:

1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
2. Data sheet for each type of plasma generator, plasma detector and accessory furnished, indicating construction, sizes, and mounting details.
3. Performance data for each type of plasma device furnished.
4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled, for projects designed with outside air reduction.
5. Product drawings detailing all physical, electrical and control requirements.
6. Copy of UL 867 independent ozone test.

B. Operating & Maintenance Data: Submit three (3) copies of O&M data and recommended spare parts lists.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturers’ recommendation for storage.

1.7 WARRANTY

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of 3 years from date of Substantial completion. The labor to

replace equipment under warranty shall be provided by the installing contractor at no additional cost to the City of Key Colony Beach.

PART 2 PRODUCTS

2.1 GENERAL

A. The Air Purification System shall be of the size, type, arrangement and capacity indicated on the Plans and required by the HVAC units furnished for the project.

B. Approved Manufacturers:

1. Global Plasma Solutions.
2. Phenomenal Aire.
3. Plasma Air.

C. All other manufacturers of comparable products requesting prior approval shall:

1. Submit to A/E for prior approval four weeks in advance, documentation indicating compliance with all requirements stated in this document.
2. Submittal shall include their ASHRAE 62.1-2007 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval and stating their calculations are ASHRAE compliant. A third-party validation study performed on a previous installation of the same application shall also be included.
3. Submit independent test data from ETL or UL showing conformance with the latest edition of UL 867, with respect to ozone generation.
4. All manufactures requesting prior approval shall provide to A/E independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in this document. Products tested only on Petri dishes to prove kill rates shall not be acceptable. Products being sold under different trade names than those tested shall not be acceptable.
5. Submit at least two other end user references in the same application with contact phone number, email, equipment used and application for the equipment at that facility. Manufacturers not having the above references in similar applications using the same equipment models as proposed on the current project shall not be acceptable

2.2 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the Plans, details, equipment schedules and/or specifications shall contain a plasma generator with bi-polar ionization output and power supply as described in this document.

B. The Bi-polar Ionization system shall be capable of:

1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
3. Capable of reducing static space charges.
4. Effectively reducing space particle counts.

5. Increasing the interior ion levels, both positive and negative, to a minimum of 1,000 ions/cm³ as measured near the diffuser(s) at each space.
6. When mounted to the air entering side of a cooling coil, keep the cooling coil free from pathogen and mold growth.
7. All manufacturers shall provide documentation by an independent NELAC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

    a. MRSA: >95% in 30 minutes or less
    b. E.coli: > 95% in 15 minutes or less
    c. TB: > 69% in 60 minutes or less
    d. H1N1: >85% in 60 minutes or less
    e. Aspergillus: > 75% in 60 minutes or less
    f. C. difficile: >86% in 30 minutes or less
    g. Noro Virus: >93% in 30 minutes or less
    h. Legionella: > 99% in 30 minutes or less.

8. Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELAC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in this document. Products tested only on Petri dishes to prove kill rates shall not be acceptable. Products being sold under different trade names than those tested shall not be acceptable.

C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable

1. Air exchange rates may vary through the full operating range of a constant Volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Plasma generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration, or dangerous conditions within the air purification system. Air purification system shall be able to withstand wash down duty.

E. Plasma (Ion) Generator:

1. Provide and install ionization devices of the type and sized to the air handling equipment capacity indicated on the Plans and/or HVAC equipment schedules.
2. Each Ion generator shall be constructed with aluminum or potted ABS casing with flanges and mounting holes, integral grounding connection and high voltage quick connector.
3. Electrodes shall be constructed from 316 medical grade stainless steel, carbon fiber or other durable non-corrosive, non-oxidizing materials.
4. Each ionization device shall contain a built-in power supply and operate on 12V DC or 24V AC. Ionization devices requiring loose transformers or power supply shall not be accepted.
5. An electrical circuit shall be provided for each ion generator power supply panel.
6. Ionization device electrodes shall energize when the main unit disconnect is turned on and the fan of the unit that it serves is operating.

7. The mechanical contractor shall mount each ionization device and wire to the remote mount power supply using cables provided by the air purification device manufacturer.
8. Ion generators shall be field installed in a location that is convenient for visual inspection, removal, and servicing. They shall have an on/off switch, ionizer indicator LED, and a set of dry contacts which will indicate ionizer functionality.
9. The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Systems that produce imbalanced ion levels shall not be accepted.
10. Ionization output from each electrode shall be a minimum of 20 million ions/cc when tested at 2" from the ionization generator.
11. The entire cooling coil width shall have equal distribution of ionization across the face.
12. Bi-polar ionization tubes manufactured with glass are not allowed.
13. Manufacturer shall demonstrate that no voltage potential exists due to exposed electrical components in the duct system or plenum. Exposed needles protruding into the air steam will not be accepted.

F. Electrical Requirements:

1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
2. The electrical power wiring to the ionization units shall be detached without the use of tools to facilitate servicing of the equipment. Quick release system shall utilize a screw down coupler.

G. Control Requirements:

1. All plasma generators shall have internal short circuit protection, overload protection, and automatic fault reset.
2. All plasma generators shall include an external BAS interface to indicate ion generator status and alarm.
3. The ionization system shall be provided with a stand-alone, independent ion sensor designed for duct mounting to monitor the ion output and report to the Building Automated System (BAS) that the ion device is working properly. Ion systems provided without an independent ion sensor, shall not be permitted. The control voltage to power the ion sensor shall be 12VDC, 24VDC or 24VAC and draw no more than 150mA of current. The sensor shall provide at minimum, dry contact status to the BAS and optionally a BacNet interface as specified on the control drawings.
4. The contractor shall mount and wire the Plasma generator device and the ion sensor within the air handling units shown on the Plans. The contractor shall follow all manufacturer Installation, Operation, and Maintenance (IOM) instructions during installation.

2.3 PLASMA DETECTOR DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the Plans, details, equipment schedules and/or specifications shall contain a plasma detector with integral contacts to connect to the BAS.

B. The plasma detector sensor shall be designed to these minimum standards:

1. Ability to detect both positive and negative ion levels from 1,000 ions/cc to 20 million ions/cc minimum. Detection limit shall be field adjustable based on sensor mounting location and the type of plasma generator being installed.
2. Plasma detector shall have integral dry alarm contacts for connection to the BAS to prove the ion system is operating properly and the ion system output is above the minimum preset threshold from the sensor manufacturer. The alarm shall activate when either positive or negative ion output drops below the preset setpoint. Cold plasma systems only providing indication the input power is applied or output power is present shall not be acceptable. The independent cold plasma detector shall be capable of working with any air purification manufacturer's system.
3. Cold plasma detector shall have an input voltage of 12VDC, 24VDC or 24VAC user selectable.
4. Cold plasma detector shall be capable of duct mounting or integral air stream mounting.
5. Housing shall be constructed of die-cast aluminum or other durable ABS fire-retardant material.
6. Temperature and humidity shall have no affect on the cold plasma detector output accuracy.
7. The alarm output shall be provided with NO, NC and C terminals for ease of integration to the BAS. The contacts shall be rated for up to 5 amps at 230VAC or up to 24VDC at 2 amps.
8. A BACnet control interface shall be provided by the plasma detector manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for maintaining all BPI equipment until Substantial Completion of the project.

3.2 ASSEMBLY & ERECTION:

A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the City of Key Colony Beach and the Project A/E.

B. All BPI equipment shall be protected from dust and damage until all work has been substantially completed and accepted by the City of Key Colony Beach and the A/E.

3.3 TESTING

A. Entire Bi-polar ionization system shall be tested in accordance with the manufacturer's recommendations to ensure all components are operating as intended. Test results shall be provided to the A/E and the City of Key Colony Beach for review and confirmation.

3.4 COMMISSIONING & TRAINING

A. A manufacturer's authorized representative shall provide start-up supervision and training to the City of Key Colony Beach designated personnel, on the proper operation and maintenance of all BPI equipment.

END OF SECTION

15890 DUCTWORK

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 07840 - Firestopping and Smoke Sealing.
2. 15240 - Vibration Isolation.
3. 15180 - Mechanical Systems Insulation (INDOOR).
4. 15850 - Packaged Dedicated Outdoor – Air Units
5. 15855 - Air Handling Units.
6. 15891 - Fume Hood Exhaust Ducts
7. 15910 - Duct Accessories.
8. 15940 - Outlets (HVAC).
9. 15990 - Tests (HVAC).

1.2 REFERENCES

A. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), latest edition:

1. HVAC Duct Construction Standards (Metal and Flexible).

B. National Fire Protection Association (NFPA):

1. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals.
2. NFPA 90A - Installation of Air-conditioning and Ventilating Systems
3. NFPA 96 - Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment.

C. National Electrical Code - NEC 70 (Edition applicable to the Project).

D. American Society of Heating, Refrigerating, and Air-conditioning Engineers, Inc. (ASHRAE) 62.1 - Ventilation for Acceptable Indoor Air Quality.

1.3 SYSTEM DESCRIPTION

A. Provide solid double walled ducts, with minimum 2″ thick sandwiched insulation, for the first 15 feet of supply and return ductwork from each AHU to provide for sound attenuation. Provide outside air ducts with similar double walled insulation throughout the mechanical room, to prevent condensation. The use of perforated interior double wall or Mylar film to protect exposed fiberglass is not allowed. At Auditoriums or TV studios where maximum sound attenuation is required, the use of acoustical fiberglass lining with a rubberized coat in contact with the airstream is allowed, when approved by the City of Key Colony Beach and the A/E sound consultant.

B. All ductwork shall be sealed to comply with SMACNA:

1. Seal Class A.
2. Leakage Class 6 for rectangular ducts.

3. Leakage Class 3 for round and oval ducts.

C. Use of fiberglass or components containing coated or exposed fiberglass in contact with airstreams is prohibited.

D. Duct lining shall consist of a sheet of flexible, closed cell, foam composition, either an elastomer or a polymer, with a substantially smooth surface on both sides attached to the duct with adhesive and stick clips. Liner thickness shall be a minimum of 1/4 " and a maximum of 1". Density shall range from 3 to 4.5 pcf. "k" factor shall not be higher than 0.25, material shall not support mold growth, have a perm rating below 0.08, and an erosion rating in excess of 3500 fpm. All lining shall be specifically manufactured for this service and shall meet all requirements of NFPA, FM, SMACNA and all other applicable standards.

1.4 SUBMITTALS

A. Ductwork:

1. Provide 1/4" scale composite Shop Drawings. Shop Drawings shall be coordinated with other trades before submitting.
2. Catalog Cuts: Medium pressure ductwork, duct sealer, and turning vanes.
3. Catalog Cuts, Ratings and Performance Data: Flexible ductwork.

B. Casings, Plenums, and Housings: Details of construction.

C. Provide details of proposed typical ductwork fittings including:

1. Seams and joints.
2. Elbows, vaned and radius.
3. Transitions and Offsets.
4. Taps and outlet frames.
5. Branch connections and tees.
6. Splitter dampers.
7. Joint Sealing

D. Duct Hanger System: Catalog cuts and shop drawing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flexible: Genflex or Flexible Technologies.

B. Ductwork and Fittings:
1. Metalaire.
2. Semco.
3. Spiramatic.
4. United Sheet Metal.

C. Duct Sealants: Water based, non-fibrated. Solid content 70% by weight.:

1. Interior

a. Foster #32-19.
b. 3M.
c. Childers CP-146.
d. Hardcast 550.

2. Exterior

a. Flexomatic No 210 with fiberglass membrane; as manufactured by Weatherproofing Products Inc., or accepted equivalent.

3. All sealants used on the construction of ductwork shall maximum VOC content of 420 grams per liter.

2.2 MATERIALS

A. Ductwork shall be fabricated and installed according to the SMACNA Standards, except as shown on drawings or specified.

B. Ductwork shall have manufacturer's gage stamp intact.

C. Extractors and Dampers:

1. Provide as shown and as necessary for proper regulation of air distribution system.
2. Locate dampers to be easily adjustable after work is completed. Provide a set screw locking device for each splitter or damper. On insulated ducts, place locking device on a bracket so set screw is on surface of insulation and is easily operable. Provide Armaflex plug. Use Ventlock or Young Regulator where damper or extractor is in accessible.
3. Sheet Metal Gage: Construct dampers of galvanized steel 1 gauge heavier than duct where installed.
4. Provide manufactured, gang operated vane volume extractors at duct branches.

D. The following ductwork and plenums shall be insulated, unless noted otherwise.

1. Outside air ductwork in plenums and mechanical equipment rooms at air handler’s closet.

2.3 LOW PRESSURE DUCTWORK

A. Includes ductwork from low pressure air handlers, exhaust, and outside and return air ductwork. Velocities shall not exceed 1,800 fpm and static pressures not to exceed 2 inches WG.

B. Provide galvanized steel ductwork, designed, constructed, installed and tested according SMACNA - "HVAC Duct Construction Standards" and as shown on drawings. Ductwork to have manufacturer's gage stamp. Provide cross-breaking or beading to prevent flexing, but do not reduce gage of metal below that required for flat ductwork sheets.

C. Plenums:

1. Galvanized steel with the largest dimension of 30 inches and larger shall be 18 gauge.

2. Plenums shall be constructed, designed, installed and tested according to SMACNA as specified. Joints shall be angle reinforced pocket type. Provide fully gasketed joints between plenums and filter sections.
3. Provide plenum access doors where indicated on drawings. Doors shall be constructed according to SMACNA - HVAC Duct Construction Standards.

D. Flexible Insulated Ductwork:

1. Lightweight duct, core of corrosion resistant reinforcing wire helix permanently bonded within fabric, insulated with 1-1/2" thick, 3/4 lb. density fiberglass flexible insulation and covered with a vapor barrier of aluminum metalized polyester film laminated to glass mesh, elastomer back coated. Duct shall meet NFPA 90A requirements and be listed as Class 1 Air Duct Material, UL 181. Minimum R-6 insulation value.
2. Manufacturers:

a. Atco Rubber Products.
b. Genflex.
c. Thermaflex II.
d. Venture Type VTKC.
e. Wiremold Co.

E. Ductwork and splitter dampers within the ductwork shall be made of the same material.

F. Turning vanes shall be provided in square elbows and shall be of same material as the ductwork. Turning vanes shall be of airfoil type, double thickness factory fabricated.

G. Fume hood ductwork shall be 316 stainless-steel as specified in Section 15891 - Fume Hood Exhaust Duct.

2.4 MEDIUM PRESSURE DUCTWORK

A. Includes ductwork from discharge of medium pressure air handlers up to and including flexible ductwork connection to medium pressure variable air volume boxes. Maximum velocity 2400 fpm and static pressures above 2 inches WG not to exceed 4 inches WG.

B. Provide galvanized steel ductwork, designed, constructed, installed and tested according to latest edition of SMACNA "HVAC Duct Construction Standards" and as shown on drawings. Ductwork shall have manufacturer's gage stamp.

C. Ductwork and Fittings:

1. Round and oval ductwork shall be factory fabricated spiral type. Take-offs shall be conical, 90 degrees except where 45-degree conical(s) are indicated on plans. Ninety-degree elbows shall be constructed of not less than 5 sections. Laterals also to be conical. Oval duct reinforcing shall be by exterior stiffener angles on flat surface restrained by rods or angle sections; stiffener spacing to be based on 6 inches WG. Ductwork and fittings shall be the product of one manufacturer.
2. Rectangular medium pressure ductwork shall be fabricated and installed per SMACNA "Duct Construction Standards". Joints shall be sealed and reinforced, and seams and corners shall be sealed with sealant and angles as required for airtightness. Welded construction shall be as required for pressure classification of each system.

D. Flexible ducts at variable air volume boxes shall be of high-pressure type, maximum 4 feet long. Core and insulation shall be as specified.

2.5 Kitchen Hood Exhaust Ductwork:

A. Includes ductwork from discharge of kitchen hood up to kitchen exhaust fan. Velocities between 1500 and 2000 FPM and static pressures up to 2 inches WG.

B. Provide 16-gauge, black steel ductwork, with welded joints, constructed, installed and tested in accordance with these specifications, NFPA 96, SMANA Construction standards and as shown on drawings.

C. Provide smooth radius elbows and duct cleanouts.

PART 3 EXECUTION

3.1 GENERAL

A. Install low and medium pressure ductwork as shown on drawings.

B. Before systems are tested and balanced, ducts shall be thoroughly cleaned and blown out.

C. Where interferences arise during construction, make transition or division of ductwork on basis of pressure drop equivalent to original size. Obtain approval from A/E before fabrication.

3.2 INSTALLATION

A. Install ductwork materials and accessories according to the latest edition of SMACNA Duct Construction Standards as specified. These written specifications shall take precedence in case of conflict.

B. Seal all duct joints with sealer as specified for field sealing of high-pressure ductwork according to SMACNA.

3.3 LOW PRESSURE DUCTWORK

A. Seams and joints in all ductwork shall be made airtight. Make exhaust ducts passing through return air chases airtight.

B. Install flexible ductwork shall be installed in sizes to match diffuser necks as indicated on drawings schedules. Duct length shall be not less than 5 feet and no longer than 7 feet. Duct shall be adequately supported to prevent kinks and sharp bends. Install according to manufacturer's recommendations and as shown on drawings.

3.4 MEDIUM PRESSURE DUCTWORK

A. Seal medium pressure ductwork seams, joints, connections, rivets, and screw heads with an adhesive sealing compound of synthetic rubber type. Adhesive sealer shall be UL listed conforming with NFPA 90A. The entire system shall meet the leakage class specified.

B. Sharp metal edges are not allowed to extend into air stream. Air inlet collars on VAV boxes shall conform to, and be flush with, flexible tubing or other inlet conditions. Duct joints shall be lapped in direction of air flow.

C. Sealing Duct Joints: Procedure for sealing medium pressure duct joints is as follows:

1. Before fittings and joints are assembled, apply sealer to rivets, groove seams and tap off collars on internal side of metal. Pittsburgh lock pocket must be flooded with sealer, and duct assembled.
2. Brush sealer around reinforcing rod washers, corners, rivets, notches and tap-off collars after ducts are assembled.
3. Coat inside of connecting joint and duct surface with sealers, where possible, sealing on inside of ductwork.
4. Spread sealer on inside of joints of duct to be assembled. Immediately after joints are assembled, apply sealer around outside of joints.
5. After 24 hours, spread a second coat of sealer over joints and allow to dry for 24 hours before testing.
6. Where joints are not accessible for proper sealing, cut hand holes in duct and seal joints from inside. Take special care to seal all duct corners.
7. When testing ducts for leaks, mark leaks and reseal without pressure in duct and allow to dry for 24 hours.

3.5 DUCTWORK SUPPORTS AND HANGERS

A. Provide support and hangers according to SMACNA HVAC Duct Construction Standards.

B. Hangers: Hang horizontal ducts at intervals not exceeding 8 feet, with hangers of 16 gage by 1-inch-wide galvanized band iron on ducts up to and including 30 inches wide and 12 gage by 1-1/2” wide galvanized band iron on ducts over 30 inches wide. Extend hangers down and fasten underneath duct in addition to both sides of duct.

C. Hangers shall be galvanized steel hung from inserts or clip angles secured to structure with expansion bolts in shear or tension as follows:

1. Roof Slab: In tension.
2. Structural Beams: In shear, 12 inches minimum from bottom of beam.
3. Concrete Joists: Use existing forming bolt holes only. Hangers shall be bent under ductwork at least 2 inches. Hangers for ducts over 48 inches wide shall be secured to bottom and sides of duct.

3.6 PRESSURE TESTING

A. All ductwork installed under these specifications shall be leakage tested as specified under Section 15990 - Tests (HVAC). Ductwork maximum leakage shall not exceed that for leakage class specified.

3.7 DUCT PENETRATIONS TO FLOOR AND FIRE WALLS

A. Joints around duct penetrations shall be packed with fire safing insulation and sealed with fire and smoke barrier caulk as specified in Section 07840, Firestopping and Smoke Sealing.

END OF SECTION

15900 CONTROLS & INSTRUMENTATION

PART 1 GENERAL

1.1 BASICS:

A. Integration and functional design shall focus on the sustainable fulfillment of its purpose, reducing its costs and minimizing the need for its operation, servicing and repair to be performed by Maintenance & Operation personnel, or service contractors.

B. The Control System design shall comply with Florida Statutes 255.257.

C. Any conflict between any term, condition, provision and requirements herein stated shall be promptly brought in writing to the attention of the A/E and City of Key Colony Beach Energy Management personnel for clarification.

1.2 Related Sections:

1. 15240 - Vibration Isolation
2. 15510 - Piping (HVAC)
3. 15515 - Valves, Hangers, and Specialties
4. 15890 - Ductwork
5. 15910 - Duct Accessories
6. 15960 - Variable Frequency Drives
7. 15990 - Test (HVAC)
8. 16155 - Motor Power and Control Wiring
9. 16721 - Fire Detection Alarm System

1.3 DEFINITIONS

A. The provider of the Control System, hereinafter referred to as the Control System Contractor, is the business entity responsible for equipment, installation, materials, labor and accessories necessary for delivering a complete integrated fully operational system.

B. BACnet: is a Data Communications Protocol for Building Automation and Control Networks. It is an ASHRAE, ANSI and ISO standard protocol.

C. Enhanced Hurricane Protection Areas (EHPA): As defined in FBC 423.25.

D. Energy Management: City of Key Colony Beach operational function dedicated to reduce energy consumption and support facilities. Presently, it is a section of the City of Key Colony Beach District Inspection, Operations and Emergency Management.

E. AHU: Air Handling Unit.

F. VAV: Variable Air Volume Boxes.

G. AI: Analog Input.

H. AO: Analog Output.

I. DI: Digital Input.

J. DO: Digital Output.

K. EMS: Energy Management System.

1.4 SUBMITTALS

A. Submit to the A/E and City of Key Colony Beach Energy Management, the Control manufacturer's literature for proposed equipment, material and software showing performance specifications, schematics, dimensions and installation instructions, for their review and acceptance.

B. Submit to the A/E and City of Key Colony Beach Energy Management, all detailed shop drawings showing proposed Control equipment locations, control sequences, raceway routing, grounding requirements, interconnections, and special instructions, for their review and acceptance. Wiring shall be clearly shown with terminations occurring on labeled terminal strips.

C. Furnish to electrical contractor wiring diagrams and wire runs specified in Division 16.

D. Substantial Completion Submittal Requirements: Upon substantial completion, provide City of Key Colony Beach Energy Management with the following:

1. Record drawing: 6 sets.
2. AutoCAD compatible disk.
3. Manufacturer's maintenance and repair instructions (6 sets) including troubleshooting instructions and schematic diagrams depicting integration of the Control System components.
4. A copy on CD or USB, of all software for all application and sub-system controllers.

E. Any Control System components manufacturer that considers any of the requirements established in this Specification to be proprietary, shall not be acceptable to the City of Key Colony Beach.

F. All the necessary technical, operational, instructional, procedural and calibration manuals addressing the overall Control System composition, integration and functions, shall be provided at Substantial Completion.

1.5 QUALITY ASSURANCE

A. Submit proof of having a local office within a 50-mile radius of the job site. The Control System Contractor office shall be staffed with factory-trained personnel fully capable of providing effective training, instruction and routine/emergency maintenance service on system components to City of Key Colony Beach personnel.

B. Submit proof of having a minimum of five (5) years successful history in design, installation and overall support of system similar in performance and scope as specified herein.

C. Furnish copies to City of Key Colony Beach of required warranty for equipment and materials as specified in the Instructions to Bidders, General Conditions and these Specifications.

1.6 WARRANTY

A. Components, parts, and assemblies furnished and installed by the Control System Contractor, product manufacturer representative or distributor, shall be warranted - in writing - against defects in material and labor, for two (2) year after Substantial Completion.

B. The Control System Contractor shall respond to routine warranty service requests by completing repairs within 24 hours from notification by City of Key Colony Beach.

C. The Control System Contractor shall respond to emergency warranty service requests with the arrival of service technician at affected site within four (4) hours of notification of the emergency. Repairs shall be expedited to bring the system online as soon as possible. Emergencies include, but are not limited to, failures of controls components or any other fault attributed to a Control System failure.

D. If the problem is not correctable within the specified time frame, the Control System Contractor shall provide in writing an expected completion date to the City of Key Colony Beach.

E. Inspections at End of Warranty: Forty-five (45) days prior to the end of the two (2) year warranty period, the Control System Contractor shall meet on-site with City of Key Colony Beach Energy Management designated staff and representatives from the corresponding RMC to address all unresolved warranty items to the satisfaction of the City of Key Colony Beach.

1.7 EQUIPMENT UPKEEP

A. During the warranty period, the Control System Contractor shall perform at least four (4) system condition maintenance inspections six (6) months apart in order to ensure that the system is performing as contractually required. The first of these inspections shall be conducted six (6) months from the substantial completion date of the Control System. The date of the other inspections shall be coordinated with City of Key Colony Beach designated representative. After each inspection, the Control System Contractor shall provide City of Key Colony Beach Energy Management a report documenting their findings and what corrective actions were taken to resolve the deficiencies that were noted. Each inspection shall be carried out together with City of Key Colony Beach Energy Management and RMC's representatives in order to facilitate the transition to full City servicing. During this period, the Control System Contractor shall abide by the City of Key Colony Beach Maintenance staff observations, Manufacturer's operation guidelines and current Industry's standards. The maintenance inspection shall address, as a minimum, the following items:
   1.
   2. Check all wiring connections and make all necessary repairs.
   3. Check communication between the Controller and Network and make the necessary repairs.
   4. Check communications with the field Network devices and make the necessary repairs.
   5. Verify operation of all sensors, valves and damper actuators and make necessary adjustment and repairs.

1.8 PREVENTIVE MAINTENANCE AND REPAIR SERVICE PROPOSAL

A. The Control System Contractor is to provide the City of Key Colony Beach Energy Management office a proposal for a two (2) year, with the option for two annual extensions thereafter, overall System Preventive Maintenance and Repair Service contract, to begin at the end of the two (2) year warranty period. The Preventive Maintenance and Repair Service contract shall cover the servicing, up-keep and repair of the system and shall include at a minimum the following items:

1. Periodic Control System inspections at six (6) months intervals, the first of which will take place six (6) months from the end of two (2) year warranty period. The remaining inspections shall be coordinated with the City of Key Colony Beach designated personnel.
2. Check all wiring connections and make necessary repairs.
3. Check communication between the Controllers and Network and make necessary repairs.
4. Check communication with the field Network devices and make necessary repairs.
5. Check all batteries and replace them once per year.
6. Verify operation of all sensors, valves and damper actuators and make necessary adjustment and repairs.

PART 2 PRODUCT

2.1 SYSTEM CONFIGURATION

A. On-site operational control programming for all application controllers and sub-controllers shall operate as stand-alone and have the capability to work simultaneously in conjunction and parallel with the SBAB EMS Terminal, when connected sometime in the future.

B. The equipment and software provided by the Control System Contractor shall be the latest model available at the time of bidding. No customized products shall be accepted, unless approved by the City of Key Colony Beach in writing. All system component spares shall be readily available from their original source during at least seven (7) years. All system components shall be ‘backward compatible” with its manufacturer’s installed infrastructure.

C. The Control System shall follow the latest BACnet standard available at the time of bidding, ensuring both hardware and software interoperability among sub-systems.

1. Compliance level: Provide PICS documents showing at least a Level 3 ability to support data read-and-write functionality for each BACnet device.
2. Physical connection of BACnet devices: BACnet network using the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol.

D. EHPA Manual Override Panel: At Facilities designated by the City of Key Colony Beach as an EHPA, provide one manual override panel for use by authorized Staff to activate manual override of cooling, ventilation and lighting systems serving the designated EHPA zones. Override-panel shall have the following features:

1. Install EHPA override-panel in the EHPA Emergency Shelter Director’s office. Locate override-panel within a lockable wall mounted cabinet. The cabinet shall be labeled

with a sign indicating: “EMERGENCY SHELTER - MANUAL OVERIDE PANEL LOCATED INSIDE”.

2. Override-panel shall be operated with a single push button switch and shall have a status light labeled “EMERGENCY SHELTER MANUAL OVERRIDE”, to signal activation.
3. Upon activation, the Control System shall convert its operating mode to “SHELTER ACTIVE MODE”, providing 24/7 mechanical cooling and ventilation, including lighting, to the designated EHPA zones.
4. In the “SHELTER ACTIVE MODE”, the system shall override any “time-schedules”, demand-limiting, or energy-saving programs that may compromise the use of the Facility as an EHPA.
5. Each chiller shall be connected to separate power circuits.

    a. As long as normal FPL power in being provided to the Facility, the HVAC system shall provide 100% of cooling to the EHPA.
    b. If normal power fails, the emergency ventilators and other life-safety systems serving the EHPA shall continue running on emergency power.

2.2 CONTROL SYSTEM INTEGRATION

A. The overall Control System composition shall be as uncomplicated and user friendly as possible to facilitate pertinent personnel to quickly learn by hands-on training, which shall include System’s fundamentals, industry standards, components integration and operation details.

B. The Control System shall be microprocessor based and consist of a standalone central console, field/unitary control processors and all other necessary components (software and hardware) to allow for a fully integrated functional and operational future connection to regional maintenance center.

C. Provide equipment, software, and instructions necessary for the City of Key Colony Beach Staff reprogramming of any performance parameter resident in non-volatile memory (e.g. EPROM, EEPROM, magnetic media, etc.). For those Control Systems using “custom” software programming, detailed instructions and documentation shall be provided, and approved by the City of Key Colony Beach.

D. Provide a backup power source for the controllers serving all major electro/mechanical equipment. During power interruptions, the backup power source shall be capable of maintaining the contents of the Control System functional parameters that are stored in volatile memory (e.g., RAM memory) for a minimum of seventy-two (72) hours.

2.3 MANUFACTURERS

A. Control System Manufacturers:

1. I/A by Schneider Electric
2. Metasys - Johnson Controls
3. Trane
4. Delta

2.4 CONTROL SYSTEM OPERATIONAL INTERFACE:

A. Software Package: The Control System software shall be a complete package including interactive graphics.

1. Provide equipment, software, wiring interfaces, and instructions necessary for the City of Key Colony Beach personnel to reprogram any of the diverse performance parameters resident in controllers provided as part of the Control System.
2. Server software shall operate on standard industry PC server. Server/controllers by manufacturer are acceptable.
3. Software: As provided by the Control System Contractor, with the same look and feel as the operating system. Third-party Web software is not acceptable.
4. The time clocks in all controllers shall be automatically synchronized daily. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the network.
5. The Software package provisions shall allow the responsible on-site staff to set a subjective level of comfort within occupied spaces, such as adjusting temperature set points.
6. Software Operating System shall be Microsoft Windows.
7. Software Licenses: All software supplied to the City of Key Colony Beach shall have its correspondent licenses from the computer and operating components designer.
8. User Access level: The software provided by the Control System Contractor shall provide to the City of Key Colony Beach personnel full access to all System capabilities and allow the City of Key Colony Beach to set up different access levels to operate the Control System. The Operator Workstation shall have the capability to create, delete and support the following BACnet Objects:

    a. Analog input, analog output and analog value
    b. Binary input, binary output and binary value
    c. Calendar
    d. Device
    e. Event enrolment
    f. File
    g. Graphics
    h. Notification class
    i. Programs
    j. Schedule
    k. Trend log

9. Accessories and software shall accomplish, but not limited to the following:

    a. Full color graphics monitoring and command.
    b. Digital and analog data monitoring and command.
    c. Time and event programming.
    d. Duty cycle programming.
    e. Chiller optimization.
    f. Optimum start/stop programming.
    g. Chilled Water Temperature Reset.
    h. Thermostats Night Temperature (Auto) Setback.

B. Exterior lighting circuits shall be interlocked with the Control System. The interlock shall provide for lighting circuits to remain energized (fail-safe) in case of total Control System failure. Full illumination shall be in effect only during periods of scheduled evening

occupancy. Where applicable, “spot” illumination shall be provided for security purposes. Exterior perimeter illumination and artificial lighting of parking lots, and other open areas shall be activated by means of sunlight-exposed photocells and time-of-day controls wired in-series. All Control System outputs for lighting controls shall originate from Control System controllers that are located within wall enclosures mounted 54" AFF and located at electrical/mechanical rooms.

C. The on/off switching of buildings’ interior lights shall not be affected by pre-set Control System automatic timing.

D. Exhaust and ventilation fans shall be interlocked with corresponding air handling units.

2.5 SUBSYSTEMS CONTROLLERS

A. Subsystem Control Units are stand-alone microprocessor-based control units that include, but are not limited to, the following:

1. No need to communicate with any other device to execute Control System programs and other control functions.
2. The controller shall have a display and keypad to monitor and modify parameters.
3. Fully user-programmable, and not restricted to any one type of equipment.
4. Support direct Ethernet or by using a communications card included with the subsystem controller. Connect SCU to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol.
5. Primary communication network shall support BACnet MS/TP
6. Alarm Reporting. Subsystem Controllers shall be able to route critical alarms to designated RMC’s EMS Stations.

B. Subsystem Controllers with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers, and shall:

1. Contain software, programs, and parameters resident in the Control System control processor in non-volatile memory random-access memory and shall allow local operator access, and backup power supply.
2. Monitor or control each Input/Output (I/O) point, process information and download from or upload to operator workstation, or diagnostic terminal unit.
3. Have 25% expandability in analog input and output points by the addition of expansion modules.
4. Have 25% expandability in digital input and output points by the addition of expansion modules.
5. Work in stand-alone mode control functions and operate regardless of network status.

C. Environment: Controller hardware shall be suitable for the designed ambient conditions.

1. Controllers used outdoors, inside weather exposed equipment and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability:

1. The Subsystem Controllers shall have diagnostic LEDs for power, communication, and processing.
2. Each controller shall have Service Port for a laptop computer or a portable operator's tool. Its function shall be, but not limited to:

    a. Log On and Off
    b. Adjust and change Control System programmed performance parameters set points and schedules.
    c. Access data from DDC controllers.
    d. Modify point/object trend logs, and graph/print these
    e. Perform DDC controller unit operation and maintenance procedures

E. Communications Requirements: For communications between the Control System controllers and associated components:

1. All hardware and software shall conform to BACnet standard, ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol, to promote interoperability between the different building subsystems.
2. The Subsystem Controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.

F. Power loss and noise: Controllers shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft] and shall shut below 80% nominal voltage.

G. Electrical Transient Protection (ETP) shall be provided for equipment according to Division 16 of the City of Key Colony Beach Specifications and with the following:

1. Power Lines:

    a. Three-line surge protection

        1) Hot and neutral wires
        2) Hot and ground wires
        3) Neutral and ground wires

    b. Northern Technology, Inc., Spokane WA, Model No. TCS-20HW, or A/E approved equal.
    c. Device shall be installed at equipment to be protected inside a sheet metal enclosure and connected to earth ground with one #6 AWG (minimum) wire in an isolated conduit.
    d. Clamping voltage shall be UL Rating 1449 330V, Joule Rate 1000, Electrical Rating 20A, 120/277 VAC.

2. Coaxial lines: (if applicable) General Semiconductor Industries, Inc., No. CX12 at each end of the coaxial lines over 20 feet in length.
3. CAT5 network lines: PWCAT5 NTP by Eaton or A/E approved equal, shall be used for data transient protection.
4. System control lines (at each end of the cable)

    a. For DC lines below 13 VDC provide Northern Technologies, Inc., Model DLP-41 or A/E approved equal.

b. For DC lines from 13 VDC to 25 VDC, and for AC lines below 16VAC, provide Northern Technologies, Inc., Model No. DLP-42 or A/E approved equal.
c. For higher voltages, contact Northern Technologies, Inc., for model numbers.

2.6 APPLICATION CONTROLLER

A. Application Controllers shall be standalone microprocessor-based control units that include, but are not limited to, the following:

1. No need to communicate with other devices to execute Control System programs and associated control functions.
2. The controller shall have a display and a keypad to monitor and modify parameters.
3. Pre-programmed application such as, VAV, VVT, HVAC unit's algorithms are allowed. All pre-set algorithms shall allow the user to modify performance parameters, as applications may change in the field.
4. Connect to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol.
5. Primary communication network shall support BACnet MS/TP.
6. Alarm Reporting. Application Controllers shall be able to route critical alarms to designated RMC's EMS Station.

B. Application Controllers with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers, and also shall:

1. Contain software, programs, and functional parameters resident in the Control System processor in non-volatile memory random-access memory. It shall allow local operator access, and backup power supply.
2. Monitor and control each I/O point, process information, and download from or upload to operator workstation, or diagnostic terminal unit.
3. Work in stand-alone mode control function operations, regardless of network status.

C. Environment: Controller hardware shall be suitable for the designed ambient conditions.

1. Controllers used outdoors, inside rooftop equipment and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability:

1. The Application Controllers shall have diagnostic LEDs for power, communication, and processing.
2. Each controller shall have Service Port for a laptop computer or a portable operator's tool. Its functions shall be, but not limited to:

a. Log On and Off.
b. Adjust and change subsystem performance parameters set points and schedules.
c. Access data from DDC controllers.
d. Modify point/object trend logs, and graph/print these.
e. Perform DDC controller unit operation and maintenance procedures.

E. Communications Requirements: For communications between the Application Controller and all other associated components:

1. All hardware and software shall conform to BACnet standard, ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol, to promote interoperability between building subsystems.
2. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.

2.7 CONTROL SYSTEM ACCESSORIES AND DEVICES

A. Temperature sensors:

1. Duct sensors shall be rigid or averaging. Averaging sensors shall be a minimum of 1.5 m [5 feet] in length.
2. Immersion sensors shall be provided with a separable brass well. Pressure rating of well is to be consistent with the fluid pressure in which it is to be installed.
3. Provide matched temperature sensors for differential temperature measurement.

B. Relative Humidity (RH) sensors:

1. Duct and room sensors shall have a sensing range of 20% to 80%.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95%. They shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].
4. Humidity sensor's drift shall not exceed 3% of full scale per year.

C. Flow switches:

1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum) with adjustable sensitivity with NEMA 1 enclosure unless otherwise required by Code.
3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for the intended application.

D. Relays:

1. Control relays shall be UL Listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable 200% (minimum) from established set points. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

E. Current transmitters:

1. AC current transmitters shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 0 to 5 VDC two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and 1% full scale accuracy at 500-ohm maximum burden.

2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA listed.
3. Unit shall be split-core type for clamp-on installation.

F. Current transformers:

1. AC current transformers shall be UL/CSA listed and completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for 1% accuracy at 5 A full-scale output.
3. Transformers shall be split-core type for installation on new or existing wiring,

G. Voltage transmitters:

1. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with 1% full-scale accuracy at 500-ohm maximum burden.
3. Transmitters shall be UL/CSA listed at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

H. Voltage transformers:

1. AC voltage transformers shall be UL/CSA listed, 600 VAC rated, complete with built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4 to 55°C [40 to 130°F] and shall provide 0.5% accuracy at 24 VAC and a 5 VA load.
3. Windings (except for terminals) shall be completely enclosed in a Nema 1 enclosure unless otherwise required by Code.

I. Current switches:

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

J. Pressure transducers:

1. Transducer shall have linear output signal. Zero and span shall be field-adjustable.
2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
3. Water pressure transducer shall have stainless steel diaphragm construction of 150-psi minimum. Transducer shall be complete with 1 to 5 VDC or 4 to 20 mA output, required mounting brackets, and block and bleed valves.
4. Water differential pressure transducer shall have stainless steel diaphragm construction of 150-psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300-psi. Transducer shall be complete with 1 to 5 VDC or 4 to 20 mA output, required mounting brackets, and enclosed five-valve manifold.
5. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), with scale range and differential

suitable for the intended application in a NEMA 1 enclosure unless otherwise required by Code.

K. Panel construction:

1. Control System Panel Enclosures: Constructed of 20-gauge steel. Equip panel doors with locks and transparent windows for viewing displays, if such displays are located within the panel. All control cabinets shall be fully enclosed NEMA 1 construction unless otherwise required by Code, with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.

L. Actuating Dampers:

1. Actuated control dampers shall be a minimum of 13-gauge, channel shaped galvanized steel, low leakage dampers with nylon or eolith bearings, as scheduled on the mechanical drawings. Leakage rating at shutoff shall be less than 1/2 percent of flow rate at 1500 FPM face velocity, with 5 inches wg differential across damper.

M. Actuating Valves:

1. Two-ways and three-ways actuated control valves shall be as herein specified or as indicated on the mechanical drawings.
2. All valves shall conform with the requirements of Division 15 of the City of Key Colony Beach Specifications.

N. Electric damper/valve actuators:

1. All these actuators shall be UL and CSA rated and have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
2. All rotary spring-return actuators shall be capable of both clockwise and counter-clockwise spring-return operation. Linear actuators shall spring-return to the retracted position. Spring-return actuators with more than 7 Nm [60 in-lb] torque capacity shall have a manual crank.
3. Proportional actuators shall accept a 0 to 10 VDC or 2 to 10 VDC operating range.
4. All 24 VAC/VDC actuators shall operate on Class 2 wiring.
5. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered.

O. Outdoor Air Flow Measuring Station shall be a sensor type GTA116Pc Gold Series flow sensor from EBTRON or A/E approved equal (size sensor for duct area).

P. The Control System Contractor shall secure a written guarantee from the System's manufacturer not to discontinue the production and supply of any of the spare parts and replacements for at least seven (7) years after the date of Substantial Completion.

2.8 WORK COORDINATION

A. Test and Balance: The Control System Contractor shall facilitate the T&B contractor all software and cables necessary to interface with the Control System during the test and balance process.

B. The following represents the scope of work of participating Trades Contractors, which the Control System Contractor shall coordinate with:

1. All Control System control valves, auto temperature control dampers and sensor wells shall be provided by the Control System Contractor for installation by others.
2. The Piping Contractor shall:

    a. Install automatic valves and separate wells as specified to be supplied by the Control System Contractor.
    b. Furnish and install all necessary pressure taps for steam, water, drain and overflow connections piping.
    c. Furnish and install all necessary piping connections required for flow devices.

3. The HVAC Sheet Metal Contractor shall:

    a. Install all automatic temperature control dampers provided by the Control System Contractor and provide and install all necessary blank-off plates, or transitions required to install dampers that are smaller than duct size.
    b. Assemble multiple section dampers provided by the Control System Contractor with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper actuators.
    c. Provide access doors or other approved means of access through ducts for service to Control System equipment.

4. Electrical Contractor shall:

    a. Furnish 120-volt power wiring to all DDC controllers including terminal box controllers and control valves as noted on drawings.
    b. Provide a minimum of one (1) 120V duplex outlet adjacent to each Control System AHU controller.

2.9 CONTROL SYSTEM WIRING

A. All Control System wiring shall be installed in strict compliance with FBC, the Control System components manufacturer's instructions, and applicable City of Key Colony Beach Division 16 requirements. Where these requirements differ, the more stringent shall be followed.

B. All Control System wiring shall be installed in dedicated conduits. Conduit shall be minimum 3/4-inch galvanized EMT or rigid conduit in accordance with Division 16 of City of Key Colony Beach Design Standards. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.

C. Wiring:

1. All wiring necessary for the installation of the Control System and associated controls shall be provided by the Control System Contractor under this Section. This shall include but not be limited to all wires, conduits, miscellaneous materials and labor as required for mounting and connecting of Control System and control devices, unless otherwise specifically noted herein.
2. Direct burial cables shall be listed by a Nationally Recognized Testing Laboratory (NRTL) approved by OSHA.

3. When Cat-5 communication cable is used, the maximum length shall not exceed 300 feet. When the length of any communication cable exceeds 300 feet fiber optic cable shall be used.
4. The Control System Contractor shall provide all Network wiring between controllers and Ethernet Data connections required for the remote access to the system.
5. The Control System Contractor shall be responsible for calibration and proper functioning of the System and electronic devices furnished under this section.
6. The Control System Contractor shall coordinate with all the necessary associated trades in order to perform all Control System wiring work.

2.10 APPLICABLE CODES AND STANDARDS

A. All work, materials, and equipment associated with this specification shall comply with all the applicable Rules and Regulations, Codes and Ordinances established by local, state, and federal authorities. The Control System installation workmanship shall comply with all mandatory industry standards, as established by:

1. National Electric Code (NEC)
2. Florida Building Code (FBC)
3. ASHRAE 135-1995
4. FCC Regulation, Part 15 - Governing Frequency Electromagnetic Interference
5. Underwriters Laboratories UL916 or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).
6. National Fire Protection Association (NFPA)

2.11 CONTROL SYSTEM COMPONENT SELECTION

A. The Control System Contractor shall be responsible for the proper selection of control devices.

2.12 CONTROL SYSTEM DELIVERY

A. The Control System Contractor shall deliver, install and connect all required components, and be responsible for the initial set-up of the System as a whole.

B. On existing sites, the overall security access to the workplace shall be coordinated with pertinent on-site staff.

C. The time schedule for the Physical Plant Equipment System commanded automatic start/stop and On/Off circuits timing base-line shall be programmed in agreement with the City of Key Colony Beach at Substantial Completion.

PART 3 WORK EXECUTION

3.1 INSPECTION:

A. At completion of the Control System work, a thorough inspection of the entire System shall be conducted. The inspection shall be performed by the Control System Contractor, the A/E, the City of Key Colony Beach Project Manager, the applicable City of Key Colony Beach Trade Masters, representatives from the corresponding RMC's, and personnel from City of Key Colony Beach Energy Management. The Project Manager shall coordinate with the Control System Contractor and City of Key Colony Beach relevant

staff the conduct of the inspection. A minimum of two (2) weeks' notice shall be given to all involved parties prior to the performance of this inspection.

3.2 TRAINING:

A. The Control System Contractor shall provide two levels of hands-on training to City of Key Colony Beach Staff. All training shall be conducted by certified manufacturer's representatives.

1. The Control System Contractor shall provide a minimum of one (1) 4-hour hands-on training City of Key Colony Beach Central Maintenance personnel, the corresponding RMC's technician, and the on-site zone mechanic, on the function, operation, software programming, maintenance and emergency repair of all system components.
2. In addition, the Control System Contractor shall provide a separate one 4-hour hands-on training to City of Key Colony Beach Energy Management System (EMS) personnel, on the function, operation, and software programming of all system components.
3. All training shall be scheduled at the City of Key Colony Beach's discretion within thirty (30) days after Substantial Completion.

3.3 DEMONSTRATION:

A. Prior to Substantial Completion, the Control System shall undergo a series of performance tests to verify operation and compliance with this specification. The required tests shall be scheduled after the Control System Contractor has completed the overall installation, activated the entire Control System and performed its own tests.

B. Demonstrate compliance with Sequences of Operation through all modes of operation.

C. Final connections and operational tests of Control System equipment shall be performed by certified factory trained technicians or under the direct supervision of manufacturers' representatives of the equipment being tested.

D. The checkout and testing procedures shall include tests for short circuits, ground faults, and continuity of wiring and components.

E. For Facilities considered to be EHPA, the Contractor shall test the Control System override switch in the presence of the A/E, City of Key Colony Beach Project Manager, City of Key Colony Beach Energy Management personnel, Central Maintenance Training Administrator, the corresponding RMC's technician and the on-site zone mechanic. The test sequence shall be as follows:
1. Shut off normal power to facility.
2. Start Emergency Generator.
3. Turn off EHPA override switch.

F. Confirm that all EHPA Systems, including but not limited to AHU's, exhaust/supply fans, cooling equipment, VAV's, EMS emergency controls, etc., are properly operating on power provided by the emergency generator.

3.4 CLEANING:

A. The Control System Contractor shall clean up all debris resulting from its activities daily, removing all cartons, containers, crates, etc., under his responsibility as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

3.5 FINAL COMPLETION:

A. Upon the completion of all the Control System work, including the correction of all deficiencies identified in the Test and Balance Report, and all items identified by the A/E and City of Key Colony Beach during the Substantial Completion inspection, the Control System Contractor shall request a Final Completion Inspection of the work. Prior to requesting Final Inspection, the Control System Contractor shall ensure that all the requirements of the specifications have been completed including but not limited to the following:

1. Completion of all punch list items.
2. Performance of all sequence of operation tests.
3. Submittal of all closeout documents.
4. Performance of all training sessions.
5. Submittal of all Operational and Maintenance Manuals.
6. Submittal of all spare parts.

END OF SECTION

15910 DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Extent of duct accessories is indicated on drawings and by the requirements of this section.

B. Types of duct accessories required for project include the following:
   1. Volume Dampers/Regulators
   2. Flexible Connectors
   3. Fire and Smoke Dampers
   4. Duct Access Doors
   5. Ceiling Access Panels

C. Ceiling access panels furnished under this Section shall be installed in accordance with Section 08305 - Access Panels.

D. Related Sections:

   1. 08305 - Access Panels
   2. 15890 - Ductwork.
   3. 15900 - Controls and Instrumentation.
   4. 15940 - Outlets (HVAC).

1.2 REFERENCES

A. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - ”Duct Construction Standards (Metal and Flexible)”.

B. National Fire Protection Association (NFPA) 90-A Installation of Air-conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Duct Access Doors: Catalog cuts.

B. Volume Dampers: Shop drawings.

C. Fire Dampers: Catalog cuts.

D. Low Pressure Ductwork Round Fittings: Shop Drawings or catalog cuts.

E. Flexible Connections: Catalog cuts.

F. Test Holes: Pipe couplings, catalog cuts, and proposed installation locations.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Volume Dampers:

1. Dampers shall be manual or automatic as indicated on drawings. Dampers furnished with automatic actuators shall be furnished under the applicable section of these specifications and installed under this section.
2. Dampers shall have opposed blades.
3. Dampers shall be one gage heavier than the duct they are installed in and shall be reinforced to prevent vibration and noise.
4. Dampers shall be fabricated in accordance with SMACNA Standard. Dampers shall have an indicating device with lock to hold damper in position for proper setting.
5. Bridge lock type quadrant operators of dampers shall mount flush with surface of duct insulation.

B. Flexible Connectors: Size flexible connections at a minimum of 4 inches between connected items. Provide 30-ounce glass fabric fire retardant and airtight, coated with neoprene on both sides. Ventglass by Ventfabrics, Inc. or Neoprene Fabriduct by Elgen.

C. Fire Dampers: Provide UL 555 approved fire dampers where indicated on drawings. Dampers shall be constructed and installed according to requirements of UL 555, and each damper shall be provided with fusible link designed to melt at 165 degrees F. Damper blades shall be stacked outside of air stream.

D. Combination Smoke and Fire Dampers:

1. Damper shall bear fire damper label by UL or other OSHA approved Nationally Recognized Testing Laboratories (NRTL). Dampers shall be constructed of steel, with parallel blades.
2. Damper shall meet requirements specified for fire dampers and include operating shaft able to rotate 90 degrees and cause damper to operate between closed and open. Operating shaft and damper combination shall be suitable for linking to and operation by a damper operator. Damper and operator shall be listed as an assembly.

E. Duct Access Doors:

1. Access doors shall be hinged except where sliding or removable type is required and shall be insulated except in non-insulated ductwork and casings. Access doors shall be sized for proper access but shall not be less than 16 inches X 12 inches in size, except in small ductwork where a smaller door may be used.
2. Access doors for high pressure ducts shall be galvanized steel with dogs or cams, solid neoprene gaskets, moisture resistant and airtight. Provide door frames to extend over casing or duct insulation. Doors shall operate from outside. Construct for medium pressure application.

PART 3 EXECUTION

3.1 INSTALLATION

A. Flexible connections shall be provided as shown on drawings. Lengths shall be between 2 to 4 inches.

B. Fire Dampers:

1. Seal around fire dampers with therma-fiber at walls per UL and NFPA requirements.
2. Install dampers as shown on drawings and according to manufacturer's recommendations.

C. Low pressure ductwork round fittings shall be installed as shown on drawings and according to manufacturer's recommendations.

D. Provide test holes at mains and main branches and as required by test and balance contractor.

E. Duct Access Doors:

1. Airtight, hinged access door with catch shall be installed next to dampers sized for their inspection and maintenance.
2. Do not obstruct access doors with piping, conduits, hangers, braces, or other ducts.
3. Required ceiling access panels for areas other than removable ceilings shall be furnished under this section for installation under the general construction work.
4. Provide access doors on linkage side of automatic dampers, including fire and smoke dampers, and at duct mounted smoke detectors to allow inspection of the sampling tubes.

END OF SECTION

15940 OUTLETS (HVAC)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15890 - Ductwork.
2. 15910 - Duct Accessories.

1.2 SUBMITTALS

A. Outlets: Catalog cuts and schedules of installation and performance data at noted capacities.

B. Outlet Accessories: Plaster frames, opposed blade dampers, and square to round neck adapter catalog cuts.

C. Samples: Submit color chips for manufacturer's standard baked enamel colors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Outlets:

1. Air Guide.
2. Anemostat.
3. Carnes.
4. Krueger.
5. Metalaire.
6. Nailor Industries Inc.
7. Price.
8. Titus.

2.2 MATERIALS

A. Plaster frames shall be provided for plaster and dry wall ceiling and wall installations.

B. Finishes shall be as follows:

1. Devices installed on surfaces to be painted shall match surface color. Factory prime coat.
2. All Other Areas: Factory applied baked enamel. Color to match color chip furnished by A/E.
3. Aluminum Devices: Satin aluminum baked enamel, except as specified.

C. Provide a synthetic sponge rubber gasket between each frame and mounting surface forming an airtight seal.

D. Manufacturer's published performance data shall be provided indicating compliance with ANSI/ASHRAE Standard 70.

E. Air diffusers shall be provided with opposed blade volume dampers adjustable from diffuser face, blanking for proper coverage, and blow without producing objectionable noise or air motion at occupied level.

1. Diffusers in the same room shall be the same size and type, except as otherwise noted.
2. Diffusers shall be suitable for operation at 5 percent excess and 25 percent less than noted capacities.
3. Louvered face ceiling diffusers shall be of square, round, or rectangular face patterns. Provide:

    a. Removable central core, snap-in type.
    b. Flat flanged frame.
    c. Welded aluminum construction.
    d. White baked enamel finish.

4. Perforated ceiling diffusers are not allowed.

F. Grilles and Registers.

1. Ceiling return and exhaust registers shall be 1/2" x 1/2" x 1/2" grid or perforated panel face type with neck adapters, opposed blade dampers and aluminum construction with white baked enamel finish. Frame shall be suitable for plaster frame mounting where required.
2. Sidewall return and exhaust registers shall be aluminum flange frame with fixed 45 degrees louvers spaced 3/4" with an opposed blade damper. Louvers shall be parallel to the long dimension.
3. Grilles shall be as specified for registers except dampers are not required. Perforated ceiling grilles shall be of the lay-in type.

G. Linear diffusers for wall mounting shall be fixed bar type. Bars shall be 1/8" thick with an extruded shape to provide 0 degrees or 15 degrees air deflection as indicated. Bar spacing shall be 1/2". Construction shall be aluminum, primed to accept finish paint.

H. Linear diffusers for ceiling mounting shall be Titus or Nailor linear diffusers with sizes as indicated. These devices shall be installed with end caps and alignment strips as required for a complete and finished installation.

I. Sidewall supply grilles and registers shall be aluminum flange framed, with 2 sets of adjustable vanes parallel to the long and the short sides and an opposed blade damper.

J. Supply and return, registers, diffusers, and grilles shall be provided with frames and finishes suitable for wall or ceiling finish and construction where installed. Coordinate with Construction Documents for ceiling types and locations.

K. Air outlets shall be provided as indicated on drawings. If outlet type is not indicated on the drawings, provide type used in similar areas elsewhere in the building.

PART 3 EXECUTION

3.1 EXAMINATION

A. Manufacturer of air distribution devices shall be responsible for examining application of each diffuser, grille, and register and guaranteeing each will provide comfort space conditions without drafts and excessive noise at noted capacity.

3.2 INSTALLATION

A. Install and connect light troffer diffusers provided under Division 16.

END OF SECTION

15960 VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 SUMMARY

A. This specification covers a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor, rated 600V or less.

B. The drive manufacturer shall supply the drive and all necessary options as herein specified. VFD's that are manufactured by a third party and brand labeled shall not be acceptable. All VFD's installed on this project shall be from the same manufacturer.

1.2 RELATED SECTIONS

A. 13810 - Energy Management System (EMS)

B. 15900 - Controls and Instrumentation

1.3 QUALITY ASSURANCE

A. Referenced Standards:

1. Underwriters Laboratories, UL508C or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).
2. National Electrical Manufacturer's Association (NEMA), ICS 7.0, Adjustable Speed Drives.
3. International Electromechanical Commission, IEC 16800 Parts 1, 2 and 3.
4. National Electrical Code (NEC) 430.120, Variable Frequency Drives.
5. Institute of Electrical and Electronic Engineers (IEEE), Standard 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.

B. Qualifications:

1. VFD's and options shall be UL listed as a complete assembly. The base VFD shall be UL listed for 100 KAIC without the need for input fuses. VFD's shall not require additional branch circuit protection.

1.4 ACCEPTABLE MANUFACTURERS

A. Manufacturers:

1. Danfoss.
2. ABB.
3. Johnson.
4. Eaton.
5. Rockwell (Allen-Bradley).
6. Cerus.

1.5 SUBMITTALS

A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.
2. Connection and power wiring diagrams.
3. Technical product description including a complete list of options.
4. Operation and Maintenance data.
5. Calculation showing total harmonic distortion is less than 5%.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES

A. The VFD package as specified herein shall be enclosed in a UL Listed NEMA 1 enclosure.

1. Environmental operating conditions: 0 to 40^0 C (32 to 104^0 F) continuous. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.

B. All VFDs shall have the following standard features:

1. All VFDs shall have the same interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall allow for uploading and downloading of parameter settings as an aid for start-up.
2. The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be a fault reset and help buttons on the keypad. The help button shall provide assistance for programming and troubleshooting.
3. The VFD shall have internal 5% impedance dual (positive and negative DC bus) reactors to reduce the harmonics to the power line and to add protection from AC line transients.
4. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120.
5. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.

C. All VFDs to have the following adjustments:

1. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad command, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the designated device to open without allowing the VFD motor to operate. When the device is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch shall be wired to a VFD digital input to allow VFD motor to operate. A minimum of two separate safety interlock inputs shall be provided. When any safety is opened, the motor shall be commanded to coast to stop and the controlled device shall be commanded to close.
2. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active.

3. The VFD shall include a fireman's override input. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run at a preset speed or in a separate PID mode.

D. Serial Communications:

1. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet MS/TP. The use of third party gateways and multiplexers is not acceptable. All protocols shall be certified by their governing authority.

E. EMI / RFI filters. All VFD's shall include EMI/RFI filters.

F. BYPASS CONTROLLER

1. A complete factory wired and tested bypass system consisting of a door interlocked, padlockable circuit breaker, output contactor, bypass contactor, and fast acting VFD isolation fuses. Motor overload protection shall be provided in both drive and bypass modes.
2. The bypass enclosure door and VFD enclosure must be mechanically interlocked such that the disconnecting device must be in the "Off" position before either enclosure may be accessed.
3. The VFD and bypass package shall have a UL listed short circuit current rating (SCCR) of 100,000 amps and this rating shall be indicated on the UL data label.
4. To ensure maximum possible bypass operation, fast acting fuses, exclusive to the VFD, shall be provided to allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection. This maintains bypass operation capability in the event of a VFD failure. Bypass designs, which have no such fuses will not be accepted.
5. The system (VFD and Bypass) tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage range. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain sealed in over this voltage tolerance at a minimum.
6. The bypass shall maintain positive contactor control throughout the voltage tolerance window of nominal voltage +30%, -35%. This feature is designed to avoid contactor coil failure during brown out / low line conditions and allow for input single phase operation when in the VFD mode. Designs that will not allow input single phase operation in the VFD mode are not acceptable.
7. The bypass system shall be capable of detecting a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in bypass mode are not acceptable.
8. The bypass system shall not depend on the VFD for bypass operation. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed.
9. The bypass shall be capable of being monitored and / or controlled via serial communications.
10. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process.

11. The user shall be able to select the text to be displayed on the keypad when an external safety opens. The user shall also be able to determine which of the up to four (4) customer safety contacts is open over the serial communications connection.

PART 3 EXECUTION

3.1 INSTALLATION

A. Power wiring shall be completed by the contractor, to NEC code 430.122 wiring requirements based on the VFD input current.

B. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the VFD installation manual.

3.2 START-UP

A. Certified factory start-up shall be provided for each drive by a factory authorized service center.

3.3 WARRANTY

A. The VFD Product Warranty shall be 36 months from the date of Substantial Completion. The warranty shall include all parts, labor, travel time and expenses. Warranty shall include accidental damage, line or load anomalies such as lighting strikes, accidental collision and exposure to moisture or corrosives. Vandalism, installation damage or damage from flood, fire or hurricanes are excluded from the warranty.

END OF SECTION

15990 TESTS (HVAC)

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15545 - Water Treatment.
2. 15991 - Test and Balancing.

1.2 SUBMITTALS

A. Upon completion of tests, submit marked up drawings showing portions of system tested.

B. Submit report of test results for review by A/E. Report shall contain but not be limited to the following:

1. Testing procedures followed.
2. Type and capacity of equipment used.
3. Duration of test.
4. Pressures achieved.
5. Rate or percentage of leakage.
6. Corrective action taken.
7. Retesting results.

PART 2 PRODUCTS

2.1 Provide pumps, blowers, compressors, gages, instruments, test equipment and personnel required for tests. Make provisions for removal of test equipment and draining of chilled water storage tank and all pipes, after tests have been made.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Tests of isolated portions of the system may be made to facilitate general progress of installation. Any subsequent revisions to systems will require retesting of affected portions.

B. Systems shall be tested before painting, installation of insulation and concealment.

C. Notify A/E in writing of impending tests at least 72 hours before performing test.

D. Do not perform tests without presence of A/E.

E. Piping Pressure Tests:

1. Chilled, hot, and condensing water piping systems shall be hydraulically tested at a pressure not less than 100 psi.

2. Test for not less than 2 hours with no fluctuation in pressure.
3. Tests shall be applied before connection of equipment.
4. Leaks in screwed fittings shall be corrected by remaking the joints.
5. Leaks in welded joints shall be cut out and re-welded and not by caulking.

F. Compressed Air Lines:

1. Automatic temperature control systems shall be pneumatically tested for 24 hours at a pressure of 30 psig with leakage not to exceed 10 percent (3 psig).
2. Leaks shall be corrected by remaking the joints and not by caulking.
3. All ductwork between air handlers and VAV boxes shall be pressure tested for compliance with Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "HVAC Systems Duct Design" Table 5-3 for maximum permissible leakage.
4. SMACNA "HVAC Air Duct Leakage Test Manual" shall be used as a manual of good practices for all pressure tests. The City of Key Colony Beach Test and Balance consultant, who shall be notified by the contractor, shall witness pressure testing.
5. The contractor shall use no SMACNA publication as a reference in an attempt to invalidate, or not to perform, any and all ductwork pressure testing required under this contract.

END OF SECTION

15991 TESTING AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Test and Balance Agency: City of Key Colony Beach contracted firm that will perform the test and balance services required for this project.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Testing and balancing equipment and instruments will be provided by City of Key Colony Beach contracted firm.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Test and Balance Agency will provide periodic inspection during construction and will provide water and air distribution test and balance.

3.2 CONTRACTOR'S RESPONSIBILITY

A. Furnish one complete set of approved equipment submittal data and the latest approved mechanical drawings or shop drawings to the Test and Balance Agency.

B. Before and during construction, assist Test and Balance Agency with inspection and pre-completion requirements.

C. Perform a preliminary balance to verify components and systems are operational and ready for test and balance agency.

D. Provide sufficient notice and time before final completion date for completion of testing and balancing within project schedule.

E. Prerequisite to Substantial Completion Inspection: Construction, starting, adjustment, testing and balancing, and instruction shall have been completed.

F. Provide at no additional cost to the City of Key Colony Beach, labor, materials, and tools necessary to make corrections when required without undue delay.

G. Put applicable systems into full operation and continue operation during each working day until testing and balancing is complete.

H. Test and Balance Agency shall be kept informed of any major changes made to the system during construction and shall be provided with a complete set of "record" Construction Documents.

I. Prepare air side for balancing in following manner:

1. Fans, blowers and air handling equipment shall be mechanically checked and available to operate under design conditions.
2. Splitters, volume dampers, fire dampers and vanes shall be in neutral positions.
3. Controls: Electronic, electric, pneumatic, or any combination thereof, shall be mechanically checked and available to operate under design conditions. Provide a written letter attesting that the controls are installed and operating per design requirements.
4. Provide and install filters with design static drops for clean filters acceptable to the Test and Balance Agency.
5. Locking devices at dampers shall be marked to represent the position of the dampers.
6. Make any necessary adjustments.
7. Change pulleys, belts and dampers as required to correct system balance as determined by Test and Balance Agency.
8. Check variable air volume boxes in operation to verify no loose linkages, damper blades, etc. and that all parts move freely.
9. Check safety and operating controls of electric strip heaters and verify heaters operate at minimum air flow conditions.
10. Provide fixed diameter pulleys in place of adjustable pulleys at supply fans and at return air fans after test and balance has been completed. Pulley size shall be as determined by the Test and Balance Agency. Install new belts as required and as determined by the Test and Balance Agency.
11. Provide to the Test and Balance Agency a start-up report including rated nameplate volts and amps and actual volts and amps on HVAC equipment.
12. Provide scaffolding as required for Test and Balance.

J. Prepare water side for balancing as follows:

1. Open valves to full position, including coil stop valves, close bypass valves, and open return line balancing cocks.
2. Clean strainers.
3. Examine water and system to verify a clean and treated system.
4. Check pump rotation.
5. Check system is full of water.
6. Set temperature controls to have coils call for full cooling.
7. Check operation of automatic bypass valves.
8. Check and set operating temperatures of chillers to design requirements.
9. Provide scaffolding as required for Test and Balance Agency.

END OF SECTION

15992 COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

1.2 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

1.4 COMISSIONING AUTHORITY

A. CXA shall be retained directly by the City of Key Colony Beach and report directly to the City of Key Colony Beach.

1.5 COMISSIONING PLAN

A. Commissioning plan shall be issued by CXA, concurrent with the construction documents.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase coordination meetings.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.7 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures, to be implementation for actual HVAC&R and domestic hot water systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.8 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that HVAC&R and domestic hot water systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing work and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing 10 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing agency shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Contractor , testing and balancing agency , and HVAC&R Instrumentation and Control Contractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the City of Key Colony Beach. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC&R systems, subsystems, and equipment Testing Procedures

A. HVAC&R Instrumentation and Control "Sequence and Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

B. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in HVAC piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

C. Energy Supply System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of gas hot-water and solar systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation controls.

END OF SECTION

16023 CODES AND STANDARDS

PART 1 GENERAL

1.1 REFERENCES

A. Comply with the following:

1. Florida Building Code (FBC).
2. National Electrical Code - (NEC), (NFPA 70).
3. National Fire Protection Association (NFPA), NFPA 101 and other NFPA codes as applicable, except NFPA 101 10-2.2.7 and 10.2.2.7 Exit Passageways.
4. American National Standards Institute (ANSI) A117.1.
5. American Society of Civil Engineers (ASCE).
6. Florida Accessibility Code
7. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.2 QUALITY ASSURANCE

A. Where materials and equipment are available under the continuing inspection and listing service of an OSHA approved Nationally Recognized Testing Laboratory (NRTL), furnish materials and equipment so listed.

B. Maintain a maximum of 3 helpers to 1 journeyman.

C. NOT USED

PART 2 NOT USED

END OF SECTION

16100 BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete electrical system as shown on the Plans and as specified in Division 16 sections of these Specifications. This work includes but is not limited to the following:

1. Complete distribution system for lighting and power, wiring devices, equipment and controls, panel boards and equipment provided by others.
2. Complete raceway system.
3. Underground duct bank, grounding, etc. rework as required for primary and secondary power system under the provisions of Florida Keys Electric Cooperative (FKEC). FKEC contact person is Mr. Juan Moreno at 305-852-2431.
4. Fire Detection Alarm System.
5. Intrusion Alarm and Card Access Systems.
6. Emergency Stand-By Generator, Transfer Switches. Standard base tank, muffler, battery charger, control panel and related equipment and remote annunciator panel, as required for new addition.
7. Normal and Emergency Lighting System and Luminaries.
8. Interior and Exterior Light and Control Systems.
9. Conduit and wiring system for air conditioning electrical controls.
10. Marking of all junction boxes with system voltage inside and outside of box.
11. Painting of exposed electrical and special equipment.
12. Furnishing and installing necessary access panels.
13. Complete electrical testing.

B. Coordination With Other Trades:

1. Examine drawings and specifications. Visit site to determine work to be performed by Electrical, Mechanical, HVAC, and other trades.
2. Follow as closely as possible, the drawings and riser diagrams, indicated in diagrammatic form which show the arrangements desired for the connection of electrical equipment, fixtures, principal apparatus, kitchen equipment, etc.
3. Provide required electrical materials and equipment to put work into operation, completely wired, tested, and ready for use including raceways, conductors, disconnects, starters/contactors, or other devices for proper operation and sequences of electrical, mechanical, or other systems or equipment.
4. Unless otherwise noted, conduit, wire for controls, and devices, both line and low voltage, shall be provided and installed as described in this or other parts of the Construction Documents.

    a. Install boxes or housings necessary for conduit and wire to controls including thermostats, excluding items to be installed in piping, ducts, tanks, machinery, solenoid valves, pressure switches, aquastats, or similar devices.
    b. These items are specified for installation in other sections. Connecting wiring is provided under this Division.
    c. Temperature control equipment and water heater will be furnished. Installed and tested under provision of Division 15 and wired under provisions of Division 16.

5. Control wiring in separate conduit between HVAC sensing devices and control panels or motors, shall be installed under this Division after verification from approved shop drawings of the required locations and connections.
6. All motors, unless otherwise specified herein shall be furnish and set in place under provision of Division 16.
7. Seal penetrations through fire rated floors or walls with fire resistant compound as specified in Section 07840.
8. Connect electrical equipment and devices as parts of the equipment or furniture furnished under other sections.
9. Comply with provisions of Instructions to Bidders and General Conditions and Section 01340.

C. Tradesperson Qualifications:

1. Contractor shall provide or cause to be provided by the appropriate subcontractors in the electrical trade for all work required by this Division 16, a ratio of one licensed master or journeyman for every three trainees. No other workers shall be allowed.
2. Where the work of these trades is subcontracted:

    a. The contractor shall include this requirement in those subcontracts.
    b. The subcontractor shall show capacity to bond the subcontracted work. The decision to require such bond to be issued remains with the general contractor.

D. To ensure compliance with the above tradesperson qualifications requirement, the General Contractor shall require the trade subcontractor to submit with each draw request and shall in turn submit with the General Contractor's draw request, a certified payroll identifying each tradesperson employed for the work of this section during the payroll period, the qualification level of each tradesperson, and where licensed as a Master or Journeyman the license number of each individual.

1. This certified payroll shall also reflect the number of hours spent on this project performing the work of this section and shall reflect the appropriate ratio of qualified tradespersons as required by this section.
2. Failure to comply with this section either in providing the appropriate number of required licensed personnel or failure to submit the appropriate certified payroll information as required herein shall be a major breach of the contract and shall result in rejection of the payment application where the breach occurs and be cause for termination of the contract.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Complete list of materials to be furnished under this section.
2. Manufacturers' specifications and other data required to assure specification compliance.
3. Catalog cuts, clearly marked for identification of items to be provided, including disconnects, breakers, fuses, starters, lighting fixtures, transformers, or other materials not requiring specially prepared Shop Drawings.

B. Within thirty (30) days of Notice-to-Proceed, submit in loose-leaf bound form and indexed properly, at least ten (10) copies of shop and detail drawings, factory certified prints and material lists for items included but not limited to those listed below:

1. Panelboards.
2. Disconnect switches, motor starters, fuses, time clocks, contactors and relays.
3. Transformers.
4. Terminal cabinets.
5. Wiring devices and plates.
6. Luminaires, dimmers and accessories.
7. Conduit, fittings, supports, pull boxes, wire and cable.
8. Fire Alarm System.
9. Intrusion Alarm and Card Reader Access System.
10. Emergency Generator and Transfer Switches System.

C. Shop Drawings for nonstandard items, including but not limited to anchoring layouts and details, lighting fixtures, or similar products.

PART 2 PRODUCTS

2.1 HARDWARE

A. Provide all hardware, accessories and fittings for the intended use, and to complement the items with which they are used. All materials shall have corrosion protection suitable for the atmosphere in which they are installed. All such hardware shall be U. S. Standard Size.

2.2 EQUIPMENT

A. Ensure that equipment of a similar nature is of the same manufacturer. Example: All panelboards are of the same manufacturer and of the same style.

2.3 MATERIAL PROTECTION

A. Store and protect all materials from damage prior to installation. Do not store materials directly on the ground or floor and keep as clean and dry as possible and free from damage or deteriorating elements. Do not install damaged materials.

2.4 ELECTRIC SHOCK PROTECTION

A. Provide ground fault protection in all temporary services and wiring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Factory paint or finish all enclosures, panels, cabinets, relays, safety switches, fixtures, gutters and other exposed equipment or accessories except as indicated otherwise.

B. Group mounted items shall be similar in finish and color.

3.2 IDENTIFICATION

A. Tag all conductors and identify major conduits in or at wire-ways, panels, pull boxes, switchboards, motor controllers, cabinets and similar items to assist in future circuit tracing. Conductor tags: non-conductive.

B. Use Paint markers, or other approved methods except as indicated otherwise.

C. All junction box covers shall be labeled on both sides indicating type of system and voltage.

D. All gutters, terminal cabinets, starters, transformers, panelboards and disconnects shall be identified with stencil labels indicating type of system, voltage, panel circuit designation and equipment being serviced. Provide screw on engraved white on black phenolic nameplates or permanent labeling for panelboards, switchboards and similar equipment (Do not use markers).

3.3 TESTS

A. Show by demonstration in service that all circuits and devices are in good condition to operate.

B. Test that each item of control equipment will function.

C. Test all circuits for grounds, shorts and continuity.

D. Provide all materials and equipment necessary for testing.

3.4 DEMONSTRATION

A. Demonstrate the essential features of the following electrical systems upon completion of satisfactory testing:

1. Emergency Generator System.
2. Lighting System.
3. Motor Control.
4. Contactors.
5. Electrical Motors and Starters.
6. Fire Alarm System.
7. Intrusion Alarm and Card Reader Access System.

B. The demonstration by the Contractor shall be held in the presence of the City of Key Colony Beach or his designated.

1. Demonstrate how to “start-stop”, reset, replace and emergency procedures.
2. Demonstrate one system at a time.

3.5 CONTRACT CLOSEOUT SUBMITTALS

A. Record Drawings.

B. Warranties.

C. Operating Instructions, maintenance manuals, and parts lists.

D. Point-to-point wiring diagrams.

3.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Deliver materials to jobsite in their original unopened containers with labels and certifications intact and clearly legible at time of use.
2. Store materials according to manufacturers' recommendations and as approved by A/E.

B. Replacement: In case of damage, pilferage, or other loss, make immediate repair or replacement of materials necessary to obtain approvals of A/E, without cost to the City.

C. Protection: Use necessary means to protect materials of this section before, during, and after installation, including protection of installed work and materials of other trades.

END OF SECTION

16112 RACEWAYS AND CONDUIT

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services necessary to complete the conduits, fittings and support work, as indicated on the drawings, and as specified herein.

B. All materials provided under this section shall be listed by an OSHA-approved, Nationally Recognized Testing Laboratory (NRTL).

1.2 RELATED SECTIONS:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 02200 - Earthwork
3. 07840 - Firestopping and Smoke Sealing.
4. 07900 - Joint Sealers.
5. 09200 - Metal Studs, Metal Lath, Suspensions Ceilings, Plaster, and Stucco.
6. 09900 - Painting.
7. 10400 - Identifying Devices.
8. 16120 - Wire and Cable.
9. 16131 - Outlet, Pull, and Junction Boxes.
10. 16450 - Grounding.

1.3 SUBMITTALS

A. Submit product data depicting manufacturer's literature, including printed installation instructions, and recommendations before starting work. Submit samples if requested.

B. Shop Drawings:

1. Show accurately scaled components and spatial relationships to adjacent equipment.
2. Submit shop drawings and product data under provisions of Section 01330 Shop Drawings and Product Data and samples.

1.4 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 - National Electrical Code - latest edition (NEC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fibrated Emulsion Conduit Coatings:

1. Karnak Chemical Corp., 220 Fibrated Emulsion.
2. Monsey Products Co., Monsey Asphalt Emulsion Roof Coating Fiber.
3. Sonneborn Building Products, Hydrocide 700B.

2.2 EQUIPMENT

A. Conduit shall be sized according to NEC, unless otherwise noted. Feeders and home runs shall not be less than 1/2" diameter.

B. Rigid Conduit:

1. Galvanized Rigid Steel Conduit (GRS): Hot dip galvanized or electro-galvanized, with corrosion resistant coating on the inside, threaded, standard weight steel conduit complying with Federal Specifications WW-C-581, ANSI-C80.1, UL-6 and Article 344 of the NEC.
2. Intermediate Metal Conduit (IMC): Hot dip galvanized or electro-galvanized, threaded, steel conduit complying with ANSI C80.6 and Article 342 of the NEC.
3. Rigid Non-Metallic: Schedule 40, PVC plastic 90 degrees C. complying with ANSI/UL 651, and Article 352 of the NEC.

C. Electrical Metallic Tubing (EMT):

1. Galvanized steel tubing with smooth interior coat of lacquer enamel or zinc coat.
2. Comply with Federal Specifications WW-C-563, ANSI-C80.3, UL 797 and Article 358 of the NEC.

D. Flexible Metal Conduit:

1. Steel: Flexible galvanized steel conduit (Greenfield) complying with Federal Specification WW-C-566, ANSI C33.92, UL 360 and article 348 of the NEC.
2. Liquid tight flexible metal conduit shall consist of a core of flexible galvanized sheet tubing over which is extruded an oil resistant and liquid-tight jacket of polyvinyl chloride (PVC), complying with Article 350 of the NEC.
3. Minimum size for flexible metal conduit shall be 1/2".
4. The use of MC Cable is not allowed

E. Conduit Fittings:

1. Rigid Steel Conduit and Intermediate Metal Conduit: Zinc or cadmium plated steel or galvanized malleable iron complying with ANSI listings. Fittings shall be threaded type. Bushings for Rigid Steel Conduit: 1-1/4 inch and larger, provide the threaded grounding insulated type. Insulating inserts: Thermo-setting plastic or fiber material which conforms to the flame test requirements of UL 514, molded or locked into the metallic body of the fitting. The grounding means may be either pressure type wire terminals or copper grounding lugs.
2. Rigid PVC conduit: 90 degrees C., PVC fittings UL listed. Fittings shall match conduit and complying with ANSI/UL listings.
3. EMT fittings: Zinc or cadmium plated steel or malleable iron of the compression type or steel multiple point locking (set screw) type. Couplings and connectors for EMT: Made of steel only, rain and concrete tight, and be gland, rolled steel set screw or compression type. Provide all connectors with insulated throats. Fittings larger than 2 inches: Concrete tight only. Fittings shall comply with ANSI listings.
4. Flexible metal conduit fittings: Steel or malleable iron only with insulated throat, complying with Fed. Spec.W-F-406B.

5. Fittings for Liquid-Tight Flexible Conduit shall incorporate a threaded grounding cone, a steel or plastic compression ring and a gland for tightening and shall be made of steel only with insulated throats.
6. Bushings and connectors shall incorporate an insulating insert of at least 150 degrees C. rated plastic or 105 degrees C. rated nylon. Conduit bushings made entirely of nonmetallic material are not allowed. Grounding and bonding bushings shall have clamp type terminal for copper conductor.
7. Expansion Fittings and Sealing Fittings: Shall be listed by a NRTL, with ground continuity means. Expansion fittings shall be deflection and expansion type.
8. Conduit sleeves shall be galvanized steel, cast iron, plastic or ductile iron pipe when they are located in concrete walls, foundations or floors.
9. Die cast zinc alloy fittings are not allowed on any type of conduit.

F. Conduit Supports:

1. Pipe Straps: Formed zinc coated steel or malleable iron one-hole pipe straps or conduit clamps sized for conduits or tubing. Individual and multiple pipe hangers and riser clamps including all parts and hardware: hot-dipped galvanized throughout. Provide all U-bolts, clamps, attachments and hardware for hanger assembly and conduits. Design each multiple hanger to support load equal to or greater than the sum of the weights of the conduits, wires and hangers itself, plus 200 pounds. Hangers and hardware: Federal Specification WW-H-171d. Manufacturers shall be Allied Tube, Triangle Conduit or Carlon products.
2. Fastenings: Zinc coated, or cadmium plated steel screws, bolts, toggles, and expansion anchors as required. Nailing or nail-n anchors are not allowed.
3. Electrical steel channels shall be equivalent to Unistrut P-3000 Series. Provide trapeze, clamps, supports, concrete inserts, galvanized steel or plated steel with galvanized conduit clamps, and threaded 1/4" diameter minimum suspension rods.
4. For individual branch circuit EMT or flexible metal conduit concealed above accessible hung ceilings only, "caddy clips" spring steel conduit clamps.

G. Conduit Coatings: Steel conduit buried directly in the earth shall receive a factory applied PVC coating or 2 coats of fibrated emulsion conduit coating. Comply with manufacturer's

H. Wireways and Auxiliary Gutters:

1. Hot dip galvanized code gauge sheet steel, complete with knockouts, enclosures, and removable covers unless indicated as hinged.

    a. Manufacturers:

        1) Hoffman.
        2) Keystone.
        3) Square D.

2. Exterior locations shall have weather-tight gasketed covers, joints, and drip-proof rain shields. Paint after installation with exterior enamel paint.
3. Wireways and gutters shall comply with NEC requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not proceed with the work of this Section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Provide where indicated and where required, ducts, conduits, tubing, wireways, and gutters to form a complete and integrally grounded raceway system. The system shall be installed according to NEC and local code requirements. Components of the system shall be of sufficient size, strength, and capacity to allow for placements, pulling-in, or other installation of conductors, wires, cables, splices, taps, and terminations whether included in this Contract or for future use without strain or damage to those items being installed.

B. Provide pull wires in empty raceways where no conductors are installed in this Contract. Allow 10 inches minimum slack at each end of pull wire and securely caulk in place. Provide marking tags showing opposite destination noting building and closet number at each end.

C. The minimum size of rigid conduit, EMT, and flexible metallic conduit shall be according to NEC except as follows:

1. Unless otherwise specified under "Products" or shown on the Drawings.
2. Unless otherwise shown on the Drawings, telephone conduits shall be not less than half inch (1/2") trade size.
3. Feeders and homeruns shall not be less than 1/2" diameter. Homerun conduits shall be defined as conduits that carry power from the circuit breaker to the first electrical box, plug or switch in the circuit.

D. Check sizes of raceways to determine the green equipment ground conductor specified, shown, or required can be installed in the same raceway with phase and neutral conductors according to the percentage of fill requirements of NEC. If necessary, increase the duct, conduit, tubing, or raceway sizes shown or specified to accommodate conductors without additional cost to the City of Key Colony Beach.

E. Raceway and Conduit Locations: Unless indicated otherwise, conduit types specified shall be used in the following locations. Any deviation from this schedule shall be submitted for approval with corresponding price adjustments before installation. Any conduit installed and not of the specified type shall be removed and replaced with the specified type at no additional cost to the City of Key Colony Beach.

1. Exterior Raceways:

a. Below Grade:

1) Below Grade Direct Buried:

a) Galvanized rigid steel (GRS) painted or PVC jacketed.
b) PVC Schedule 40, as noted on plans.

2) Below Grade Concrete Encased:

a) GRS.
b) PVC Schedule 40.

b. Exterior Exposed – Wet Locations:

1) GRS conduit.
2) IMC conduit.
3) PVC flexible conduit, PVC jacketed with liquid tight fittings.
4) Gutters, wireways, and troughs of the gasketed, raintight type.

c. Exterior Exposed – Damp Locations:

1) GRS or IMC conduit
2) PVC flexible conduit, PVC jacketed with liquid tight fittings.
3) EMT conduit with steel fittings, permitted only under covered areas protected from rain.
4) Gutters, wireways and troughs of the gasketed type.

2. Interior Raceways:

a. Under Slabs on Grade:

1) GRS (painted or PVC coated).
2) PVC Schedule 40, with 12 inches clear to bottom of slab.

b. Embedded in Concrete Walls or Floor On or Below Grade:

1) PVC or GRS with threaded or concrete tight steel fittings.

c. Embedded in Concrete Walls or Floors Above Grade:

1) PVC Schedule 40.
2) GRS or IMC with threaded or concrete tight steel fittings.
3) EMT with concrete tight steel fittings.

d. Concealed in Masonry Walls:

1) GRS or IMC with steel fittings.
2) PVC Schedule 40, as noted on plans.
3) EMT with concrete tight fittings.

e. Concealed in dry wall construction, or in suspended ceilings:

1) EMT or flexible metal conduit with steel fittings.

f. Interior Exposed:

1) GRS or IMC at 8 feet or less above finish floor.
2) EMT with steel fittings, at locations a minimum of 8 feet above finish floor.

3) Option: EMT installed below 8 feet from floor in electrical, mechanical, and telephone rooms.

3. Sealing fittings shall be installed at the following points and as otherwise indicated:

   a. Where conduits pass from warm locations to cold locations, such as refrigerated spaces and air-conditioned spaces, use to prevent passage of water vapor.
   b. Where required by the NEC.

4. PVC conduit shall not be used indoors either exposed or concealed, except embedded in concrete, in masonry walls for lightning protection system down conductors or under slabs on grade.

   a. The depth of conduits under interior slabs shall be based on the minimum allowable bending radii of stub-ups and NEC requirements.
   b. Stub-ups on exterior and exterior walls shall be GRS, with transitions from PVC to GRS occurring below grade. Curves to stub-ups shall be GRS.
   c. PVC conduit elbows into in-ground handholes are acceptable.
   d. PVC Indoor Exception: Exposed in the Main Electrical Room for protection of the main electrical grounding conductor.

F. Raceway and Conduit Installation:

1. Conduit Routing:

   a. Route feeders, homeruns, and conduits as indicated on drawings, except for minor deviations as accepted by the A/E.
   b. Maintain a minimum separation of 12 inches between conduits containing emergency feeders and conduits containing normal feeders.
   c. The routing of conduits, as shown on the plans, is general and diagrammatical.
   d. Before installing any work, examine the working layouts of all other trades to determine exact locations and clearances.
   e. Where equipment is installed by other trades requiring connection as specified in this section, determine exact conduit entry locations from the approved shop drawings.
   f. Modifications to conduit runs shown on the electrical drawings, based on this section, shall be made without additional cost to the City of Key Colony Beach, and shall be subject to A/E approval.
   g. In determining clearances, conduit shall not be run within 6 inches of any heated pipe or duct, or if unavoidable, the conduit must be kept at least 1 inch from the outer covering.

2. Conduits In Finished Spaces:

   a. Conduits, fittings, outlet boxes, and pull boxes shall be concealed in ceilings, floor slabs, walls, or partitions of the buildings.
   b. Provide sufficient space at concealed conduits over conduit and coupling for the applications of finished floor, walls, and ceilings.
   c. Examine the Drawings, and if necessary, confer with the A/E to determine the type of construction containing the concealed conduits and the space available for such conduits.

d. Unless otherwise shown on the Drawings, conduit may be run exposed on unfinished walls, on un-furred basement ceilings, in mechanical rooms and in penthouses, attics, and roof spaces.

3. Roof Conduit:

   a. Avoid running conduit on the roof wherever possible.
   b. If absolutely necessary, roof mounted conduit shall be GRS, a minimum of 16 inches above roof. Coordinate with roofing specifications for penetration and support requirements.

4. Conduits Penetrating Waterproof Membranes Under Floor Slabs on Grade:

   a. Coordinate installation of conduits before installation of waterproof membrane.
   b. Membrane to be sealed waterproof to conduits as specified in Section 07120 before pouring of slab over membrane.
   c. Provide Schedule 40 galvanized steel pipe sleeves for conduits penetrating floor slabs as specified in the section of the Master Specifications applicable to the Project.

5. Conduits Penetrating Waterproof Membranes on Walls: Provide properly coordinated Schedule 40 galvanized steel pipe sleeves for conduits in concrete forms as specified in the section of the Master Specifications applicable to the Project. Membrane to be sealed waterproof to conduits as specified in the section of the Master Specifications applicable to the Project.

6. Conduit Embedded in Concrete:

   a. Conduit embedded in poured concrete shall be of the specified type, unless otherwise indicated.
   b. Metallic conduit buried in the ground shall be of the specified type and painted with a rust inhibitor.
   c. The outside diameter of any conduit buried in concrete shall not exceed one-third of the thickness of the structural slab, wall or beam in which it is placed. The conduit shall be located entirely within the middle third of the member whenever possible.
   d. Lateral spacing of conduits buried in concrete slabs shall be not less than three diameters except where drawings indicate the concrete slab has been specially designed to accommodate a closer spacing of conduits entering signal or electric closets, panelboards, etc., or the arrangement is accepted by the A/E.
   e. In general, conduits shall not be run through beams, except where clearly indicated on the drawings, specified, or where allowed by the A/E. Specifically note such conditions on shop drawings for A/E review.
   f. No vertical conduit passing through horizontal concrete beams shall interfere with reinforcing. Where accepted by the A/E, horizontal conduit may pass through beams, provided they are not closer than 6 inches clear and are confined to upper half of beam section.
   g. Properly support conduit to be embedded to maintain correct location and spacing during concreting operations. If necessary, provide suitable metal supports for this purpose.
   h. Where a concrete embedded conduit passes through an expansion or contraction joint in the structure, install the conduit at right angles to the joint, and

provide an approved conduit expansion fitting at the joint installed according to the manufacturer's instructions. Paint the conduit with an approved bituminous compound for 1 foot on either side of the expansion joint.

i. Conduits concealed in slabs on grade shall be installed over vapor barrier. Underground rigid conduit not encased in concrete shall receive the specified conduit coating.
j. Factory applied plastic resin or epoxy coated metal conduit and fittings may be used, provided that coating holidays and abrasions to coating are repaired with compatible mastic.
k. At any 1 point, not more than 2 lines of conduits shall intersect in any portion of slab.

    1) In all such cases, any additional conduit shall be rerouted through other areas, or run under the slab and stubbed through the slab at the required locations.
    2) Conduits and pipes shall have a minimum cover of 1 inch of concrete.
    3) Do not install conduit in slabs 3 inches thick or less.
    4) Under no conditions shall aluminum conduit be buried in concrete slabs.
    5) Conduits installed in slabs and rising CMU walls shall be stubbed within webbing of block and shall be extended vertically concurrently with laying of block.

7. Conduit Bending, Cutting, and Placement:

    a. Conduit bends and offsets shall be avoided where possible.
    b. Required bends shall be made with standard benders designed for the purpose and with a minimum radius of 6 times the internal conduit diameter.
    c. Make conduit bends according to the NEC unless otherwise shown on the contract Drawings. Use of a pipe tee or vise for bending conduit is not allowed.
    d. Conduit crushed or deformed shall not be installed.
    e. Bends shall be free from dents or flattening. Bends more than 360 degrees are not allowed in conduit between any 2 terminations of pull boxes, as per NEC requirements.
    f. Make no bend in surface raceways. Use factory formed fittings for surface raceways.
    g. The ends of conduit shall be carefully reamed out free from burrs before installation and after threading.

        1) Cuts shall be made square.
        2) Coupling of conduit by means of running threads is not allowed.
        3) Where it is impossible to run the conduit and coupling sections together, an Erickson coupling, or other accepted combination coupling shall be used.
        4) Joints shall be made up mechanically tight.
        5) Joints in conduits concealed in slab, floor fill, earth, etc., shall be made using approved silicone paint on threads.
    h. Prevent lodgment of plaster, dirt, or trash in raceways, boxes, fittings, and equipment during course of construction. Clogged raceways shall be entirely freed of obstructions or replaced.
    i. During installation of conduit, unfinished runs and terminations in pull boxes, cabinets, etc., shall be capped until conductors are installed.
    j. Plastic caps designed for this specific purpose shall be used to cover and align conduits before concrete pours and shall remain on conduit stub-ups until conduit

is extended. Caps shall have self-aligning, interlocking male or female wings molded on each side. Duct or electrical tape and wire are unacceptable.

8. Conduit Connections:

   a. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Unless otherwise specified, each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. Where nominal circuit voltage exceeds 250 volts:

      1) In rigid conduit, an additional locknut shall be provided, 1 inside locknut and 1 outside locknut.
      2) In EMT or flexible metal conduit, the 1 locknut shall be made wrench tight.
      3) Locknuts shall be the bonding type with sharp edges for digging into the metal wall of an enclosure and shall be installed to provide a locking installation.
      4) Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections.
      5) Conduit bushings for power and branch circuits in sizes larger than 1 inch shall be metal and for sizes 1-inch or smaller may be PVC. Conduit bushings for all low voltage conduit sizes may be PVC.
      6) Protect vertical runs of conduit or EMT terminating in the bottoms of wall boxes or cabinets, etc., from the entrance of foreign material before the installation of conductors.

   b. Plastic conduit joints shall be made by brushing a plastic solvent cement on the inside of the plastic coupling fitting and on the outside of the conduit ends. Slip together the conduit and fitting, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly. Remove excess cement built-up on the surface of the conduit.
   c. The end of each conduit one inch and smaller shall be provided where it enters a junction box, outlet box, cabinet, etc., with the locknut and bushing. For conduits 1-1/4" and larger, use insulated bushings with ground stud. If insulated bushings are of the fully insulated type, use additional locknuts inside the junction box or cabinet before installing the bushing. Provide conduit entering main distribution switchboard feeder pull boxes with insulated bushing with ground stud regardless of size.
   d. Install the conduit system complete before any conductors are drawn in. Each run of conduit shall be blown through and swabbed after plaster is finished and dry, and before conductors are installed.
   e. Install conduit to drain any moisture, collecting in the conduit, to the nearest outlet or pull box, where possible.
   f. Where metallic conduit is exposed to different temperatures, seal the conduit to prevent condensation and passage of air from one area to the other.
   g. Light and power conduit shall run from a permanent and continuous ground return back to the service ground connection point. Conduits used on systems entirely isolated from the light and power distribution system shall be electrically continuous and grounded in an approved manner. Ground cable trays to the conduit system.

9. Conduit Penetrations and Supports:

    a. Sleeves, conduits, or other pipes passing through floor slabs, beams, or walls shall be located to not impair the strength of the structure.
    b. Conduits penetrating the walls or smoke partitions shall be fire stopped (sealed). Filling materials for openings in floors shall be fire-resistive, and finished to prevent passage of water, smoke and fumes. Filling material for openings in walls shall be fire-resistive where it occurs in fire walls and shall be installed to prevent the passage of air, smoke or fumes. Where conduit and wiring pass through fire walls or floor slabs, the Contractor shall fill the opening with fireproof sealant, as specified in Section 07840.
    c. Roof penetrations shall be made using approved flashings and counter-flashings. Do not run conduits up through roof nearer than 12 inches from toe of cant strip. Where conduits penetrate exterior walls near flashings, penetration shall be at least 3 inches above the flashing reglet.
    d. Where conduits passing through the openings are exposed in finished rooms, the finishes of the filling materials shall match and be flush with the adjoining floor, ceiling, or wall finishes.
    e. Where unused sleeves or slots are provided for future installation of conduit, etc., they shall be suitably identified if not readily recognizable.
    f. EMT and conduits not embedded in concrete or masonry shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports, etc. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.
    g. Run conduits exposed in unfinished spaces, mechanical equipment spaces, where specifically indicated on the Drawings, or with the expressed permission of the A/E.

        1) Feeder conduits shall be run exposed or in hung ceilings, except as noted.
        2) Where exposed conduits are installed, they shall be run parallel to the building walls or partitions, using approved conduit fittings.
        3) Exposed conduits shall be securely supported with malleable iron pipe straps, angle iron pipe straps, angle iron or steel channel racks or other approved means as required for clearance of other piping or ductwork.
        4) Wood hangers and perforated sheet metal hanger straps are not allowed.
        5) Spacing of conduit supports shall not exceed 7 feet.
        6) Horizontal feeder conduit banks shall have their hangers fastened to the building structure by approved means.
        7) Hangers for banks consisting of 1 or 2 conduits may be fastened from inserts in the slab.
        8) Auxiliary steel for fastening shall be furnished and installed under this section.

    h. Support individual conduits not larger than 1-1/2" diameter by means of one-hole pipe straps or individual pipe hangers. Support individual horizontal conduits larger than 1-1/2" diameter by individual pipe hangers.
    i. Conduit located in hung ceilings shall be supported in approved manner similar to exposed conduits.
    j. Branch circuit conduits above suspended ceilings may be supported from the floor construction above or from the main ceiling support members, however, the finished installation shall not interfere with the removability of ceiling panels. Individual branch conduits above suspended ceilings with removable panels may

be supported from the ceiling suspension wires provided the load imposed on any individual wire is not greater than 64 pounds, including the ceiling weight.

k. Unsupported vertical drops over 10 feet from bus ducts or at motors shall be in rigid steel conduit. For vertical drops of less than 10 feet EMT may be used. Brace conduit to prevent swaying.
l. Space conduits installed against concrete or masonry surfaces away from the surface by clamp backs or other approved means.
m. In dry locations, spring steel fasteners, clips, or clamps specifically designed for supporting exposed single conduits may be used instead of pipe straps or pipe hangers.

    1) Hanger rods used with spring steel fasteners shall be not less than 1/4" diameter steel with corrosion resistant finish.
    2) Spring steel fasteners shall be specifically designed for supporting single conduits or EMT
    3) Type, size and spacing of spring steel fasteners with accessories shall by approved by the A/E and the Contractor.
    4) Submit applicable load and rating data for approval.
    5) Wire shall not be used for support.
    6) Nails are not allowed for the support of conduit.

n. Where 2 or more horizontal conduits or EMT run parallel and at the same elevation, they shall be supported on multiple trapeze pipe hangers. Each conduit or EMT shall be secured to the horizontal hanger member by a U-bolt, one-hole strap, or other suitably designed and approved fastener.
o. U-bolts, clamps, attachments, and other hardware necessary for hanger assembly, and for securing hanger rods and conduits shall be provided. Each multiple hanger shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger, plus 200 pounds. Hardware shall be hot dip galvanized after fabrication.

10. Fittings:

    a. Expansion Fittings: Each buried conduit in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fittings shall be made of hot dip galvanized malleable iron and shall have a factory installed packing that will prevent the entrance of water, a pressure ring and a grounding ring.
    b. In addition to the grounding ring, a separate external copper bonding jumper secured by grounding straps on each end of the fitting shall be provided.
    c. Sealing Fittings: Sealing fittings for use with rigid steel conduits shall be of the threaded, zinc or cadmium coated, cast or malleable iron type. Fittings used to prevent passage of water vapor shall be of the continuous drain type.
    d. Sealing fittings shall be installed and sealed according to the manufacturer's recommendations at suitable, approved, accessible locations. In concealed work, each fitting shall have an access door or panel to allow access to the fitting.
    e. Set screw and compression steel fittings shall be made up mechanically tight according to manufacturer's recommendations.

11. Conduit Fastening: Fasten raceways as follows:

a. To Wood: Wood screws, sheet metal screws, or screw type nails.
b. To Hollow Masonry: Toggle bolts or expansion bolts as required. Holes not used to be filled.
c. To Concrete or Solid Brick Masonry: By steel expansion bolts. Holes drilled to a depth of more than 1-1/2".
d. To Steel Work: Machine screws, welded threaded studs, or spring-tension clamps. Raceways or pipe straps shall not be welded to steel structures.
e. To Light Steel Construction Partitions: Sheet metal screws. Bar hangers may be attached with saddle ties of 16 gage double strand zinc-coated steel wire.
f. Explosive charge setting devices are not allowed for any type of fastening on the project.
g. Conduits, tubing, or raceways shall be continuous from outlet to outlet, cabinet, junction box, or pull box.
h. Surface Wireways and Auxiliary Gutters: Fasten according to manufacturer's directions with fastenings appropriate for surface as specified.
i. Cable Supports in Vertical Raceways: According to NEC Article 300-19.

12. Flexible Conduit:

    a. Flexible conduits shall be used for connections to motors and other electrical equipment when it is subject to movement, vibration, misalignment, cramped quarters, or where noise transmission is to be eliminated or reduced. Flexible conduit used to meet the above requirements shall be of the liquid-tight type when installed under any of the following conditions:

        1) Exterior locations.
        2) Moisture or humidity laden atmosphere where it is possible for condensation to accumulate.
        3) Corrosive atmospheres.
        4) Where water or spray due to wash-down operations is frequent or possible.
        5) Wherever there is a possibility of seepage, dripping, etc., of oil, grease, or water.

    b. Flexible conduit shall be used for short connections to control devices, recessed fixtures, and similar items with enough slack to avoid tension. Connection between structure and first point of attachment to vibrating equipment shall be flexible.

13. Empty Conduits: Where empty conduit or tubing is indicated for wiring to be installed in future by utility company or by separate contract, install conduit or tubing according to previous requirements for conduit and tubing with following additional requirements:

    a. No length of run shall exceed 75 feet for 1/2" size, 100 feet for 3/4" size, and 150 feet for 1 inch or larger sizes.
    b. Raceways shall not contain more than four 90-degree bends or equivalent.
    c. Install additional pull or junction boxes to comply with above limitations, whether or not indicated.
    d. Inside radii of bends in conduits of 1 inch or larger shall be not less than 10 times nominal diameter.
    e. Provide pull wire in empty raceways.

14. Painting: Paint exposed conduits to match the surrounding wall or ceiling it is mounted against, according to Section 09900 Painting.

3.3 FIELD QUALITY CONTROL

A. Grounding: Test cable trays to ensure electrical continuity of bonding and grounding connections.

3.4 ADJUSTING AND CLEANING

A. Upon completion of installation of cable trays, inspect trays, fittings, and accessories, remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

16120 WIRE AND CABLE

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials equipment and services necessary to complete for the Wire and Cables work, as indicated on the drawings, and as specified herein.

B. Related Sections:

1. 16112 - Raceways and Conduit.

1.2 SYSTEM DESCRIPTION

A. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

B. Provide wires and cables comprised of copper conductors under provisions of the American Society for testing and materials (ASTM) and insulated Power Cable Engineers Association (IPCEA) Standards.

1.3 SUBMITTALS

A. Submit shop drawings, product data, and descriptive literature before starting work, and as specified in other section of the Master Specifications applicable to the project.

B. Delivery, Storage and Handling shall conform to Section 16100, Basic Materials and Methods". Deliver, store, and handle all wire and cable in complete coils, boxes, or reels with manufacturer's name and approval tag attached. Tag to indicate wire size and type of insulation.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Wire and Cable:

1. Wire and cable shall be soft annealed 98 percent conductivity copper with 600-volt A.C. thermoplastic insulation unless otherwise noted.
2. Wire and cable shall be new and manufactured not more than 12 months before installation.
3. Each coil or reel shall bear UL label and wire marked with AWG or circular mil wire size, voltage rating, insulation type, type stranding, and the manufacturer's name.
4. Unmarked wire found installed shall be replaced at no additional cost to the City of Key Colony Beach.
5. Wiring shall comply with NEMA WC-5, NEMA WC-7, IPCEA S-61-402 and IPCEA S-66-524.

B. Light and Power Wiring Circuit Conductors:

1. Light and power wiring circuit conductors may be stranded in sizes No.10 AWG and smaller, and concentric strand Class B for conductors No.8 AWG and larger.
2. Stranded copper conductors may be used for final connections to individual recessed lighting fixtures, devices, and for control and signal circuit wiring only with crimp-on type terminations.
3. Do not use stranded wire for wiring to receptacles unless insulated crimp-on connectors are installed on the wiring ends.

C. Wiring Insulation shall be as follows:
1. Lighting and receptacle branch circuit protected at no more than 20 amperes: solid copper having THHN/THWN-2 insulation, in trade size #12 AWG rated 600 volts, 90 degrees Centigrade in dry and wet locations.
2. All control and alarm wiring: type THHN/THWN-2 stranded copper in trade size #14 or smaller, rated 600 volts, 75 degrees Centigrade in dry and wet locations.
3. Unless otherwise specified or shown, all other branch or feeder conductors: stranded copper having THHN/THWN-2 insulation, in trade sizes No. 10 AWG TO 600 MCM, inclusive.
4. Provide distinctive markings for the covering of wires and cables designed to meet the above specification so that they may be readily identified in the field. Provide a distinctive color code for the covering of the individual conductors for identification of individual conductors.

D. Color Coding:

1. Color Code secondary service feeder and branch circuit conductors throughout the electrical system as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Purple
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green

2. Conductors:

a. As manufactured by Colonial Wire and Cable, Southwire Company, or American Insulated Wire and conform under provisions of NFPA and IPCEA.
b. 98 percent conductive copper under provisions of Matheisen's Standard rated for 600 volts.
c. Aluminum conductors are not acceptable.
d. Stamped for voltage, type, temperature, size, etc.

3. All other colors (violet, traced, etc.) shall only be used for switch legs, control, or communication circuits.
4. Conductors for control wiring shall be color coded, using different color coding than the energy conductor coding specified above. Control wires shall be numbered.

E. Minimum Wire Size shall be No.12 AWG for distribution, power and lighting, and control over 200 feet, unless otherwise noted. Control wiring may be No.14 AWG if distance is less than 200 feet.

1. Fire alarms, CCTV and intrusion systems shall have cable and wiring according to manufacturer's specifications or as specified.

F. Wire and Cable Connectors and Terminations:

1. For splices in branch circuit conductors solid or stranded size No.10 AWG and smaller, use UL listed soft plastic wire nut with sharp self-cutting interior threads, 3M Scotchlok, Ideal Supernut, or T&B Piggy of the size to match the wire.
2. For terminations of stranded or solid wire in size No.10 AWG and smaller at equipment terminals, use UL listed, tin-plated copper, 600-volt vinyl insulated compression type ring or fork type equivalent to T&B "Sta-Kon" or Burndy "Vinylug".
3. For No.8 AWG and Larger: T&B "Locktite" connectors, Burndy "Versitap" connectors, or OZ-Gedney solderless connectors, with insulating covers, tape or heat shrink insulation system.

    a. Terminations and splices in feeders may be made with solderless pressure type connectors complete with composition insulating covers, field insulating tape, or heat shrink insulation system.
    b. Connectors and lugs for 250 mcm cable and larger shall be of the 2-hole type and for compression type shall have at least 2 indents.
    c. Compression lugs and connectors shall be tin plated wrought copper, of size to match the cable.

4. Splices in underground exterior wiring shall be made fully waterproof by potting or encapsulating. 3M ‘Scotchcast’ in-line resinpower cable splice kit or equivalent for wire sizes #4 AWG and larger, and 3M direct bury splice kit or equivalent high impact, UV resistant tube pre-filled with water-resistant gel for wire sizes #6 AWG and smaller. Underground waterproof splice kits shall be listed by an OSHA approved NRTL.
5. Insulating tapes shall be of a type approved for the application and shall be flame retardant. Tapes shall be as manufactured by 3M or Bishop Electric.
6. Cable Ties: T&B "Ty-Rap" or Burndy "Unirap".
7. Cable Identification: Branch circuits wire markers 3M "Scotch Code" or accepted equivalent. For feeder sizes, non-ferrous metal stencil tags.
8. Thermal Fusion Connections: "Catalytic thermal weld" by Cadweld or accepted equivalent.
9. Arc/Proofing Tape

    a. A tape consisting of a flexible, conformable fabric of organic composition coated one side with a flame retardant elastomer.

        1) Tape shall not support combustion, shall be self-extinguishing and shall retain not less than 65 percent of its original tensile strength when tested by the cut-strip method of ASTM.
        2) Include test information of exposure to distilled water, 3 percent salt water, ultraviolet light and sunlight in compliance with ASTM requirements.

10. Control Wiring:

    a. Control conductors for 75 volts or less: #18 AWG stranded copper.

b. Wiring: comply with NEC Art. 725 Class 1, Class 2, Class 3 Remote Control, Signaling and power limited circuits.
c. Communication, sound and intercommunication conductors: 100 percent shielded.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Wire and Cable Installation:

1. Wire and cable shall be suitably protected from weather or damage during storage and handling and shall be in first-class condition when installed.
2. Conductors shall not be pulled into conduit until raceway system is substantially complete. Wiring shall be continuous within conduit runs. Splices will be allowed only at outlet and junction boxes. Joints shall be mechanically and electrically secure.
3. Pulling lubricants, if used, shall comply with UL requirements for the type of conduit material and cable insulation being used.
4. Commercially produced wire lubricant may be utilized to ease wire pulling. Lubricant of a type to produce no deteriorating effect on conductor installation or on the interior of associated wire way and shall be approved by the wire manufacturer.
5. Care shall be taken to prevent cutting and abrasion of cable insulation during the pulling of feeders.

    a. Ropes used for pulling of feeders shall be made of polyethylene or other suitable nonmetallic material.
    b. Pulling lines shall be attached to conductor cables by means of either woven basket grips or pulling eyes attached directly to the conductors.
    c. Rope hitches shall not be used.
    d. Cables to be installed in a single conduit shall be pulled in together.
    e. Where polyethylene insulation is used and a pulling lubricant is required, the lubricant shall be certified by the manufacturer to be non-damaging to such insulation.
    f. Cables without a metallic sheath, the cable support: of the split wedge composition type with clamps each individual conductor firmly and tightens due to the weight of the cable. All boxes: hot-dipped galvanized after fabrication.

6. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impracticable and shorter radii are allowed by the NEC and NEMA Standards.
7. Neatly and securely bundle conductors located in branch circuit panelboards, cabinets, control boards, switchboards, and motor control centers. Use nylon bundling straps.
8. Provide suitable installation equipment to prevent cutting or distortion of conduits during the pulling of feeders. Use masking or other means to prevent obliteration of cable identification when solid color coating or colored tracers are used.

9. Control wiring color codes shall be of type as required by its equipment manufacturer. Interconnections of control wiring shall be on numbered terminal strips.
10. Where 2 neutrals are installed in same conduit, their sets of wiring shall be grouped and clearly identified by permanent tags or other means.
11. At each outlet, a loop or end-of-wire not less than 9 inches long shall be left for connection to lead.
12. Leading end of each conductor pulled shall be carefully examined for damage to jacket. If damage is evident, cable shall be extended and further checked for damage, with good cable only to remain.
13. Cables in junction and pull boxes shall be properly trained and racked.
14. Branch circuit wiring in panelboard gutters shall be installed vertically in the gutter with a 90-degree bend at the supply circuit breaker, wire shall enter the circuit breaker lug horizontally.
15. Install cable supports and boxes at vertical feeders and according to the schedule in the NEC. Boxes shall be built of heavy steel plates not less than No.10 USS gage fastened to an angle iron frame with removable covers secured by brass machine screws. The cable support shall be of the split wedge type that clamps each conductor firmly and tightens due to the weight of the conductor.
16. Install wires in conduit runs after concrete and masonry work is complete and moisture is swabbed from conduits.

B. Wire and Cable Splicing and Terminations:

1. Splices and terminations of conductors shall be made using specified materials and methods installed according to the manufacturer's recommendations. Make conductor length for parallel feeders installation of exactly the same length.
2. Splices in branch circuit wiring shall be made by stripping conductor insulation, twisting conductors until mechanically secure, and installing a self-threading insulated type connectors. In the making of a splice, connectors shall be brought up upon the conductors so that all the conductors are equally engaged, the insulation is not ruptured, no bare wires are exposed or have backed-off due to application of pressure and the connector will not loosen due to cycling or vibration, in order to insure an efficient splice. Splices are not allowed within panelboards.
3. Conductors shall be squarely cut and fully inserted into the lug barrel or connector. Insulation shall be stripped without cutting the conductor or removing strands, exposing the conductor for the minimum distance required for connection. Splice connectors shall be of a type and be so installed that the conductor is fully insulated by a skirt of such design or taped so cold flow of the conductor insulation will not be induced when the conductor is positioned in its final operating position. No splices or joints will be permitted in either feeder or branch, circuits, except at outlets or accessible junction boxes.
4. Do not combine conductors under the same lug. Provide individual lugs for individual conductors. Re-tighten bolt type connectors 24 to 48 hours after initial installation and before taping.
5. Connectors shall be insulated by approved type, integral or separate cover, or by means of taping with approved plastic or rubber and friction tapes to provide insulating value equal to that of the conductors being joined. The number and size and combinations of conductors allowed by UL as listed on manufacturers' packaging of connector shall be strictly complied with.
6. Terminations at equipment terminal blocks shall be made using compression type connectors suitable to match terminal type.

7. Continuity of neutral on multi-wire branch circuits shall not be made on any device at terminal blocks, but shall be spliced and a tap brought out, thereby assuring no openings of the neutral in the replacement of a device.
8. Feeders shall be identified by means of nonferrous tags or pressure-sensitive labels securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc. Tags or labels shall be stamped or printed to include the feeder number, source and equipment supplied. If suspended type tags are provided, they shall be attached by nylon cables ties or other nonconductive permanent means.
9. Branch circuit conductors shall be identified at supply circuit breakers, with the circuit number using pressure sensitive adhesive wire markers.
10. Branch circuit wiring for lighting and other single phase 277-volt or 120-volt applications shall be multi-wired utilizing common neutrals. Under no circumstances shall any switch break a neutral conductor.
11. Circuiting work shall comply with the following:

    a. Loads on panel busses shall be balanced on phases as evenly as possible.
    b. No neutral conductor shall be common to more than 1 circuit conductor connected to the same phase leg of the supply system.
    c. Circuiting of panelboards shall allow breakers to be grouped logically by functions.

C. General Wiring Methods:

1. Provide wiring complete from point of service connection to all receptacles, luminaires, power outlets, pull and junction boxes and other devices as shown. Provide slack wire for all future connections. Unless otherwise specified, branch circuit conductors, provide No. 12 AWG or larger. In outlet boxes for future installations, tape ends of wires and blank covers installed.
2. Do not bend cables during installation to radii less than that recommended by the manufacturer.
3. Bundle conductors not larger than No. 10 AWG located in branch circuit panel boards, signal cabinets, signal control boards, switchboards and motor control centers. Cable in individual circuits, conductors larger than No. 10 AWG located in switchboards, motor control centers and pullboxes.

    a. Bundling and cabling shall be provided with straps made of self-extinguishing nylon.
    b. Each strap shall be constructed with a locking hub or head on one end and a taper on the other.
    c. Apply Arc-proofing, as specified, after cabling.

4. Where the length of a homerun, from panel to first circuit, exceeds 100 feet for a 120-volt circuit or 150 feet for a 277-volt circuit, the conductor size shall be No. 10 AWG.
5. Where homerun circuit numbers are shown, follow such numbers in connecting circuits to panel boards. Where panel board cabinets are recessed, stub up concealed conduits (with sufficient capacity to carry the number and size of future conductors) to a junction box for future connections and extensions located as follows:

    a. In an area with removable ceiling, provide accessibility above the suspended ceiling for the junction box.

b. In an area with non-removable ceiling, recess the junction box in the ceiling directly over the panel board location.
c. In an area without suspended ceiling but with finished wall, recess the junction box in the wall directly above the panel board as directed by the A/E.
d. In an area without suspended ceiling but with unfinished wall, expose the junction box on the ceiling directly over the panel board location.

6. Do not utilize channel support members for suspended type fluorescent lighting fixtures for building branch circuit wiring unless otherwise indicated. Connections between units in continuous rows shall be made within the fixture wireway.
7. Provide dedicated neutral conductors for computer power outlets.

D. Phasing and Identification

1. The plans designation of all secondary conductors are the same and are indicated in or on all 3-phase outlets, transformers, panel boards and disconnect switches, and they shall be connected with uniform phase sequence.
2. Maintain A, B, C phase relation left to right when viewed from the front.

E. Voltage Drops at New Construction:

1. Total Allowable Voltage Drop for Service Source to Load: Limit to a maximum drop of 5 percent. Increase wire size, where necessary, to comply with this requirement.

a. Branch Circuits: Limit to a maximum voltage drop of 3 percent.
b. Service Source to Individual Panelboards: Limit to a maximum voltage drop of 2 percent.

END OF SECTION

16131 OUTLET, PULL, AND JUNCTION BOXES

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services necessary to complete the Outlet, Pull and Junction Boxes work, as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09900 - Painting.
2. 16112 - Raceways and Conduits.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Box size shall comply with NEC for number and size of conductors in boxes.
2. Box size shall comply with NEC for number and size of conduits entering and exiting each box.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data as required.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Outlet Boxes:

1. Provide outlet boxes at required locations, where shown on the drawings, and as specified.

a. Fixture studs shall be securely fastened in an acceptable manner.
b. Plaster covers shall have depths suitable to the finish being applied to the walls.
c. Sheet steel boxes shall be properly drilled and tapped.
d. There shall not be more holes in any of the outlet boxes than are required for the entering conduits.
e. Depth of boxes shall allow for easy wire pulling and proper installation of wiring devices.

2. Outlet boxes shall be galvanized steel or rust-resistant malleable iron alloy and comply with ANSI C33.65.
3. Outlet Boxes shall be as follows:

a. For Recessed Ceiling Fixtures: 4-inch square sheet steel box with blank cover and suitable hanger bar-box to be fastened to ceiling suspension members in an acceptable manner not more than 1 foot from fixture opening.
b. For Surface or Stem Mounted Ceiling Fixtures from Slab with Concealed Conduit: 4-inch sheet steel octagon concrete ring of a depth suitable to the construction and furnished with top cover having a 3/8" fixture stud.
c. For Ceiling and Wall Bracket Outlets on Exposed Conduit in Dry Locations: 4-inch octagon sheet steel box with 3/8" fixture stud.
d. For Surface Mounted Ceiling Fixture or Hung Ceilings: 4-inch octagon sheet steel hung ceiling box with suitable hanger bars and 3/8" fixture stud. Box shall be fastened to ceiling suspension in an acceptable manner.
e. For Surface Mounted Wall Bracket Fixtures with Concealed Conduit: 4-inch square sheet box with round opening plaster cover and 3/8" fixture stud.
f. For Ceiling and Wall Bracket Outlets on Exposed Conduit at Damp or Wet Locations:4-inch malleable iron.
g. For Switches and Receptacles in Tile, Plaster, or Gypsum Board Walls: 4-inch square sheet steel box or multi-gang box with proper plaster covers as required. Two gangs may be provided by means of a 4-inch square box with two gang plaster cover.
h. For Switches and Receptacles in Enameled or Face Brick walls, Unfinished Walls, and Woodwork: Single or multi-gang sheet steel utility boxes as required.
i. For Switches and Receptacles on Exposed Exterior Conduit Work: Type FS or FD conduit box, single or double gang with multiple entry points, as required for installation.
j. For Telephone or Computer Outlets: 4-11/16" square x 2-1/2" deep.

4. Boxes for fire alarm or signal systems, pilot lights, and other specialty equipment shall be by the manufacturer of the equipment.
5. Wet/Damp Locations:

    a. Provide gasketed, weathertight, screw covers, code gage galvanized steel pull boxes with weatherproof conduit hubs for pull boxes with multiple conduit entries.
    b. Provide steel or malleable iron metal hub type, dipped in rust inhibitor and with gaskets for individual conduit runs.

6. Extension Rings: Do not use to increase the volume of boxes, except where necessary due to multiple conduit run conflicts. Where such conflicts occur, an extension ring may be allowed for changes in direction of conduit to make necessary clearances. Not more than one extension ring may be used for each box where necessary.

B. Pull and Junction Boxes:

1. Where indicated in the plans and specifications or where necessary for compliance with code requirements for cable installation, install junction and pull boxes of the proper size for conduits over 1 inch trade size. Pull and junction boxes shall be of adequate size to accommodate installation of conductors without excessive bending of conductors that could damage insulation.
2. Pull and junction boxes shall comply with Fed.Spec.WJ-800F and be of all steel construction, spot or seam welded at joints and hot dip galvanized after fabrication.
3. Boxes shall be drip proof with screw attached covers. Each box shall have a turned-in lip welded at joint to develop full strength. Lip shall be drilled and tapped for 1/8" or

3/16" round head screws, symmetrically placed. To provide adequate length of thread, nuts shall be tack welded on inside of lip, or lip shall be made double thickness.

4. Pull and junction boxes shall be sufficiently rigid to withstand moderate twisting strains. Steel boxes shall comply with the following:

    a. Sheet steel boxes 100 cubic inches or less shall not be less than 0.0625-inch-thick steel.
    b. Sheet steel boxes over 100 cubic inches shall not be less than 0.053-inch-thick steel.
    c. Barriers and reinforcing angles shall be supplied as required.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work or this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Locations of outlets on electrical drawings are approximate only.

1. Do not scale drawings.
2. Locate outlets and equipment in accordance with architectural plans, sections, elevations and details.
3. Note the direction of door swings on architectural drawings for properly locating light switches on latch side of doors, unless otherwise shown on the drawings.
4. Coordinate wall outlet locations with chalkboards, tackboards, cabinets, and equipment.

B. Determine the proper position of outlets and receptacles. Relocate any outlet or receptacle not located in accordance with furniture and equipment plans without additional cost to the City of Key Colony Beach.

C. The City of Key Colony Beach reserves the right to change the location of any outlet, apparatus, or equipment up to the time of roughing in without additional cost, provided conduit runs are not substantially increased.

D. Fasten and secure boxes to the building structure independent of the conduit. Provide acceptable plaster stops for boxes to be set in plastered walls and ceilings.

E. Boxes and supports shall be fastened as follows:

1. To concrete or brick: Bolts and expansion shields.
2. To hollow masonry: Toggle bolts, or bolts and expansion shields.
3. To steel work: Machine screws or welded studs.
4. Explosive charge setting devices are not allowed.

F. Recessed wall outlets shall be flush with the wall surface. Install box in wall with cover to allow block or wall surface to fit tight against lip of cover.

G. Gang switches and receptacles together only where plans specifically indicate such combinations.

H. Outlets for duplex receptacles shall be arranged for vertical mounting of the receptacles unless otherwise specifically indicated on plans.

I. Barriers shall be provided as necessary to isolate voltage classes.

J. Under no circumstances shall outlet boxes for adjoining spaces be placed back-to-back in partition walls.

K. Circuit breakers and switches shall not be grouped or ganged in outlet boxes unless they can be arranged where the voltage between exposed live metal parts of adjacent switches does not exceed 300 volts. Provide barriers between 120- and 277-volt switches where ganged together.

L. Align rows of outlet boxes for ceiling lights.

M. Unless noted, specified, or directed otherwise, wall outlets shall be centered above finished floor as follows:

1. Convenience outlets: 18 inches to bottom of box.
2. Utility outlets: 18 inches to bottom of box.
3. Exit lights: 6 inches over doorway.
4. Switch outlets: 46 inches to bottom of box.
5. Telephone outlets: 18 inches to bottom of box.
6. Fire alarm visuals with or without horns: 78 inches to bottom of box.
7. Fire alarm horns: 6" minimum below adjacent surface, but not less than 8'6" or greater than 10'0" above finish floor.
8. Fire alarm pull station: 46 inches to bottom of box.
9. Refer to Architectural drawings for additional mounting heights.

N. Pull and junction boxes shall be provided at locations required to reduce length of cable pull or reduce number of elbows between outlets.

O. Provide blank covers for outlet boxes when devices or wiring has been removed or not installed.

P. Paint exposed boxes to match the color of the wall or ceiling to which they are mounted.

Q. Where several feeders pass through a common pull box, tag each feeder to clearly indicate electrical characteristics, circuit number, and panel designation.

END OF SECTION

16132 FLOOR BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Floor Boxes work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 Related Sections:

1. 09900 - Painting.
2. 16112 - Raceways and Conduits.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data before starting work.

B. Shop Drawings and product data shall give materials, dimensions, finishes, accessories, and installation directions where required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Boxes and Covers:

1. Hubbell.
2. Steel City.
3. Legrand Wiremold.

2.2 EQUIPMENT

A. Concealed Service Floor Box:

1. To deliver both power and communications without exposed service fittings housing.
2. Underfloor box shall be galvanized No.14 steel, approximately 8.5 to 13.2 inches long, 5 to 6.5 inches wide, 2 to 4 inches deep, with slot-head screws at each corner through a leveling plate welded to the bottom of the box. Box to house 1 duplex 20A, 120-volt, grounded, mounted on a slanted face place at one end, leaving ample space (±60 cubic inches) for communication connections.

    a. Hubbell 3-SFBSS.
    b. Steel City 664-SC.
    c. Legrand Wiremold RFB-2.

3. Box shall be covered with a hinged floor plate, level with the finished floor. Concealed service top shall include the floor flange and the hinged floor plate reinforced with a 5/32" plate. The floor plate to accept a piece of flooring material selected for the space by the A/E. Include a retractable exit port for power cords and communication cables.

PART 3 EXECUTION

3.1 INSTALLATION

A. Floor boxes shall be installed with top ring flush with concrete floor. Floor box shall be leveled after concrete has hardened by means of interior leveling screws.

B. Location: Coordinate placement with furnishings, built-in counters and equipment. Locate outlets to minimize interference with furniture and foot placement.

END OF SECTION

16140 WIRING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Wiring Devices work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. Division 16 - Electrical.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature and data before starting work.

1.3 QUALITY ASSURANCE

A. Comply with Florida Building Code (FBC).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wiring devices shall be as manufactured by Hubbell, Leviton or Pass and Seymour.

2.2 COMPONENTS

A. Wiring Devices: Comply with NEMA WD6 and NEC (NFPA 70).

1. Switches:

a. Rated at 20 amps, 120/277-volts AC, horsepower rated for 1HP at 120-volts.
b. Provide for back (not push-in) or side wiring.
c. Key-type switches shall all be keyed alike.
d. Manufacturers: Hubbell CSB 120 Series or accepted equivalent by Leviton or Pass and Seymour.

2. Duplex Convenience Receptacles:

a. Comply with NEMA 5-20R as applicable, be of specification grade, back (not push-in) and side wired, U-slotted grounding type, 3-wire, rated 20-amp, 125-volts AC.
b. Tamper-resistant shutter complying with NEC requirements if required by code.
c. Double Duplex: Consist of 2 receptacles under a common plate. Single receptacles shall be similar to duplex receptacles.

d. Manufacturers: Hubbell CR20 or BR20WHUTR or accepted equivalent by Leviton or Pass and Seymour.

3. Ground Fault Receptacles:

a. NEMA 5-20R type, rated at 20-amps, 120-volts with 5 ± 1 mA trip threshold, and UL nominal trip time of 0.025 sec.
b. Manufacturers:

1) Hubbell GF20, feed thru type, or accepted equivalent by Leviton or Pass and Seymour.

4. Dimmers Switches:
a. When not remote controlled, shall be solid state type, UL Listed.
b. Dimmers shall be rated to control indicated load.
c. Manufacturers: Hubbell Preset Slide Control or accepted equivalent by Bryant, Leviton, or Pass and Seymour.

5. Wiring devices shall be white color unless noted otherwise.

B. Cover Plates:

1. Molded plastic, by Hubbell or Leviton. Color to match device. Plate design shall be smooth without ornamentation.
2. Cover plates shall be listed by an OSHA approved NRTL, and meet the following minimum requirements:

a. Metallic Outlet Boxes: UL 514A.
b. Non-metallic Outlet Boxes: UL 514C.

3. Switches or receptacles in kitchens or pantry shall have brushed stainless steel plates.
4. Provide ganged switches to a maximum of three. If more are required on Drawings, provide in multiples of two or three.
5. Provide weatherproof receptacles with cast aluminum, spring loaded dock-type gasketed wet location cover for in-use device.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install wiring devices according to manufacturer's recommendations.

B. Verify location of wiring devices before rough-in of outlet boxes and conduit with Architectural Drawings for door swings and furniture details. Duplex receptacles in finished areas shall be vertically mounted.

C. Boxes mounted back-to-back are not allowed.

D. Install devices tightly within box with screws provided. Do not rely upon plate for device alignment and support to assure devices are grounded to box. In receptacles, use self-grounding screws, separate ground conductor or bond wire to box.

END OF SECTION

16160 TERMINAL CABINETS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Terminal Cabinets work, as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. RELATED SECTIONS:

1. 13810 - Energy Management System.
2. 13845 - Intrusion Alarm System.
3. 13860 – Card Access System.
4. 15970 - HVAC Control System.
5. 16721 - Fire Detection Alarm System.

1.2 SUBMITTALS

A. Submit manufacturer's literature and technical data before starting work.

B. Shop Drawings: Show layout, construction details, elevations, and installation procedures.

1. Dimensioned outline drawings of the cabinets, including hinged door, lock data, metal gage, and finish.
2. Cabinet nameplate type, dimensions, and wording.
3. Diagram and schedule for each terminal cabinet showing use of each wire and the associated terminal number.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Ortronics Communication Cabinets.

B. Hoffmann Cabinets

2.2 EQUIPMENT

A. Terminal Cabinets:

1. Cabinet shall be fabricated of 14-gauge sheet metal.
2. Provide hinged doors of 14-gauge sheet metal with lock. Lock shall be similar to type used on circuit breaker panelboards.
3. Front cover shall be primed and painted with enamel finish manufacturer's standard gray.
4. Nameplate on cover shall have white letters on black background.

5. Cabinets shall be of size as required but not less than 14 inches wide, 20 inches high, and 4 inches deep.
6. Cabinets shall be keyed alike.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install surface mounted on wall or recessed as shown on plan.

B. Provide identification number for each terminal in the cabinet.

END OF SECTION

16250 AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 SUMMARY

A. Related Sections:

1. 15377 - Fire Pump and Controls.
2. 16620 - Standby Emergency Generator.

B. SUBMITTALS

1. Submit detailed shop drawing for review.

1.2 SYSTEM DESCRIPTION

A. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. MANUFACTURERS

1. AZCO.
2. Russelectric.
3. Cummins-Onan.
4. Zenith.

B. Provide an open transition automatic transfer switch compatible with the generator manufacturer to maintain, system compatibility, and local service responsibility, for the complete emergency power system, and be equal to 277/480V with time delay to transfer retainer. Provide only four (4) pole transfer switches unless existing conditions dictate otherwise.

1. The current rating shall be as shown on the Drawings.
2. Control voltage shall be l20 volts.
3. The transfer switch shall be suitable for operation at a maximum line voltage of 600 volts and according to the requirements of NFPA 110 and Underwriters Laboratories (UL) UL l008.

C. Load transfer control shall be completely automatic, and it shall include necessary relays and component parts, with electrical and mechanically interlocked switches.

D. The motor operated transfer switch:

1. Shall be mechanically held electrically operated on both line and generator sides.

2. Shall be electrically and mechanically interlocked to positively prevent the load from being simultaneously energized by normal and emergency power.
3. Shall include a manual operation to manually transfer the mechanism in either direction.
4. Ensure the automatic transfer switch with terminal and neutral bar lugs are compatible with both copper and aluminum conductors.

E. The control module shall include:

1. Protective cover and be mounted separately from the transfer.
2. Switch for ease of maintenance.
3. Sensing and control logic: solid state and mounted on plug in printed circuit boards. Key printed circuit boards to prevent incorrect installation.

F. The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit current available at the automatic transfer switch terminals with the type of over-current protection, voltage and X/R ratio to match switchboards.

G. Unit shall be housed in NEMA 1 enclosure, suitable for wall mounting.

H. Provide transfer switches with the following additional features:

1. Frequency and voltage lockout sensor.
2. Close differential voltage sensor with a 3-phase protection set for drop out of a 90 percent and pick up 95 percent.
3. Selector switch, Off Auto Engine Start Test.
4. Override switch, emergency to normal.
5. Engine start contacts, gold plated.
6. Two auxiliary contacts, 1 n.o., 1 n.c., connected to main contact shaft.
7. Operating source pilot lights
8. Engraved plastic nameplates, 1 inch high (red) with 1/4-inch letters (white).
9. Control voltage shall be 120 volts.

I. The complete automatic transfer switch shall be designed and tested by manufacturer. Provide the following functions:

1. Upon power line outage, automatically start generating set. When generating set comes up to voltage, disconnect load circuits from main line and transfer them to standby set output.
2. Upon normal power line return, transfer load back to line and stop set.
3. Rating of transfer switch shall be sufficient to handle capacity of loads being transferred and allow for short circuit currents of 20 times full load rating for one second.
4. Automatic transfer switch shall be mechanically held, electrically operated type rated for continuous duty in an unventilated sheet metal enclosure.

    a. The switch shall be double throw having electrically operated normal/emergency positions inherently interlocked mechanically and with main contacts mechanically attached to a common shaft.
    b. Provide a manual operator.

5. Main contacts shall be silver alloy wiping-action type and protected by arcing contacts.

    a. Main contacts shall transfer in l/l5th of a second or less.
    b. Switch and relay contacts, coils, springs, and control elements shall be removable from the front of the transfer switch without removal of the switch panels from the enclosure and without disconnection of drive linkages or power conductors.
    c. Sensing and control relays shall be continuous duty industrial control type with minimum contact rating of 10 amperes.

6. Undervoltage Protection:

    a. Solid state voltage sensitive devices shall be provided to monitor normal power source and signal emergency power to start and assume load, on a partial loss of power on any phase or where feedback voltages exist.
    b. These shall have calibrated dial adjustments and be temperature compensated for a maximum deviation of plus or minus 2 volts, from minus 25 degrees F. to plus 175 degrees F.

7. Battery Charger:

    a. Load transfer control shall include a SCR design, fused, battery charger to automatically charge and maintain starting battery of emergency set.
    b. Shall have a maximum charge rate of 2 amps at 24 volts (nominal) and automatically taper to trickle charge.
    c. Shall have a manually set timer to provide an equalized charge for periods up to 12 hours.

8. Time Delay to Start Emergency Power: Provide a time delay, adjustable from 1.5 seconds, to prevent emergency power from needless starting and stopping during periods of momentary voltage fluctuations from normal power source.
9. Time Delay to Pick-Up Load: Provide a time delay, adjustable from 5 seconds to 50 seconds, to prevent emergency power from accepting load until emergency power operates unloaded for a predetermined period of time.
10. Time Delay to Retransfer Load: After normal power has returned to service, provide a time delay adjustable from 1 to 30 minutes to delay retransferring load to normal power for purpose of:

    a. Overriding initial voltage fluctuations of returning normal power.
    b. Providing a predetermined minimum period of operating time for emergency power.
    c. If emergency set should fail during delay period, time delay shall be bypassed, and load instantly retransferred to normal power.

11. Time Delay to Stop Emergency Power: After load has been retransferred to normal power, provide a time delay, adjustable from 1 to 30 minutes, to allow engine to cool by permitting emergency set to operate unloaded for a predetermined period of time before shutdown.
12. Automatic Exerciser:

a. Means shall be provided to automatically start and run emergency generating set for a set period of time for purpose of testing or exercising complete engine, alternator and load transfer control.
b. After completion of set period of time for testing and exercising, emergency source shall be automatically shutdown.
c. Such periods for testing or exercising shall be adjustable in multiples of 15 minutes per period with period repeated on any combination of days over a cycle of 7 days before recycling.
d. During period of testing or exercising, emergency power shall assume load.

13. Provide test switch to simulate a normal source failure.
14. Provide for Remote Control Operation from the Fire Control Station where required.
15. Provide a disconnect means, to electrically disconnect control section from transfer switch, to permit safe access for maintenance or service of control, during periods of normal operation.
16. Switch shall have a fully rated neutral transfer contacts, driven by the main contact shaft that momentarily connect the neutrals of the 2 sources during the transfer/ retransfer operations. The neutrals shall remain interconnected, until the source contacts close on the source to which the load is being transferred.
17. Normal and Emergency Lamps: Provide colored indicating lights on the enclosure door and labeled to show transfer switch position: Green - normal source; Red - emergency.
18. Provide 2 auxiliary contacts, 1 to close and the other to open when normal source fails.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the cabinet rigidly and securely attached to building construction and not depending upon conduits for support.

B. Install and connect automatic transfer switch according to the manufacturer's recommendations.

END OF SECTION

16440 DISCONNECT SWITCHES

PART 1 GENERAL

1.1 WORK INCLUDED:

A. Provide all labor, materials, equipment and services necessary to complete the Disconnect Switches work, and as indicated on the drawings, and as specified herein.

B. All Materials provided under this section shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. RELATED SECTIONS

1. 09900 - Painting.
2. 16475 - Overcurrent Protective Devices

1.2 SYSTEM DESCRIPTION

A. Performance Requirements: Label for "SERVICE ENTRANCE" where so applied.

1.3 SUBMITTALS

A. Submit manufacturer's literature and technical data as required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Disconnect Switches:

1. G.E.
2. Siemens.
3. Square D.

2.2 EQUIPMENT

A. Disconnect switches shall comply NEMA KSI for type HD and shall be of heavy-duty type, enclosed, of quick-make, quick-break construction. Rating shall be as indicated on drawings. Switches shall be horsepower and I2t rated.

B. Disconnect Switch Enclosure:

1. NEMA 1 for indoor use.
2. NEMA 3R for outdoor use.
3. NEMA 4X for outdoors as noted on drawings.

C. Disconnect switch operating handle shall be of insulated box mounted type that directly drives switch mechanism suitable for padlocking in "OFF" position.

D. Defeatable, front accessible, "coin-proof" interlocks shall be provided to prevent opening of cover when switch is in "ON" position and prevent turning switch ON when door is open. Securely fastened metallic nameplate shall include highly visible "ON-OFF" indication.

E. Motor Disconnect Means: Provide each motor with an in-sight disconnect means, when required by NEC, and where shown on the drawings.

F. Provide fuses for disconnect switches so indicated. Fuses shall be dual element type as specified in Section 16475 - Overcurrent Protective Devices.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install the disconnect switches vertically with top not more than 6 feet above the floor, and rigidly and securely attached to the building. Disconnect switches shall not depend upon conduit for support.

B. Where used as service entrance main disconnects, switches shall be permanently labeled "MAIN SWITCH 1 of 4", "MAIN SWITCH 2 of 4", etc.

C. Mountings:

1. Plywood Panel for interior installations only: Mount panelboards on backboard of 3/4" exterior grade plywood, finished one side, primed all surfaces, painted with two coats gray of fire-retardant paint on all sides (front, back and all edges) and secure to wall with approved shields or screws as directed by the A/E.
2. Unistrut for interior and exterior installations: Mount disconnect switches on Unistrut P-3000 mounting channels at top and bottom, secured similarly to wall.

D. Label switch covers in 1-inch-high stenciled letters showing equipment served.

END OF SECTION

16450 GROUNDING

PART 1 GENERAL

1.1 SUMMARY

A. Related Work:

1. 16120 - Wire and Cable.
2. 16112 – Conduits, Fittings and Supports.
3. 16470 – Panelboards.
4. 16460 - Dry Type Transformers

1.2 SYSTEM DESCRIPTION

A. All materials shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.3 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, accessories, and installations where required.

B. Ground resistance tests.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Install a complete grounding system installation shall comply with Article 250 NFPA 70 Latest Edition of the National Electrical Code-(NEC).

B. Coordination: Arrange with Plumbing Contractor to have the main metallic water line accessible for ground connection at point entrance to the building. The metallic water line shall be buried and have at least 20 feet in contact with earth.

C. Maximum resistance to ground shall not exceed 5 ohms. Provide written report of acceptance test and performance verification to the A/E and the City of Key Colony Beach.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Sections 01330, “Submittals”.

1.6 TESTS

A. Submit under provisions of Section 01452, “Testing and Inspecting Services”.

B. Measure ground grid resistance with a Megger ground resistance tester and install additional ground rods and conductors as required until resistance to ground does not exceed 5 ohms.

1. Testing and recording of results shall be by the Electrical Contractor in the presence of the A/E or his authorized agent.
2. Conduct test after the complete system has been fully grounded and under provisions of the latest editions of the N.E.C. and I.E.E.E. standard 142 recommended practice.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Grounding System.

1. Grounding system shall comply with ANSI C33.8, IEEE-81.
2. The electrical system and equipment shall be grounded according to the requirements of the NEC and as specified herewith.
3. The grounding conductor shall be an insulated copper wire of size indicated on drawings and following requirement of the NEC.
4. Where not indicated, the conductor shall be according to the requirements of the NEC except that minimum size shall be No.8 copper for system ground.
5. Inaccessible connections shall be made with the exothermic welding process using equipment manufactured by Burndy or Erico Products.
6. Accessible connections shall be made with multiple bolt silicon bronze connectors specifically designed and accepted for the connection to be made.
7. Connectors shall be as manufactured by Burndy or O.Z. Electric.
8. Grounding jumpers shall be provided across metal parts separated by non-conducting materials, such as conduits with expansion joints or when joined, so there is a high resistance at the joint connections.
9. Grounding electrical conductors shall not be buried directly in concrete. Provide a conduit sleeve where each cable passes through concrete. If buried in earth, they shall be tinned.
10. Grounding for the lightning protection system shall be as specified under "LIGHTNING PROTECTION SYSTEM" and as shown on the drawings. Lightning protection system shall be connected to the building grounding system as required by NEC article 250.
11. Refer to electrical drawings for additional grounding requirements.

B. Grounding Source:

1. Grounding electrical system shall comply with NEC Article 250. All the grounding electrodes shall be bonded together.
2. Ground sources shall be connected to the ground bar. Ground bar of copper bus shall be mounted on insulating standoff on the Main Electrical Room and Electrical Room wall. Ground bus shall be complete with lugs for connecting grounding cables. Maximum resistance to ground shall be limited to 5 ohms. Additional ground rods shall be driven if required to maintain this level.
3. Maximum ground resistance to each of individual rods shall be 25 ohms or less.
4. Submit test results to the A/E and the City of Key Colony Beach for acceptance indicating that these values have been met, using the fall of potential method as directed in IEEE latest Standards.

C. System Grounds: Neutral bus and ground bus shall be connected by means of an accepted bus link.

D. Ground Rods: Copper clad steel not less than 3/4" in diameter, 10 feet long, driven full length into the earth.

E. Cold Water Pipe:

1. Connection to cold water pipe shall be made by a suitable ground clamp.
2. If flanged pipes are encountered, connections shall be made with the lug bolted to the street side of the flange connection.

F. Foundation Structural Steel:

1. Connection to structural foundation steel, a minimum of 20 feet long continuous steel bar, shall be made by an exothermic connection.

G. Parts to be Grounded: Panelboard frames, fittings, fixtures and devices, cable sheaths, neutral of transformers, boxes and raceways, motor frames, outdoor lighting poles, emergency generator set, non-current carrying parts of appliances and devices, and all other parts and equipment as required by NEC. Neutral wire shall never be used as grounding means.

H. Conductor: Grounding cable shall be green insulated copper stranded cable, soft drawn or annealed, sized as indicated on drawings.

PART 3 EXECUTION

3.1 POWER SYSTEM GROUNDING

A. Supplement the grounded neutral of the secondary distribution system by an equipment grounding system. Arrange the equipment grounding system so that all non-current carrying items in close proximity with electrical circuits are maintained continuously at ground potential and provided with a low impedance path for ground fault currents. The system shall comply with the National Electric Code Article 250, modified as indicated and as specified.

B. The basic grounding system utilize reinforcing bars in the footings of the building supplemented by two (2) ground rods in the Main Electrical Room and a connection to a cold-water pipe, where required to meet the test requirements specified.

C. Provide a green insulated copper ground conductor, in conduit, as shown to the main metallic water service entrance and connect to the supply side of same by means of ground clamps. The conduit shall be bonded to the ground conductor at each end.

D. Low voltage system neutrals: grounded at the related transformers to the feeder ground and to the nearest cold-water line all in accordance with the National Electric Code requirements in Article 250.

3.2 INSTALLATION

A. Install grounding system as shown on drawings and as required by the latest edition of the NEC Article 250.

B. Connections to equipment, bus, or conduit shall be made with approved type of solderless connector and shall be thoroughly cleaned and made bright before connection is made to insure metal contact.

C. Connections inaccessible after completion of project shall be made by exothermic weld process.

D. The grounding medium for lighting branch circuits shall be the conduit system.

1. Ground the lighting fixture by means of a conductor between the outlet box and the fixture.
2. Where GFCI type receptacles are indicated, provide a separate ground conductor directly from the panelboard.

E. Do not use flexible conduit as a grounding medium. Provide a bonding wire in flexible conduits and connect to the boxes at each end in an approved manner. Bonding conductor in flexible conduit runs to connect low voltage control and monitoring devices is not required.

F. Bond to ground all metal underground pull box covers.

G. End-to-End Luminaires: continuously bonded.

H. Grounding contacts of receptacles shall be connected to a system-grounding conductor (not the system neutral) by a stranded copper wire not smaller than #12 AWG. The resistance between the contacts and solid earth ground shall not exceed 3 ohms.

I. Bond all metal parts. Make equipment and bus connections with suitable lugs or clamps. Cadweld all wire-to-ground rod joints. Cadweld all wire-to-wire joints #1/0 AWG or larger.

J. Bond all conduits stubbing under switchboards, transformer and similar locations using bonding bushings.

K. Provide a bond wire in all flexible metal conduits and connect to the boxes at each end in an approved manner.

L. Use PVC for outdoor applications for sleeving grounding electrode conductors, except that where sleeves are subject to damage, use rigid metal conduit bonded at both ends.

M. Ground all transformer secondaries under provisions of NEC-250 unless shown otherwise on the drawings.

N. Light Poles: Provide a ground rod driven near pole bases and Cadweld a #8 wire to the top of the rod and extend the wire to a grounding lug in the base and bond to all metal parts.

END OF SECTION

16460 DRY-TYPE TRANSFORMERS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete Dry-type Transformer System as indicated on the drawings, and as specified herein.

1.2 Related Work:

1. 16120 - Wires and Cables.
2. 16450 - Grounding.
3. 16112 - Raceways and Conduits

1.3 REFERENCES

A. Florida Building Code (FBC).

B. National Fire Protection Association, Inc. (NFPA):

1. NFPA 70 - National Electric Code (NEC)

C. Underwriters Laboratories (UL), latest edition or other OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1. UL 1561 - Dry-Type General Purpose and Power Transformers
2. UL 506 - Safety for Specialty Transformers

D. National Electrical Manufacturers Association:

1. NEMA ST-20 - Dry Type Transformers for General Applications
2. NEMA ST-1 - Specialty Transformers
3. NEMA TP-1 - NEMA Standard for Defining the Energy Efficiency Performance of Transformers
4. NEMA TP-2 - NEMA Standard for Testing Procedures for Meeting the Requirements of TP-1.

E. Institute of Electrical and Electronics Engineers:

1. IEEE C2 - National Electrical Safety Code

1.4 SYSTEM DESCRIPTION

A. All materials shall be tested and listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.5 SUBMITTALS

A. Submit manufacturer's catalog cuts and technical data before starting work.

B. Submit test data for transformers as requested.

C. Submit shop drawings and product data under provisions of Section 01330,”Submittals”.

1.6 QUALITY ASSURANCE

A. Dry type transformer installation shall comply with NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Dry Type Transformers:

1. General Electric Corp.
2. Siemens.
3. Square D.

2.2 EQUIPMENT

A. Rating:

1. Transformers 15KVA and larger shall be ventilated dry type, 3 phase, 60 Hertz, 480 volts delta primary and 208Y/120 volts secondary, with four 2-1/2 percent FCBN taps and two 2-1/2 percent FCAN taps. KVA rating shall be as shown on drawings.
2. Transformer insulation shall be Class "H", 220 degrees Centigrade insulation systems and shall be rated for operation (150 degrees C. rise above 40 degrees C. ambient). Insulating materials shall be according to NEMA ST20 standards.
3. Transformer sound level shall not exceed following values when measured according to ANSI C89.2:

    a. 0 to 5 KVA-40 db.
    b. 6 to 25 KVA-45 db.
    c. 26 to 150 KVA-50 db

4. Transformers shall be low loss type with minimum efficiencies per NEMA TP-1 when operated at 35% of full load capacity. Efficiency shall be tested in accordance with NEMA TP-2.

2.3 DESIGN AND CONSTRUCTION

A. Core and coil assembly shall be vacuum impregnated for maximum resistance to moisture and shall be mounted on vibration isolation pads.

1. Transformers shall be provided with a drip-proof, rodent-proof, enclosure having a durable finish and a rustproof diagrammatic nameplate.
2. Wiring compartments shall have adequate space for terminating cables and shall be front connected for easy accessibility.
3. Where transformers are exposed to the weather, provide weather shields.

B. Core of the transformer shall be of high quality, cold-rolled, grain-oriented steel, annealed by manufacturer for low loss and exiting current.

1. Laminations shall be formed to eliminate burrs and annealed to reduce losses to a minimum.
2. Winding conductors shall be annealed and insulated by transformer manufacturer.
3. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hydroscopic thermosetting varnish.
4. All cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
5. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
6. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be listed by an NRTL for outdoor use.
7. Conductor surfaces shall be free from slivers, burrs, and other irregularities.

C. Primary voltage and connection and secondary voltage and connection as shown on the schedules. All transformers shall be rated at 60 hertz.

1. Manufacturer shall submit the following test data under provisions of Section 01330 “Submittals”, and Section 01452, “Testing and Inspection Services”.

    a. Indicate loss data, efficiency at 25, 50, 75, and 100 percent rated load, and sound level in decibels.
    b. Percent regulation at 100 percent load, and 80 percent power factor.
    c. No load and full loses in watts.
    d. Impedance and rating.
    e. Manufacturer’s installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Section 01452 - Testing Services. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Dry type transformers shall be installed by Contractor in accordance with manufacturer's instructions in rooms assigned for the installation of equipment.

B. Transformer enclosures and secondary neutral shall be securely grounded to a cold-water pipe, 3/4" diameter by 10 feet long buried in direct contact with the earth, with a copper conductor sized according to NEC latest edition Article 250.

C. Dry type transformers shall be floor mounted or bracket mounted as shown on drawings. Transformers shall be bolted to floor if floor mounted and shall be bolted to steel angles if bracket mounted, or as shown on drawings. Provide a 4-inch-high concrete pad under floor mounted transformers. Oversize concrete pad so it will be 3 inches all around bigger than the transformer footprint.

D. Transformers shall be vibrationally isolated from the building structure by means of double neoprene pads, in addition to the vibration isolation built into the transformer. Neoprene shall be similar to Mason Industries Type W, 40 durometer minimum or sized for proper weight load.

E. Conduit connections to the equipment shall be made with flexible conduit, loosely installed.

F. Dry type transformers shall be installed with wiring compartment to the front to allow removal.

G. Maintain manufacturers recommended clearance from walls or surfaces to allow adequate ventilation, but in no case shall the transformers be installed less than 6 inches from any wall.

H. Provide grounding and bonding in accordance with Section 16450 “Grounding”.

I. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.

END OF SECTION

16470 PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete Distribution Panelboard system as indicated on the drawings, and as specified herein.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09900 - Painting.
2. 16120 - Wire and Cable.
3. 16475 - Overcurrent Protective Devices.

1.2 SYSTEM DESCRIPTION

A. Panelboards used as service entrance equipment shall be NRTL labeled as service entrance equipment.

1.3 SUBMITTALS

A. Submit shop drawings, manufacturer's literature, and technical data before starting work.

B. All switchboards and panelboards submitted shall be designed and manufactured according to the latest revisions of the following specifications:

1. UL 50, UL 67, UL 89, Ul489, Ul 891, UL 1283, UL 1449
2. Nema AB-1, PB1, PB1.1, PB2, PB2.1 PB 2.2
3. NFPA 70
4. Federal Specifications: W-C-375B, W-P-115C

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Panelboards:

1. General Electric.
2. Siemens.
3. Square D.

2.2 EQUIPMENT

A. Distribution and Power Panelboards:

1. Interior: Provide fully rated plated copper bus. Plating shall run the entire length of the bus bar. Solid neutral and ground bar shall be copper. Maximum rating: 1200 amp.
2. Main breaker shall be horizontally mounted. Main breakers shall have conspicuous marking labels.
3. Trims shall have door with keyed lock. All locks shall be keyed the same.
4. Provide directory holder and typed directory for all circuits.
5. Enclosure shall be galvanized galvaneal steel constructed in accordance with UL50 and NEMA 250. Box end walls shall be blank.
6. Short circuit current ratings shall be equal to or greater than available fault current at point of application. NRTL listed series ratings may be utilized, where not in violation of NEC 240.86. Provide documentation of NRTL listed series rating used.
7. Surge Protective Devices (SPD) shall be provided when specified in the design and associated electrical plans, with optional peak surge current of 260kA.
8. Distribution panels for use at 120/208 volts shall ne NRTL listed with minimum integrated assembly rating of 22K AIC.
9. Distribution panelboards, 400 amperes and over, shall be provided with molded case circuit breakers tested and labeled according to UL 489.

B. Lighting, Receptacle and Power Panelboards

1. Interior: Provide fully rated plated copper bus. Plating shall run the entire length of the bus bar. Solid neutral and ground bar to be copper. Maximum rating: 600amp.
2. Main breaker shall be vertically or horizontally located and have conspicuous marking labels.
3. Trims shall have door with keyed lock. All locks to be keyed the same. Provide trims with concealed door hinges and trim screws for panels 600 amps or less.
4. Provide directory holder and typed directory for all circuits.
5. Enclosure shall be galvanized steel constructed in accordance with UL50. Box endwalls shall be blank.
6. Short circuit current ratings shall be equal to or greater than available fault current at point of application. NRTL listed series ratings may be utilized, where not in violation of NEC 240.86. Provide documentation of NRTL listed series rating used.
7. Provide SPD's when specified in the design and associated electrical plans, with optional peak surge current of 100kA.
8. Minimum rating of breakers shall be as follows:

    a. Lighting and power panels for use at 120/208 volts: 225 amp maximum with circuit breakers rated at 10K AIC symmetrical at 240 volts.
    b. Lighting and power panels for use at 480/277 volts: 225 amp maximum with circuit breakers rated at 14K AIC symmetrical at 480 volts.

9. Interiors shall be factory assembled and designed to allow switching and protective devices to be replaced without disturbing adjacent units, without removing the main bus connectors, and allowing circuits to change without machining, drilling or tapping.
10. Branch circuits shall be arranged using double row construction unless narrow column panels are indicated. A nameplate shall be provided listing panel type and ratings. Circuit breakers shall be bolt-on type.
11. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection. A ground bus shall be provided in all panels.

C. Boxes and Trims shall meet the following criteria:

1. Boxes shall be at least 20 inches wide made from code gage galvanized sheet steel.

    a. Provide minimum gutter space according to NEC requirements.
    b. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space.
    c. At least 4 interior mounting studs with adjustable nuts shall be provided.

2. Switching device handles shall be accessible.

    a. Doors and panelboard trims shall not uncover any live parts.
    b. Doors shall have flush chrome plated handle with cylinder lock and catch, except doors over 48 inches in height shall have auxiliary fasteners top and bottom of door in addition to the flush-type cylinder lock and catch.
    c. Panelboard switching devices with individual dead front doors shall be acceptable instead of standard door in trim design.
    d. Panelboard trim clamps shall be of the indicating type.

3. Exterior and interior steel surfaces of the trim shall be properly cleaned, primed with rust inhibiting phosphatic coating, and finished with manufacturer's standard gray paint.

    a. Trims for flush panels shall overlap the box for at least 3/4" all around.
    b. Surface trims shall have the same width and height as the box.
    c. Trims shall be mountable by a screwdriver without the need for special tools.
    d. After installation, trim clamps shall not be accessible when the panel door is closed and locked.

4. Panelboards exposed to the weather shall have NEMA type 3R raintight enclosure or NEMA 4X in corrosive environments.

D. Electrical Components:

1. Main bus bars shall be fully rated copper bus bars, with plating shall running the entire length of the bus bar and shall be sized according to NRTL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C. above an ambient of 40 degrees C. maximum. Provide main circuit breakers, main lugs, or sub-feed lugs as required.
2. Each panelboard shall incorporate breakers as shown with AIC or higher, at the application voltage, than the available fault at its location along the electrical distribution system, as determined by the short circuit study. Minimum rating of breakers shall be:

    a. Lighting and power panels for use at 120/208 volts: 225 amp maximum with circuit breakers rated at 10K AIC symmetrical at 240 volts.
    b. Lighting and power panels for use at 480/277 volts: 225 amp maximum with circuit breakers rated at 14K AIC symmetrical at 480 volts.
    c. Distribution panels for use at 120/208 volts: UL listed with minimum integrated assembly rating of 22K AIC, or as indicated on drawings.

3. Panels tested and listed according to UL 67 and bearing an integrated short circuit rating shall be determined by the short circuit study on the electrical system with 10,000 AIC minimum.
4. Any 2 single pole circuit breakers shall be replaceable by 1 two-pole circuit breaker and any 3 single-pole breakers shall be replaceable by 1 three-pole circuit breaker.
5. Breakers 100 ampere through 400 ampere frame sizes shall be thermal-magnetic trip with inverse time current characteristics, unless otherwise noted.
6. Provide ground fault circuit interrupter circuit breakers where indicated.
7. Emergency Panelboards Identification: Paint door red and stencil in 1-inch-high yellow letters "EMERGENCY PANEL" in addition to appropriate individual panel identification as shown on drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Panelboards shall be installed where indicated and with top of cabinet 6'-6" above floor and shall be rigidly and securely attached to building construction and shall not depend upon conduit for support. Allow at least 1/2" air space behind wall mounted panelboards.

B. Install panelboards according to manufacturer's recommended data. Maintain clearances required by the National Electrical Code, with particular attention to working space around panelboards. Maintain clear space above panelboards, coordinate with other trades to avoid placement of panelboards below piping, ductwork, or other foreign appurtenances. Relocate panels at no additional cost should such interferences occur.

C. Supply panelboards with phenolic nameplate 1 inch x 3 inch on exterior of panels and engraved with panel designation and voltage rating. Lighting and power panelboards shall be provided with a clear plastic enclosed typewritten directory inside. Circuit identification shall include load type (lighting, receptacles, etc.) and rooms served.

D. Where flush type panelboards are indicated, provide one 3/4" empty conduit terminated in accessible ceiling above for each 3 spare circuit breakers provided in the panelboard.

E. Clean and touch up panelboard as required at completion of the project.

F. Support surface mounted panelboards for other than masonry walls, from floor slab secured "Unistrut" channels. Mount those installed on masonry walls to back boards secured to walls, and according to manufacturer’s recommendations and applicable codes and regulations. Contractor shall coordinate manufacturer’s actual panelboard dimensions with room clearances to conform with NEC requirements.

END OF SECTION

16475 OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Provide a complete system of overcurrent protective devises as indicated on the drawings, and as specified herein.

1.2 Related Sections:

1. 16440 - Disconnect Switches.
2. 16470 - Panelboards.
3. 16156 - Motor Starters.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.4 SUBMITTALS

A. Submit properly identified manufacturer's literature, product data, and technical data before starting work.

1.5 QUALITY ASSURANCE

A. NEMA AB 1 1993 – (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches.

B. UL 489 – (Underwriters Laboratories Inc.) Molded Case Circuit Breaker Enclosures.

C. UL943 – Standard for Ground Fault Circuit Interrupters.

D. CSA C22.2 No. 5.1 – M91 – (Canadian Standard Association) Molded Case Circuit Breakers.

E. Federal Specification W- C – 375b/GEN – Circuit Breakers, Molded Case; Branch Circuit and Services.

F. National Fire Protection Association NFPA – 70 (National Electric Code).

G. Fuses shall comply with NEMA FUI and ANSI C33.42.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Circuit Breakers:

1. GE.

2. Siemens.
3. Square D.

B. Fuses:

1. Bussman Manufacturing.
2. Gould-Shawmut Company.
3. CEFCO.
4. Littelfuse, Inc.

2.2 EQUIPMENT

A. Circuit Breakers:

1. Conform to Federal Specification W-C-375a and NEMA Standard AB-1, unless indicated otherwise.
2. Lugs and terminals: UL approved for copper-aluminum.
3. Accessories: 120-volt.
4. Each circuit breaker shall be provided with a trip unit for each pole with elements providing inverse time delay under overload conditions and instantaneous magnetic trip for short circuit protection, unless indicated as non-automatic. Trip elements shall operate a common trip bar to open all elements.
5. All circuit breakers shall be bolt-on type, consisting of the number of poles and ampere ratings as noted on the drawings.
6. Two and three pole breakers shall be of the common trip type.
7. Circuit breakers shall be a circuit interrupting device operating both manually for normal switching functions and automatically under overload and short circuit conditions, while providing circuit and self-protection when applied in its ratings. Provide at voltage, phase, and amps indicated, with symmetrical amperes interrupting rating to be equal or larger than that shown on drawings. Control and signaling function may be incorporated by use of accessories.
8. Operating mechanism shall be entirely trip-free so contacts cannot be held close against an abnormal over-current or short circuit condition.
9. Operating handle of circuit breaker shall open and close all poles of a multi-pole breaker simultaneously. Circuit breakers shall meet applicable NEMA AB-1 and have UL label.
10. Ampere rating shall be clearly visible. Contacts shall be of non-welding silver alloy. Circuit breakers to be used in switchboards, lighting and power panelboards, distribution panelboards and individually enclosed shall be 1, 2, or 3 poles as indicated on drawings.

B. Molded Case Circuit Breakers Characteristics - General:

1. Circuit Breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick – make, quick – break contact action.
3. The circuit breaker handle shall reside in a tripped position between on and off to provide local trip indication. Circuit breaker escutcheon shall be clearly marked on and off in addition to providing International I/O markings.

4. The maximum ampere as established by a NRTL, or other certification standards, with applicable voltage systems and corresponding interrupting ratings, shall be clearly marked on face of circuit breaker.
5. Circuit breakers shall be factory sealed with a hologram quality mark and shall have date code on face of circuit breaker.
6. Circuit breaker combinations for series connected interrupting ratings shall be listed by a NRTL as a recognized component combination. Any series rated combination used shall be marked on the end use equipment along with the statement “Caution – Series Rated System _____A Available. Identical Replacement Component Required.”
7. Circuit breakers shall be equipped with NRTL listed electrical accessories as noted on the electrical drawings. Circuit breaker handle accessories shall provide provisions for locking handle in the On and Off position.
8. Circuit breakers shall be NRTL listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.
9. Molded case circuit breakers shall be bolt-on type, mounted in lighting and power panelboards and individually enclosed units.
10. Molded case circuit breakers shall be quick-make, quick-break action.
11. Molded case circuit breakers for panelboards shall have a short circuit current rating based on the coordination and short circuit study or the following minimum symmetrical ampere interrupting capacities (RMS):

    a. 120 volts: 10,000 SAIC power panelboards (minimum).
    b. 277 volts: 14,000 SAIC lighting panelboards (minimum).
    c. 277/480 volts: Up to 42,000 SAIC distribution panelboards, or as shown on drawings.

12. Each molded case circuit breaker shall have a thermal magnetic trip device, with common tripping for all poles, and with trip ratings as shown on drawings.

C. Fuses:

1. Provide rejection fuses for fusible equipment regardless of which trade has furnished such equipment.
2. The time-current characteristic and ratings shall assure positive selective coordination.
3. All fuses: current limiting and have an interrupting capacity of at least 200,000 amperes RMS symmetrical.
4. The time-current characteristics and ratings shall be set in such a way that positive selective coordination is assured.
5. Coordination and current limitation for the protection of each part of the electrical system must be designed around the type and class and manufacturer selected for that type and class.
6. Fuses, 601 amperes and larger, shall comply with UL Class L standard and be Shawmut Form 480 "Amp-Trap" or Bussman "Hi Cap".
7. Fuses, 600 amperes and lower, where applied to general feeder and branch circuit protection, shall comply with UL Class RKl standards and be Shawmut dual element "Amp- Trap" or Bussman "Low Peak" Limitron.
8. Dual element fuses shall have low resistance and relatively low operating temperatures. Fuses shall be provided with thermal protection against damage from poor contact. Fuse shall open when temperature at thermal cutout reaches 280 degrees F., preventing damage to clips and switches before fuse opens. They shall

combine high interrupting capacity (200,000 ampere RMS symmetrical) with time delay, holding 500 percent load for a minimum of 10 seconds.

9. Individual motor circuit fuses shall be sized at approximately 150 percent of motor full load current. Fuses, below 600 amperes shall comply with UL Class RK1, time delay, dual element standardsand be Gould-Shawmut "Amp-Trap" or Bussman Type LPN-RK. Fuses 601 amperes and larger, shall comply with UL Class L standards and be Gould-Shawmut Form 480 "Amp-Trap" or Bussman Type KRP-C.
10. Provide 10 percent spares (minimum of three) of each size and type of fuses furnished. Spare fuses shall be placed in a wall-mounted cabinet located in the main electric room.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install all circuit breakers and fuses where indicated on drawings, where required by NEC or other applicable codes and regulations, and in accordance to manufacturer's recommendations and accepted submittals. Special attention shall be given to air conditioning equipment.

B. Two and three pole breakers must be true, full size two and three pole breakers.

   1. Do not combine single pole breakers with common handle connection to meet multiple pole breaker requirements.

C. Label circuit breaker enclosures with 1-inch-high stenciled letters showing equipment served.

D. Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated on the coordination study.

END OF SECTION

16511 LIGHTING FIXTURES AND LAMPS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the lighting fixture installation work, and as indicated on the drawings and as specified herein.

B. All materials shall be listed by an OSHA approved National Recognized Testing Laboratory (NRTL).

C. Related Sections:

1. 09200 - Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.
2. 09510 - Acoustical Ceilings.
3. 16112 - Raceways and Conduits.
4. 16120 - Wire and Cable.

1.2 SYSTEM DESCRIPTION

A. Explosion-proof, shielded, and vapor tight and wet location fixtures shall bear a NRTL label appropriate for the type of application.

1.3 SUBMITTALS

A. Submit, shop drawings, manufacturer's literature and technical product data as required.

B. Shop drawings shall include but not be limited to:

1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all luminaires including finished, metal thickness, fabrication methods, support method, ballasts, sockets type of shielding, reflectors, provisions for re-lamping and all other information to show compliance with the Contract Documents.
2. Submit shop drawings and samples as requested of luminaires for approval before fabrication. Luminaire details may vary slightly from those shown on drawings provided the changes do not adversely affect size of installation, durability of luminaire, luminaire performance or appearance. Submitted samples may be subjected to photometric testing at an independent testing laboratory, refer to Section 01330, “Submittals”.

C. Furnish certified photometric data for every fixture specified.

D. Upon request, a sample of each fixture proposed for every use and specified unit shall be submitted to the A/E for review.

E. Lighting calculations shall comply with Florida Building Code (FBC) and IES minimum foot-candle level when required.

1.4 QUALITY ASSURANCE

A. Materials, equipment and appurtenances as well as workmanship provided under this section shall conform to the highest commercial standard and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated: made of materials most appropriate for their use or function and as such resistant to corrosion, thermal, and mechanical stresses encountered in the normal application and functioning of the luminaires.

B. All cast parts, including die-cast members: of uniform quality, free from blow holes, pores, hard spots, shrinkage defects, cracks or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys. Exterior surfaces, which do not otherwise receive a finishing coating: machined, sanded or similarly treated areas, such as extruded metal parts. All such finished castings given a minimum of one coat of baked-on clear methacrylate lacquer unless a painted finish is specified.

C. Comply with Florida Building Code (FBC).

D. Luminaries and components shall be built under provisions of the N.E.C.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Exterior fixture shall be of aluminum or plastic construction.

B. Lighting Fixtures:

1. Provide lighting fixtures as indicated on the drawings and as specified.
2. The schedule and details of lighting fixtures, appearing on the drawings, indicate the type, construction, appearance, quality and performance of the fixtures required.

    a. Any proposed deviation from the fixtures specified shall equal or be superior to the item specified under these headings.
    b. Proposed substitute lighting fixtures will be judged on overall quality on construction.
    c. Provide 120V working sample of proposed substitution with cord, plug, and lamp.
    d. The fixture manufacturers products scheduled are considered acceptable, based on the equivalency of individual units as determined by the A/E.

3. Materials used in the manufacture of fixtures shall be new and the best of their respective kind, and shall be formed and assembled in a neat, accurate, and professional manner.

    a. Sheet metal shall be of sufficient thickness or shall be ribbed, flanged, or otherwise reinforced so that lighting fixtures and their component parts will withstand the stresses of normal handling and installation and service without undue distortion of shape.
    b. Plastering or other installation procedures shall not be relied on to reinforce lighting fixtures or their component parts.

c. Fixture bases shall be metal and fastened to mounting location with metal components.

4. Finishes:

   a. Painted steel sheet shall be processed with Bonderize or equal phosphate treatment or shall be Paintlok or Galvanneal.
   b. Unpainted sheet steel shall be Galvanneal, by Republic Steel or accepted equivalent.
   c. Springs shall be of full hard temper stainless steel.
   d. Fasteners of ferrous metal shall be cadmium plated or zinc plated with chromate.
   e. Screws mounting fixture housing in plaster ring shall be minimum #8, pointed to facilitate installation.
   f. Plaster frame rings shall be of sufficient strength to withstand deformation during installation, and of suitable materials or finish to prevent corrosion from ceiling plasters and mortars.

      1) The contractor shall furnish the fixture manufacturer a complete list of fixtures that will be installed in acoustical plaster ceilings with types and quantities.

   g. Painted finishes shall be baked epoxy, polyester powder coated, acrylic or accepted equivalent finish suitable for the service required including temperature and accepted by the A/E. Finish shall be applied after fabrication.

5. Fixtures shall be complete with canopies, suspensions of proper lengths, hickeys, casing, sockets, holders, reflectors, hardware, and shall be completely wired and assembled. Each troffer shall have positive enclosed spring-loaded catches and safety hinges.
6. Furnish suitable plaster rings or plaster stops for fixtures set in plaster ceilings. Consult the "Finish Schedules" on drawings for locations and extent of plaster ceilings. Coordinate the mounting methods of recessed fluorescent lighting fixtures with ceiling suspension system and ceiling trades.

C. REFLECTORS

1. Reflectors and reflecting cones or baffles: fabricated from #12 aluminum reflector sheets, 0.57: (15 gage) or heavier, all absolutely free of any tooling marks including spinning lines, and free of any marks or indentations caused by riveting or other assembly techniques. No rivets, springs or other hardware will be visible after installation.
2. Reflectors and baffles: of first quality polished, buffed and anodized finish, "Alzak", and of specular finish color as selected by the A/E. Reflector and baffles: modified elliptical contour and produce no apparent brightness from nadir to 40 degrees above nadir, nor the lamp image nor any part of the lamp be visible from nadir to 40 degrees above nadir.
3. Submit samples of colored aluminum finished (black, brass, bronze, etc.) for approval before fabrication.

D. LENSES

1. Plastic lenses and diffusers used on LED fixtures shall be 100 percent prime virgin acrylic, minimum unpenetrated thickness of 0.125" and be furnished with anti-static treatment.
2. Exposed fixture housings or frames shall have a continuous smooth surface with no visible seams and a neat and finished quality appearance. Hinges and fastening devices shall be fully concealed unless otherwise specifically approved by the A/E.
3. The thickness of visible edges of mounting frames and rings at the ceiling line shall be between 0.035" and 0.050". Light leaks around trim frame or lens or between any of these are unacceptable.
4. Where fixture type is not indicated on drawings, fixture type used in similar locations shall be provided, as accepted by the A/E.
5. Components of the same type, size, rating, functional characteristics, and make of similar interior lighting fixtures shall be interchangeable.
6. Fixture stems shall be furnished by the manufacturer of the fixture specified or as shown on the drawings.
7. Fixtures for use outdoors or in wet areas shall be suitably gasketed to prevent access of moisture or insects into fixture or diffuser.
8. Metal parts of fixtures for use in damp locations, specified as requiring painting, shall be painted with suitable weather and moisture resistant paints exhibiting moisture resisting qualities equal to epoxy-based coatings.
9. Aluminum parts of fixtures for use in damp locations specified as requiring an unpainted finish shall be anodized.

E. Lamps:

1. LED:

a. Shall be Reduction of Hazardous Substance (RoHS) compliant, and shall comply with FCC 47 CFR Part 15, IES LM-79 & 80.
b. Minimum CRI of 80 with a color temperature of 3000-3500ºK for interior fixtures and 4000-4500ºK for exterior fixtures, unless otherwise noted in the Contract Documents.
c. Minimum rated life of 60,000 hours at 25ºC ambient temperature.
d. LED driver shall have a THD of <20% and a power factor of 0.95 or higher with integral short circuit, open circuit and overload protection.
e. LED driver and LED module shall be accessible and replaceable from below.
f. LED lighting fixtures shall be assembled in the USA with minimum 80% materials content from the USA.
g. All LED fixtures located within instructional spaces shall have factory installed dimmable control modules built right into the fixture.
h. LED fixtures shall be provided with a minimum 10-year warranty on entire fixture (all components).

2.2 MARKING OF LUMINAIRES

A. Mark luminaires designed for voltages other than 110-125 volts circuits.

2.3 SOUND TRANMISSION

A. It is the intent of this Specification that sound transmission through the luminaire units, when spaced as indicated on drawings, shall be sufficiently attenuated to maintain speech privacy between adjoining spaces.

2.4 LUMINAIRE TRIMS

A. Luminaires shall have finish trim designed for the following types of ceiling systems:

1. LED Luminaires:

	Ceiling Type	Trim Type
a.	Plaster	F - Flanged with Plaster Frame
b.	Metal pan	M - Modular - Fit-In
c.	Mineral Tile	F - Flanged
d.	Drywall	F - Flanged
e.	Lay-In	G - Grid

B. Each trim detail shall be as shown on the drawings, which are indicative of appearance and dimensional requirements. The manufacturer's trim finish and dimensions: subject to the approval of the A/E. Flush mounted ceiling trims for rectangular or square recessed luminaires shall include mitered corners continuously welded and smoothed before shop finish is applied. No lapping of trim metal is permitted.

C. Trim of luminaires installed in metal shall match the color of that deck.

2.5 EXIT LIGHTS

A. LED lamps shall have 6-inch red letters on white background.

B. Field convertible mounting-end, back or top.

C. Field convertible directional arrows.

D. Each LED exit light shall have a total connected load of less than 2 watts.

2.6 LIGHTING CONTACTOR

A. Electrically operated, mechanically held, double break silver alloy contacts. Fully rated for tungsten lamp loads, when used as a back-up for HID luminaires, fluorescent lamp loads and general use loads. Interrupting capacity: 300 percent of rated current. NEMA I enclosure except otherwise specified.

B. As manufactured by: Asco-920RC, Square 'D' - Class 8903, General Electric - CR160MB, Westinghouse A202.

2.7 MODULAR RELAY PANEL

A. Comply with UL 508 and UL 916; factory assembled with modular single pole relays, power supplies, and accessory components required for specified performance.

1. Cabinet: Steel with hinged, locking door.

a. Barriers separate low-voltage and line-voltage components
b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.

2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.

    a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
    b. Rated capacity (Mounted in Relay Panel): 20A, 125V AC for tungsten filaments; 20A, 277V AC for ballasts.
    c. Endurance: 50,000 cycles at rated capacity.
    d. Mounting: Provision for easy removal and installation in relay cabinet.

2.8 TIME SWITCHES (Allowed only when EMS is not available to perform the function)

A. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic Time Clock capability.
3. Battery Backup: For schedules and time clock.

B. Electromechanical-Dial time switches:

1. Circuitry: Allow connection of a photoelectric relay as a substitute for on-off function of a program.
2. Astronomic time dial.
3. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

C. Description: Solid state, with dry contacts to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.9 INDOOR PHOTOELECTRIC SWITCHES

A. Ceiling Mounted Photoelectric Switch: Solid-State, light level sensor unit, with separate relay unit, to detect changes in lighting levels that are perceived by the eye.

1. Sensor output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay unit: Dry contacts rated for 20A ballast load at 120V and 277V, for 13A tungsten at 120V AC, and for 1hp at 120V AC. Power supply to sensor shall be 24V DC, 150mA, Class 2 power source as defined in NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with dead-band adjustment.

5. Indicator: Two LEDs to indicate the beginning of on-off cycles.

2.10 ILLUMINANCE COMPUTER ANALYSIS

A. Provide illuminance computer analysis for all indoor space.

B. For indoor analysis the initial light loss factor shall be taken as the product of the voltage drop factor (0.97) times the ballast factor.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Install fixtures according to manufacturer's recommendations and in compliance with the NEC.

B. Install "Lay-In" type fixtures with 6-foot lengths of flexible conduit to enable fixture relocation with minimum inconvenience. Fixture shall be securely fastened to ceiling frame members by mechanical means as per the NEC.

C. Luminaire locations as indicated on the drawings are generalized and approximate. Carefully verify future locations with architectural floor plans, reflected ceiling plans and other reference data prior to installation. Check for adequacy of headroom and non-interference with other equipment, such as ducts, pipes or openings

D. Upon completion of the installation, the luminaires and lighting equipment must be in first class operating order and free from defects in condition and finish. At time of final inspection, all luminaires and equipment shall be fully lamped, and be complete with required lenses of diffusers, reflectors, side panels, louvers or other components necessary for the functioning of the luminaires. Luminaires and equipment shall be clean and free from dust, plaster or paint spots. Any reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced by the Contractor.

E. The housings of recessed luminaires shall be adequately protected during installation by internal blocking or framing to prevent distortion of sides or dislocation of threaded lugs which, upon completion, shall be in perfect alignment and match the corresponding holes in frames or rims. Holding screws shall be inserted freely without forcing and remain easily removable for servicing. Threads intended to receive holding screws shall be chased after plating and finished to ensure easy installation and removal of knurled headed screws.

F. Housings shall be rigidly installed and adjusted to neat flush fit with the ceiling or other finished mounting surface. No light leaks will be permitted at the ceiling line or from any visible part or joints of the luminaires.

G. Housings installed directly in concrete shall be fabricated of hot dip galvanized steel or cast aluminum. Where cast aluminum housings are used, provide two coats of asphaltum paint prior to installation.

H. Provide 1/8-inch-thick x 2-inch diameter solid neoprene grommets at every mounting point for all luminaires surface mounted to concrete structure to prevent direct contact of housing to concrete.

I. Adjust all directional luminaires to obtain the most uniform distribution. Orient all similar luminaires consistently. Coordinate luminaires with speakers, air grilles, pipes and ductwork.

J. Luminaire bottoms, edges and ends of rows shall be even. Rows shall be straight, aligned and equally spaced in distinct areas. Clean all luminaires of debris and fingerprints and adjust trim to fit surface snug.

K. Provide all necessary hangers and mounting accessories for a complete installation.

L. Locate the fluorescent luminaires in the equipment rooms to best illuminate the equipment installed. Use chains or rods to support below ducts and pipes as required. Install after pipes and ducts are in.

M. Test all luminaires, switches and controls for operation. Replace all lamp burnout's if their estimated operating period is less than 80 percent rated lamp life prior to final acceptance.

3.3 Exit lights:

A. Install wall or ceiling mounted as shown on drawings.

B. Provide directional arrows required to show correct path to exit.

C. Install exit lights at a location and height to ensure a clear line of sight from the egress passageway.

D. Relocate exit lights that are not readily visible at no additional cost to the City of Key Colony Beach.

E. Internally illuminated exit signs shall have LED light source on normal power.

3.4 SUPPORTS

A. Fixture Supports:

1. Fixtures shall be supported according to manufacturer's recommendations and the NEC.
2. Where pendant fixtures are mounted in continuous rows, the number of hangers shall equal the number of 4-foot lengths, plus 1.
3. Do not support fixtures to plaster or gypsum board ceilings.
4. Furnish and install steel members and supports to fasten and suspend fixtures.

B. Install lighting fixtures on ceilings or walls of mechanical and electrical equipment rooms after piping, ductwork, and equipment are installed therein.

1. Exact location and switching for such fixtures will be determined at the job site during the work.
2. Fixtures shall be located to give maximum illumination to items of equipment requiring servicing and moving machinery.
3. Any lighting fixtures blocked, inaccessible or improperly located shall be relocated at no extra cost.
4. Where fan rooms are used as an air plenum, provide suitable gasketed vapor-tight lighting fixtures.

C. Plaster frames for lighting fixtures shall be furnished under this Section and installed by others under this Contract. Frames shall be finished matte white baked enamel unless otherwise noted.

D. Recessed luminaires shall be provided complete with mounting devices and accessories and constructed and mounted as to permit access to wiring.

E. Attachment devices shall be fabricated of formed, rolled or cast metal shapes with the requisite rigidity and strength to maintain continuous alignment of the installed luminaires.

F. Contractor shall be responsible for necessary adjustments in ceiling required to install luminaires.

G. Contractor shall verify all ceiling conditions from the architectural plans and provide appropriate mounting details for each luminaire.

H. Reflectors shall be attached to housing by means of a length of chain, which will prevent reflector from falling. Ensure that no part of chain is visible after installation when viewed from any angle below 45 degrees from the horizontal.

I. Pendant or surface mounted luminaires shall be provided with required mounting devices and accessories, including hickeys, stud-extensions, ball-aligners, canopies and stems. Coordinate locations of luminaires in mechanical areas. Mounting stems of pendant luminaires shall be of the correct length to uniformly maintain the luminaire heights shown on the drawings or established in the field.

3.5 ADJUSTMENTS

A. After the installation of luminaires is completed, adjust luminaires after dark under the supervision of the A/E at no additional cost to the City of Key Colony Beach.

B. Upon the completion of the installation of all luminaires, turn on for a continuous period of 48 hours and during that time, replace any burned-out lamps, defective ballasts or fuses, etc.

END OF SECTION

16530 EXTERIOR LIGHTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the lighting fixture installation work, and as indicated on the drawings, and as specified herein.

B. All materials shall be listed and labeled by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 RELATED SECTIONS:

1. 16112 - Raceways and Conduits.
2. 16120 - Wire and Cable.

1.3 SYSTEM DESCRIPTION

A. Wet location fixtures shall bear an NRTL label appropriate for that type of application.

1.4 SUBMITTALS

A. Shop drawings include but not be limited to:

1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all luminaires including finished, metal thickness, fabrication methods, support method, ballasts, sockets type of shielding, reflectors, provisions for relamping and all other information to show compliance with the Contract Documents.
2. Submit shop drawings and samples as requested of luminaires for approval before fabrication. Luminaire details may vary slightly from those shown on drawings provided the changes do not adversely affect size of installation, durability of luminaire, luminaire performance or appearance. Submitted samples may be subjected to photometric testing at an independent testing laboratory, refer to Section 01330, “Submittals”.

B. Certified photometric data for exterior lighting fixtures and a point-by-point illumination plan for entire site at same scale as Construction Documents

C. Wind load certification, by a Florida registered structural engineer, for exterior lighting poles.

D. Upon request, a sample of each fixture proposed for every use and specified unit shall be submitted to the A/E for review.

1.5 QUALITY ASSURANCE

A. Materials, equipment and appurtenances as well as workmanship provided under this section shall conform to the highest commercial standard and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated shall be fabricated from materials most appropriate for their use or function and

as such resistant to corrosion, thermal, and mechanical stresses encountered in the normal application and functioning of the luminaires.

B. All cast parts, including die-cast members shall be of uniform quality, free from blow holes, pores, hard spots, shrinkage defects, cracks or other imperfections that affect strength and appearance, or are indicative of inferior metals or alloys. Exterior surfaces, which do not otherwise receive a finishing coating, shall be machined, sanded or similarly treated areas, such as extruded metal parts. All such finished castings given a minimum of one coat of baked-on clear methacrylate lacquer unless a painted finish is specified.

C. Comply with Florida Building Code (FBC).

D. Luminaries and components shall be built under provisions of the N.E.C.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Exterior mounted lighting fixtures shall be vandal-proof types by Kenall Mfg. Co. or accepted equivalent.

2.2 EQUIPMENT

A. Exterior Lighting Fixtures:

1. Exterior fixtures shall be vandal-proof.
2. Provide required exterior lighting fixtures and components with NEMA LE2 lighting systems noise ratings.
3. Exterior lighting fixtures shall be furnished as indicated on drawings and fixture schedule. Fixtures shall be complete with necessary wiring, lamps, reflectors, glassware, and mounting accessories.
4. Components of the same type, size, rating, functional characteristic, and make of similar exterior lighting fixtures shall be interchangeable.
5. Fixture bases shall be metal and fastened to mounting locations with metal components.
6. Exterior fixtures shall be of aluminum or plastic construction.

B. Lamps:

1. Provide lamps for exterior lighting fixtures. Lamps shall be as indicated on the lighting fixture schedule.
2. High pressure sodium lamps are not acceptable.
3. Metal halide lamps shall comply with the following:

    a. Wattage ratings as shown on fixture schedule.
    b. Lamp base shall be mogul base.

4. LED:

    a. Shall be Reduction of Hazardous Substance (RoHS) compliant, and shall comply with FCC 47 CFR Part 15, IES LM-79 & 80.

b. Minimum CRI of 80 with a color temperature of 3500º K.
c. Minimum rated life of 50,000 hours at 25ºC ambient temperature.
d. LED driver shall have a THD of <20% and a power factor of 0.95 or higher with integral short circuit, open circuit and overload protection.
e. LED driver and LED module shall be accessible and replaceable from below.

C. Ballasts: High power factor, individually fused, regulator type. Ballasts shall be listed by an OSHA approved NRTL. Voltage shall be as shown on fixture schedule.

D. Lighting Poles: Comply with FPL standards and specifications and the following:

1. Luminaries, pole, base, and sub-base of exterior lighting shall be capable of withstanding wind velocity pressures determined by American Society of Civil Engineers (ASCE) 7. Supplier shall provide Shop Drawings and calculations, signed and sealed by a Florida registered engineer, as proof of compliance with this requirement.

    a. Use a map wind speed of 185 mph, risk category "III".

2. Poles shall be of material, shape, finish, and height as indicated on the drawings. Provide a reinforced handhold and grounding lug on poles.
3. Metal pole base, where indicated, shall be welded to pole and furnished complete with cover and anchorage hardware. Pole and luminaire finish shall be as indicated on the drawings and as accepted by the A/E.
4. Provide anchor bolts at least 1/2" diameter by 12 inches long with 2-inch bends, complete with nuts, washers, and shims. Anchor bolts shall be hot-dipped galvanized steel. Number of anchor bolts required shall be determined by lighting pole manufacturer.

E. OUTDOOR PHOTOELECTRIC SWITCHES

1. Description: Solid state, with dry contacts to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: 15-second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for category A1 locations.
5. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Exterior Lighting Fixtures: Exterior lighting fixtures shall be installed according to manufacturer's instructions and according to details as shown on electrical drawings.

B. Lighting Poles:

1. Lighting poles shall be installed according to manufacturer's instructions and according to details shown on electrical drawings. Adjust poles to be set plumb and make final adjustments as required.
2. Build concrete bases for lighting poles to the most stringent requirements as indicated on the drawings or submittal based on wind velocity pressures. Bases shall be complete with reinforcing anchor bolts, ground rod and conduit entry.
3. Exterior light poles shall be solidly grounded to the conduit or to the circuit ground conductor in the case of nonmetallic conduit and to a local ground rod installed at the fixture base.
4. Provide weatherproof fuse holders in each ungrounded conductor within at each lighting pole base. Splices between circuit feed conductors and fixture conductors shall be made using molded waterproof connectors equivalent to Buss "Tron" type.
5. Luminaries shall be oriented and aimed to provide the illumination patterns desired. Adjust fixtures, reflectors or lamps as required to obtain desired results.

3.3 Exterior lighting shall be controlled using a combination of photocell control with the programmable timed lighting control system.

END OF SECTION

16625 STANDBY EMERGENCY ELECTRICAL GENERATOR (DIESEL) for EHPA

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide a standby electric generating system which is rated for continuous standby service at 200 KW, 250 KVA at 0.8 power factor, 277/480 volts at 60 Hertz. The system includes but is not limited to the following:

1. A fuel-oil, engine driven electric plant to provide emergency electric power including a diesel engine driven electric plant.
2. Engine mounted start stop control systems.
3. An automatic load transfer control to provide automatic starting and stopping of the plant and switching of the load.
4. Generator main disconnects.
5. Mounted accessories as specified.
6. Remote annunciator panel.
7. Remote fuel gauge monitoring system.
8. Base mounted standard 400 gallons diesel fuel oil tank.

B. This system shall be built, tested and shipped by the manufacturer of the generator set so there is one source of supply and responsibility. The performance of the emergency electric plant shall be certified by an OSHA approved Nationally Recognized Testing Laboratory (NRTL), including the plant's full power rating stability, voltage and frequency regulations. All components shall be of American manufacture.

C. Related Sections:

1. 03300 - Concrete.
2. 16250 - Automatic Transfer Switch.
3. 16475 - Overcurrent Protective Devices.

1.2 SUBMITTALS

A. Submit for approval the following product data materials:

1. Generator Set. Generator, battery charger, batteries, engine governor, exhaust silencer, vibration isolators, remote annunciator panel, voltage regulator, jacket water heater, filters, day tank and accessories, remote shunt-trips.
2. Transfer Switches and Control Panel.
3. Mounted Accessories as specified herein.
4. The following Engine-Generator data in tabular form:

a. Make of engine.
b. Number of cylinders.
c. Bore, inches.
d. Stroke, inches.
e. Piston displacement, cubic inches.
f. Piston speed, feet per minute, at rated rpm.
g. Bmep @ rated kW output.

h. Make and type of generator.
i. Generator electrical rating, kVA and kW @ 0.8 pf lagging.
j. Number and type of bearings.
k. Exciter type.
l. Generator insulation class and temperature rise.
m. Combustion air requirements.
n. Exhaust flow and maximum allowable backpressure.
o. Radiator (CFM) air requirements at maximum rated ambient air temperature static pressure and allowable external static pressure drop.
p. Radiated heat.
q. Maximum brake hp @ rated rpm.
r. Engine manufacturer certified engine bhp curve and certified engine-generator set fuel consumption curve.
s. Lubrication requirements and recommended products.
t. Fuel requirements including fuel line sizes and recommended products.
u. Shipping and net weight of engine-generator package.
v. Type of fuel injector system.
w. Harmonic analysis.
x. Certified engine HP curves.
y. Exhaust pipe size.
z. Available short-circuit.

5. Disconnect switches.
6. NFPA 110 Level 1 Factory generator set Test Report.
7. Provide operating and maintenance manuals complete with replacement parts data, in printed and electronic format (CD).
8. Submit sample of written warranty for review and approval. Failure to comply with this mandatory requirement is considered sufficient reason to reject all submittal data.
9. Contract Closeout Submittal: Provide A/E and the City of Key Colony Beach manufacturer's certification and warranty assuring each item of equipment is complete and in good condition, free from damage, properly installed, connected, adjusted, and tested as to full power rating, stability, voltage and frequency regulation.

1.3 QUALITY ASSURANCE

A. Qualifications: Single source generator supplier and installer, acceptable to the standby emergency generator manufacturer, capable of providing, but not limited to, the following services:

1. Generator and electrical apparatus pertinent to the generator including the automatic transfer switches.
2. Complete base mounted fuel tank system.
3. Remote annunciator Panel.
4. Sheet metal shrouding.
5. Plumbing pertinent to the fuel system and generator.
6. Exhaust system and piping.
7. Insulation of exhaust system.
8. Control wiring between generator and transfer switch, water heater, battery charging, and annunciator panel wiring.
9. Required warranty.
10. Other work required for a complete and operable system.

B. Generator set, transfer switch, and all accessories shall be delivered to the job site by the manufacturer's local authorized dealer who will supervise its installation and testing.

1. In order to qualify as local authorized distributor, that dealer must be authorized to perform warranty service on the complete system including engine, generator, controls, and automatic transfer switch, and must provide written proof of such authorization upon request.
2. Authorized dealer must maintain a 24-hour emergency parts and service facility within a 4-hour response range of the job site and have a minimum of five years continuous experience in Southeastern Florida.

C. The City of Key Colony Beach will not accept 2 or more subcontractors to do the Standby Emergency Generator work.

D. Performance Requirements: Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.4 WARRANTY

A. Manufacturer of the standby emergency generator system shall provide a 5-year warranty against all defects in materials and labor from date of substantial completion. The date of equipment delivery shall not be used to supersede this requirement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Emergency Generator System:

1. Caterpillar.
2. Cummins-ONAN.
3. Kohler.

2.2 GENERATOR

A. Permanent magnet generator (PMG) exciter.

B. Class H insulation limited to Class “F” (130 degree C) rise.

C. Pitch: 2/3 pitch to minimize 3rd harmonics from the generator produced fundamental waveforms.

D. Provide an internally mounted 120-volt AC (alternating current) single-phase alternator anti-condensation space heater to minimize condensation while the generator is not running. The heater shall be electrically connected to the generator enclosure mounted AC service junction box and shall be interface wired to the AC panel by the electrical contractor.

E. Provide, install and wire 3-phase fused NRTL listed lightning arrestor and NRTL listed surge capacitor inside the generator housing.

2.3 ENGINE

A. The engine shall be turbocharged, four cycle, water cooled with unit-mounted radiator, air discharge duct adapter, fan and water pump, diesel fueled and meet EPA regulations.

1. Provide an in-line 6 cylinders and a minimum rating of 315 BHP at the operating speed of 1800 RPM developed.
2. Supply full pressure lubrication by a gear oil pump.
3. Provide oil filters with replaceable elements, oil coolers, fuel pumps and jacket water heater (208-volt AC single-phase) connected to a heater contactor controlled by the heater's thermostat; to be wired by the electrical contractor.

B. Govern engine speed by a isochronous governor to maintain alternator frequency within 3 Hertz from no load to full load alternator output. Ensure the engines have a 24-volt, DC, battery charging alternator with transistorized voltage regulator.

2.4 ENGINE INSTRUMENTS

A. The engine instruments panels: each contains an oil pressure gauge, water temperature gauge, and battery charge rate ammeter.

2.5 ENGINE CONTROLS

A. Complete engine start control, which operates on closing contact, and stop control, which operates on opening contact. Provide a cranking limiter to open the starting circuit in approximately 45 seconds if the plant has not started within that time.

B. Electric plants' control shall include a 3-position selector switch with the following positions: RUN STOP. REMOTE, high-water temperature, low oil pressure, and overspeed shutdown.

C. Provide individual signal lights and alarm terminal indicates when any safety device has operated.

D. Provide two remote emergency stop switches. Depict locations of switches on drawings, requirements as per NEC.

2.6 ALTERNATOR

A. The alternator shall be brushless, 4 pole revolving field type with rotating rectifier exciter and solid-state voltage regulators. Directly connect the stators to the engine fly wheel housing, and the rotors driven through a semi-flexible driving flange to ensure permanent alignment.

B. Voltage regulation shall be within plus 2 percent of rated voltage, from no load to full load. The instantaneous voltage dip shall be less than 12 percent of rated voltage when full load and rated power factor is applied to the alternator. Recovery to stable operation shall occur within three seconds.

C. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage.

D. Include a Rheostat that provides a minimum of plus or minus 5 percent voltage adjustment from rated value. Ensure temperature rise is within rating as defined by NEMS MG1 22.40.

2.7 ALTERNATOR INSTRUMENTS PANELS

A. The alternator instrument panel shall be wired, tested and shock mounted on the electric plant by the manufacturer of the emergency generator. It shall contain at least the following equipment:

1. Oil pressure gauge.
2. Water temperature gauge.
3. Battery charge rate ammeter gage.
4. Lapsed time meter.
5. AC voltmeter: Dual Range, indicates all voltages.
6. AC ammeter: Dual Range, indicates current in each phase.
7. Frequency meter.
8. Run off auto switch.
9. Phase selector switch.
10. Voltage adjusting rheostat.
11. Remote start-stop terminals.
12. Battery charging alternator on engine with voltage regulator.
13. Manual reset button.
14. Overload field circuit breaker with manual reset.
15. Emergency latch relay and alarm terminal.
16. Cranking limiter and light.
17. One fault light for safety shutdown.
18. Automatic overspeed shutdown.
19. High engine temperature shutdown.
20. Low oil pressure shutdown.
21. Panel lights with on-off switch.
22. Engine water jacket heater.
23. Meter Switch.
24. Voltmeter/Ammeter phase selector with off position.

2.8 ELECTRIC PLANT MOUNTING

A. Provide the electric plant on a welded steel base, suitable for mounting to any level surface. Provide unit with four quad spring vibration isolators. Mount the entire package on a 6-inch-high concrete pad that extends 4 inches all around from the generator steel base.

2.9 GENERATOR TERMINAL BOX

A. Generator phase and neutral loads shall be brought into an oversize terminal box and terminated at copper bus bar extensions, where external connections can be made to generator feeder disconnect.

B. Provide a ground bar in the box, bonded to the box, for termination of grounding conductors.

C. Ground fault CT's shall be provided in the terminal box by the generator supplier. Ground fault relays shall be alarm only.

2.10 GENERATOR MAIN DISCONNECT

A. Provide a solid-state main circuit breaker with long-time pickup and delay, short-time pick-up and delay, and instantaneous. Provide 24-volt D.C. Shunt-trip for remote trip.

2.11 FUEL SYSTEM

A. Provide the generator set an integral fuel tank base capable of supplying enough fuel to operate the generator set at full rated load for 24 hours. Fuel tank manufacturer shall be registered with Florida Department of Environmental Protection (FDEP) and have current valid equipment list number (EQ#). In addition, provide the following items:
   1. Plumbed the engine to the fuel tank base by the supplier of the generator set. Mount all openings in the top of the tank on a removable inspection plate. Include two extra 2" openings for future use located in an accessible area on the tank not obstructed by the generator.
   2. Construct fuel tank in a manner to be capable of supporting the complete generator set and any accessories required.
   3. Support the complete fuel tank by a sufficient number of 3/4-inch minimum thickness steel pads to avoid contact with concrete pad. These pads rest on vibration pads to provide isolation from vibration. Determine quantity and density of the vibration pads by the total weight of the entire generator set package and the weight of the amount of fuel. Provide the tank with four lifting eyes capable of lifting the entire assembly without fuel.
   4. Provide an engineered maintenance steel platform on three sides of the generator set enclosure. The maintenance platform shall be 42 inches wide, shall be provided with access stairs from grade level and have removable handrails along its entire length.

2.12 ACCESSORIES

A. Provide all accessories needed for the proper operation of the plant. Include critical location exhaust silencers with inlet, flexible exhaust connections, starting batteries, battery cables, battery racks and detailed operation and maintenance manuals with parts list.

B. Supply the fuel oil engine driven unit with at least the following specific accessories:

   1. Silencer and Flexible Exhaust Connector:

      a. Provide a Maxim M-41 critical type exhaust silencer as manufactured by Riley Beaird, Inc., or A/E approved equal by Nelson. Silencer size shall be as required to be equal to exhaust pipe size.
      b. Exhaust Muffler shall be all-welded design, constructed of sheet and plate steel.
      c. Provide a flexible connector, minimum 36 inches long, same size as exhaust pipe, compatible with engine manifold flange for exhaust pipe system, to be installed by mechanical contractor.
      d. Insulate the muffler and exhaust pipe with 1-1/2 inch thickness of Kaylo Block 1800 degree F insulation, as manufactured by Owens-Corning Fiberglass. Secure the 1-1/2 inch Kaylo block to the metal lath with 14 gauge galvanized wire ties, 16 inches on center. Stretch smoothly a 1 inch 20-gauge galvanized hex,

mesh and secure over the insulation. Apply a minimum of 1/4-inch thick wet coat of fibrous (non-asbestos) cement over the insulation to a smooth and even finish. After the cement has dried, cover the insulation with 8 ounces canvas applied with adhesive.

e. Jacket water heater shall be installed in-line with engine cooling system. Jacket water heater to be rated 3 KW, at application voltage, single phase.

2. Batteries and Charger:

a. Provide batteries for engine starting. Batteries shall be mounted in a suitable acid-resistant rack not made from wood products.
b. Provide an automatic battery charger with voltmeter and ammeter, for 120-volt, 1 phase input and 24-volt D.C. output. 10-amp output minimum. Meeting NFPA 110 alarm requirements. An alarm for Battery Charger failure, Low battery charge rate, High battery charge rate shall be supplied.
c. Heavy duty battery cables.

3. Remote Annunciator Panel:

a. Provide a remote annunciator panel in compliance with NFPA-110 Level 1 at EHPA Manager's Office, as indicated on Contract Drawings.

2.13 CONTROL PANEL

A. Loss of normal power (as defined in transfer switch specification), at transfer switch automatically causes the generator system to start, accelerate to rated speed and build up to rated voltage.

B. If the generator fails after 3 attempts, the failure light is lit, and an alarm sounded on the control panel and remote annunciator panel.

C. After normal power has been restored to transfer switch and after the time delay on retransfer, the transfer switch returns to normal power and all controls reset for next operation. After an adjustable time delay, the unit shuts down automatically.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the emergency generator according to the manufacturer's recommendations and according to the requirements of NFPA 70 - National Electrical Code - (NEC).

B. The emergency generator installer shall be responsible for coordinating all trades to ensure the proper functioning of the entire systems including but not limited to fuel supply, exhaust equipment and air transfer system. This coordination shall include furnishing all required information to other subcontractors regarding fuel, exhaust and cooling system dimensions, pipe and duct sizes, etc. The Installer shall furnish a dimensioned plan layout indicating all generator dimensions, roughing dimensions, piping layout, duct layout, tank locations and elevations and all required electrical wiring and interconnections. These areas include but are not limited to the following:

1. Fuel system including main fuel storage tank, day tanks, piping, and remote fuel monitoring system as specified.
2. Remote Annunciator Panel.
3. Cooling air intake and exhaust louvers.
4. Sheet metal ductwork interconnection between radiator and exhaust air louvers.
5. Installation of mufflers and exhaust pipes.
6. Insulation of mufflers and exhaust pipes.

C. Emergency generator controls shall be readily accessible as defined by NEC.

D. Provide the generator with a time elapsed meter and automatic programmer.

3.2 TESTS AND START-UP

A. Tests:

1. The emergency generator system shall receive the manufacturer's standard testing.
2. Before acceptance of the installation, the equipment shall be tested to show it will start automatically, subjected to full load test, shut down and reset as required in these Specifications.
3. The entire emergency power system will be started up and certified in writing by the manufacturer of the generator system. Test the system per NFPA 110 under full load with a dry resistive load bank at the jobsite, for a minimum of four hours, including minimum of three (3) hours at 100% and 1 hour at 110%.
4. Test shall be performed in the presence of the A/E, the City of Key Colony Beach's Project Manager, and representative from the City of Key Colony Beach Facilities Maintenance Operations.
5. Before acceptance, any defects that become evident during this test shall be corrected at no additional cost the City of Key Colony Beach.
6. Provide cold start test and record time required to come to a voltage and frequency stable condition.

B. Start-up and Instructions:

1. On completion of the installation, perform the initial start-up by a factory-trained and certified representative of the generator system manufacturer.
2. At the time of start-up, operating instructions and maintenance procedures shall be thoroughly explained to the City of Key Colony Beach operating personnel.
3. Two hard-copies and two DVD copies of all operating and maintenance instruction books shall be supplied to the City of Key Colony Beach for the emergency generator system and auxiliary equipment.
4. One set of special tools, operating software, connection cables and any other equipment necessary to diagnose and repair the generator system shall be supplied to the City of Key Colony Beach.

3.3 RELATED WORK BY OTHERS

A. All exhaust system piping, insulation and connections from the engine to the muffler, and from the muffler to the exterior of the building including the thimble, shall be provided complete under Division 15. The muffler shall be provided by the emergency generator /engine supplier.

END OF SECTION

16630 BATTERY POWERED EMERGENCY LED LIGHTING UNITS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services necessary to complete the Battery Powered Emergency Incandescent Lighting Units work, as indicated on the drawings, and as specified herein.

B. All Materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

C. RELATED SECTIONS:

1. 16511 - Lighting Fixtures and Lamps.

1.2 SUBMITTALS

A. Submit identified manufacturer's literature and technical data including printed installation instructions and recommendations.

1.3 WARRANTY

A. Three-year unconditional guarantee, 5-year pro-rata against defective parts and improper construction under normal operating conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS/PRODUCTS

A. Battery Powered Emergency Lighting Units:

1. Dual-Lite, Model LZ Series with 3 watts LED lamps.
2. Lightalarms Electronics Corp., LCA1250 Series with 4 watts LED lamps.
3. Lithonia ELM-2 LED.

2.2 EQUIPMENT

A. Unit equipment shall consist of the following:

1. Battery: Three-cell, 6-volt, maintenance free, rechargeable, sealed lead calcium or nickel-cadmium battery having a minimum of 5-year life rating and operating capacity to power the connected lamps for 1-1/2 hours to 87.5 percent of initial nominal voltage of 1.75 volts per cell.
2. Case: House battery in a compact injection molded UL 94V-O flame rated thermoplastic cabinet with front section hinged for easy access to battery, battery charger, fuses, and wiring compartment and with provisions for wall mounting. Provide access hole to test switch.

3. Charger: Solid state, multi-rate, fully automatic with sensing device to determine charging rate and to charge battery to 100 percent of battery capacity within 12 hours following a full rated load discharge to 87.5 percent nominal voltage to 1.75 volts per cell.
4. Transfer Relay: Solid state transfer relay for immediate transfer.
5. Head Lamps: LED.
6. Input Voltage: Dual voltage operation 120/277 volts, 60 cycle input voltage.
7. Accessories:

    a. Test Switch: Locate at one side of the housing.
    b. Charge Monitoring Light: Locate at one side of the housing.
    c. AC Pilot light.
    d. Cell vents as required by NEC 480-9.

PART 3 EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an appropriate manner.

3.2 INSTALLATION

A. Install according to manufacturer's recommendation and with applicable codes and regulations.

B. Securely mount unit equipment on the wall on brackets, 2 feet below ceiling or 7'-6" above finished floor, whichever is higher, exact location to be determined in the field.

C. Electrical connections to either a unit equipment or emergency lighting unit shall be permanent and connected to the circuit supplying power to other lights in that particular area, ahead of any switch controlling those lights.

END OF SECTION

16670 LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Section includes a complete and certified direct lightning protection system including necessary equipment, materials and accessories.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL). After completion, system shall bear a master label certificate.

C. RELATED SECTIONS:

1. 16112 - Raceways and Conduits.
2. 16120 - Wire and Cable.

1.2 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA) 780 - Lightning Protection Code.

B. Underwriters Laboratories (UL) Master Label Code 96A Standards for Lightning Protection Systems.

1.3 SUBMITTALS: Submit properly identified product data for review on materials and connections, fastenings, and method of installation. Submit layout of system indicating components and connections.

1.4 QUALITY ASSURANCE

A. Lightning protection system shall be the standard product of manufacturer regularly engaged in the production of lightning protection systems and manufacturer's latest approved design. The equipment manufacturer shall also be and NRTL listed and approved manufacturer.

B. After completion of the work, system shall bear a master label certificate from an OSHA approved NRTL.

1.5 SEQUENCING AND SCHEDULING

A. Work with other trades to ensure a correct, neat, and unobtrusive installation. Provide a sound bond to the main water service and assure interconnection with telephone, electrical and other building ground systems. Install surge protective device on the power service.

PART 2 PRODUCTS

2.1 MATERIAL

A. Copper, aluminum or bronze components as described, NRTL listed and labeled, and of the size, weight, and construction for use according to NRTL, code requirements and per manufacturer recommendations.

B. Conductors:

1. Downlead conductors to ground: Copper of 32 strands 17 gage minimum, 65,500 circular mils or aluminum 28 strands 14 gage 115,000 circular mils for Class 1 structures.
2. Main roof conductors: Copper of 29 strands 17 gage minimum, 59,500 circular mils or aluminum of 24 strands 14 gage 98,600 circular mils for Class 1 structures.
3. Bonding devices, cable splicers, and miscellaneous connectors on the roof:

    a. Cast bronze or aluminum with bolt pressure connections to cable.
    b. Cast or stamped crimp fittings are not acceptable.
    c. Straps and adhesive cable straps may be stamped.

C. Air Terminal:

1. Air Terminal Installed at Flat or Sloped Roofs and at Parapet Tops: Solid, round copper rod, 3/8" minimum diameter with nickel plated pointed tip, or solid, round aluminum rod, 1/2” minimum diameter with pointed tip. Rods shall project 10 inches minimum above the object to be protected.
2. Air Terminal Bases: Cast bronze with bolt pressure cable connections and securely mounted with stainless steel screws or bolts. Bases on built-up roof shall be secured with a proper adhesive and shall have a minimum surface contact area of 18.5 square inches. Provide with swivel base on loped roofs.

D. Ground Rods: Copper-clad steel, minimum of 5/8" diameter and 10 feet long. Connect to the system with a 2-bolt cast bronze clamp, having a minimum length of 1-1/2" and employing stainless steel cap screws.

E. Cable Fasteners: Substantial in construction, compatible electrically with the conductor and mounting surface and space according to Code and NRTL requirements.

F. Make connections to metallic building parts and machinery with bonding plates of cast bronze with bolt tension cable clamps or by other accepted equivalent.

PART 1 EXECUTION

1.1 INSTALLATION

A. Lightning protection system shall be installed according to NFPA Publication No. 780, UL Publication 96A, LPI Publication No. 175, as specified, as shown on drawings, and according to accepted Shop Drawings.

B. Lightning protection system shall be an LPI Certified Lightning Protection System and shall be provided with a UL or NRTL Master Label.

C. Contract drawings indicate extent and general arrangement of lightning protection system. If any departure from contract drawings is deemed necessary by Contractor, details of such departures and reasons, shall be submitted as soon as practicable to the A/E for acceptance. No such departures shall be made without prior written acceptance of the A/E.

D. Connections made in lightning protection system shall be electrically continuous to ground rods.

E. Metal on roof, including plumbing vents, roof drains, fan housings, steel frames, flashings, roof hatch, skylights, electrical conduit, etc., shall be bonded to lightning protection system.

F. Air Terminal Locations: On ridged and flat roofs, provide air terminals at locations indicated with fasteners according to system manufacturer instructions.

G. Conductor Locations: Conductors shall be installed at locations indicated with fasteners spaced a maximum of 3 feet apart.

H. Raceways Locations: Raceways shall be continuous and concealed, and any metal raceways shall be bonded at both ends. Radius for elbows and bends shall not be less than 8 inches. Coordinate roof penetrations with applicable Sections of the Specifications.

I. Ground Rod Locations: Ground rods shall be installed at locations indicated on the drawings with top of rods a minimum of 12 inches below finished grade.

J. Installation of an aluminum lightning protection system shall comply NFPA-780 paragraph 4.5.

K. Upon completion of the installation, provide a UL or other OSHA approved NRTL Master Label to the A/E for the City of Key Colony Beach's records. Submit copies of record shop drawings with the Master Label Application form.

END OF SECTION

16709 SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Section Includes Surge Protective Devices (SPDs) for the protection of AC electrical circuits and electronic equipment from the effects of lightning induced transients, other externally generated transients, and internally generated transients.

B. All materials shall be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL).

1.2 REFERENCE STANDARDS:

A. ANSI/IEEE:

1. C62.33IEEE - Standard Test Specifications for Varistor Surge-Protective Devices.
2. C62.41IEEE - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
3. C62.45-87 IEEE - Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
4. 142 IEEE - Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book).

B. Underwriters Laboratories (UL):

1. UL 1449 Standard for Safety, Transient Voltage Surge Suppressors (3rd Edition).
2. UL 1283 Electromagnetic Interference Filters.

C. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code (NEC).
2. NFPA 75 Standard for the Fire Protection of Information Technology Equipment.
3. NFPA 780 Lightning Protection Standards.

1.3 QUALITY ASSURANCE

A. The manufacturer shall submit a written statement indicating that a factory authorized representative inspected the installation. The installing contractor shall submit a checkout memorandum to the manufacturer indicating the date the equipment was placed into service and the actual method of installation. Submit three copies of each to the A/E.

B. All SPDs for service entrance, distribution, and branch circuit protection within a facility shall be provided by a single manufacturer.

1.4 WARRANTY

A. The SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of 5 years from the date of substantial completion of service and activation of the system to which the SPD is attached.

B. An SPD that shows evidence of failure or incorrect operation during the warranty period shall be repaired or replaced, including labor and materials, at no expense to the City of Key Colony Beach. Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPD shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this warranty. The warranty shall cover the entire device, not just the modules.

C. The installation of SPDs in or on electrical distribution equipment shall in no way compromise or violate equipment listing, labeling, or warranty of the distribution equipment.

1.5 SUBMITTALS

A. Submittals shall include, but not be limited to, the following information:

1. Data for each SPD type indicating conductor sizes, conductor types, connection configuration and lead lengths.
2. Manufacturer’s certified test data indicating the ability of each SPD to meet or exceed requirements of this specification.
3. Drawings, with dimensions, indicating SPD mounting arrangement and lead length configuration, and mounting arrangement of any optional remote diagnostic equipment and assemblies.
4. List and detail protection systems such as fuses, disconnecting means and protective materials.
5. SPD wiring, bonding and grounding connections shall be indicated on the wiring diagrams for each system. Include installation details demonstrating mechanical and electrical connections to equipment to be protected.
6. If requested, a sample of each SPD type shall be submitted for use in testing and evaluation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transient Voltage Surge Suppression:

1. Advanced Protection Technologies.
2. EDCO-Emerson Network Power.
3. Hubbell Surge Protection Devices.
4. LEA International by Power Logics.
5. Siemens.
6. Ditek Corp.

2.2 PERFORMANCE

A. General:

1. SPDs shall be listed according to UL – Third Edition 1449 Standard for Safety, Transient Voltage Surge Suppressors, and UL 1283, Electromagnetic Interference Filters.

2. Services entrance equipment SPD's shall be labeled as Type 1 with 10 modes of protection: 3-modes (Line-to-line) 3-modes (Line-to-Ground), 3-modes (Line-to-Neutral), and 1-mode (Neutral-to-Ground) for a 3-phase, 4-Wire plus ground voltage system. (Line-to-Neutral-to-Ground is not an acceptable substitute for Line-to-Ground).
3. Distribution and panelboard SPD's shall be labeled Type 1 with 7 modes of protection: 3 modes (line-to-ground), 3 modes (line-to-neutral), and 1 mode (neutral-to-ground) for a 3-phase, 4 wire plus ground voltage system. (Line-to-Neutral-to-Ground is not an acceptable substitute for Line-to-Ground).
4. Provide an SPD at the panelboard powering the security camera head-end equipment.
5. The UL 1449 Clamping Voltage for the following configurations shall not exceed the following:

VOLTAGE CONFIGURATION	L-G	L-N	N-G	L-L
120/208V	700V	700V	700V	1200V
277/480V	1200V	1200V	1200V	1800V

6. The unit shall be UL 1283 listed as an electromagnetic interference filter. Standardized insertion loss data shall be obtained using MIL-STD E220A 50W insertion loss methodology. Minimum insertion loss shall be as follows:

FREQUENCY[MHz]	INSERTION LOSS [dB]
0.1	34
1.0	51
10.0	54
100.0	48

7. SPDs shall use a separate path to building ground, the equipment safety ground is not to be used as a transient ground path.
8. SPDs shall be constructed using metal oxide varistors (MOV) based modules. Each SPD shall have a response time of less than one nanosecond with 6 inches or less of connected lead length for any individual protection mode.
9. Each MOV contained within a current diversion module shall be individually fused (component level safety fusing). For the assurance of safety purposes, this feature shall be a standard design feature and not an optional feature of the product. The individual component level fusing shall allow a reduction of protection rather than an automatic complete loss of protection.
10. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125 percent for a 120/208-volt system with MCOV of 150 volts and 115 percent for 277/480 volt, systems with MCOR of 320 volts.
11. The minimum surge current capacity (single pulse rated) per phase shall be:

    a. Distribution Panelboard: 200 KA
    b. Lighting and Power Panelboard: 100KA

12. SPD's shall include visual LED diagnostics indicators, and audible alarm with silence.

PART 3 EXECUTION

3.1 INSTALLATION

A. The contractor shall install the parallel SPD with short and straight conductors, not to exceed 18 inches long.

B. Service entrance SPD's shall have a 60 amp, 3-pole circuit breaker protection and distribution and lighting/power panelboards shall have a 30 amp, 3-pole circuit breaker protection. Connect SPDs with #6AWG wire gauge minimum.

C. The contractor shall follow the SPD manufacturer's recommended installation practice as found in the equipment installation manual.

D. The installation shall apply to all applicable codes.

END OF SECTION

6721 FIRE DETECTION ALARM SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Complete, operable, tested and certified, addressable, electrically supervised fire detection alarm system including necessary controls and accessories. This section covers new installation, replacements, and modifications.

B. Related Sections:

1. 08710 - Finish Hardware.
2. 13845 - Intrusion Detection System.
3. 13860 - Access Control System.
4. 15300 - Fire Protection.
5. 16112 - Raceways and Conduits.
6. 16120 - Wire and Cable.
7. 16131 - Outlet, Pull, and Junction Boxes.
8. 16709 - Transient Voltage Surge Protection.

1.2 REFERENCES

A. Florida Building Code (FBC).

B. Department of Insurance, Division of State Fire Marshall (SFM), Uniform Fire Safety Rules and Standards, Chapter 4A-48, Fire Alarm Systems, latest edition.

C. National Fire Protection Association, Inc. (NFPA):

1. NFPA 70 National Electrical Code (NEC).
2. NFPA 72 National Fire Alarm and Signaling Code.
3. NFPA 90A Standards for the Installation of Air-conditioning and Ventilating Systems.
4. NFPA 92 Standards for Smoke Control Systems.
5. NFPA 101 Life Safety Code.

D. Florida Statutes

E. ADAAG, Americans with Disabilities Act Accessibility Guidelines

F. Underwriters Laboratories (UL) latest edition, or other Nationally Recognized Testing Laboratory (NRTL) approved by OSHA.

1. UL 38 Standards for Manual Signaling Boxes for Use with Fire-Protective Signaling Systems.
2. UL 228 Door Closers-Holders, With or Without, Integral Smoke Detectors.
3. UL 268 Standards for Smoke Detectors for Fire Protective Signaling Systems.
4. UL 268A Smoke detectors for Duct Application.
5. UL 346 Water Flow Indicators for Fire Protective Signaling Systems.
6. UL 464 Audible Signal Appliances.
7. UL 497B Protectors for Data Communication and Fire Alarm Circuits.

8. UL 521 Heat Detectors for Fire Protective Signaling Systems.
9. UL 864 Control Units for Fire Protective Signaling Systems.
10. UL 1424 Cables for Power Limited Fire Protective Signaling Circuits.
11. UL 1481 Power Supplies for Fire Protective Signaling Systems.
12. UL 1635 Digital Alarm Communication Systems Units.
13. UL 1971 Signaling Devices for the Hearing Impaired.

G. American National Standards Institute, Inc. (ANSI) A117.1, Building and Facilities Providing Accessibility and Usability for Physically Handicapped People, as referenced in FBC.

1.3 SYSTEM DESCRIPTION

A. Design addressable network system to meet the requirements of NFPA 70 (NEC), NFPA 72, accessibility codes, FBC, and UL.

B. New system shall be non-proprietary in terms of devices and have open-sourced programing of those devices.

C. All fire alarm components including but not limited to systems, products, and devices, shall be factory-supported for a minimum of 5 years following Substantial Completion of the work. Installation of any fire alarm component that is approaching their end-of-life cycle and will not meet this minimum requirement is prohibited.

1.4 SUBMITTALS

A. Before starting the work, the manufacturer's authorized representative shall submit a signed document committing the manufacturer to provide the City of Key Colony Beach or its authorized maintenance contractor with all the special tools, hardware, software, any proprietary items or products, and instruction or training programs necessary to test, service, and maintain the system installed under this contract, as well as any other system of the same manufacturer and model containing similar features, currently installed in any City of Key Colony Beach facility. Submit a copy of the document/letter to the City of Key Colony Beach District Alarms.

B. Before starting the work, submit shop drawings and product data on all equipment including the following:

1. Dimensioned outline drawings and technical data sheets for all equipment.
2. Riser diagrams indicating wiring and conduits. Wiring diagram shall include but not be limited to all connections and numbering for each terminal, wire color-coding at each device and terminal cabinets. Since the wiring diagram will be used as part of the "As Built Drawings", no "typical" wiring diagrams will be allowed.
3. Indicate cabinet elevations with each item on the face of the cabinet identified.
4. Functional description of the complete fire alarm system and subsystem.
5. Fuel shut-off system.
6. Parts list.
7. Device identifications for the entire project.
8. Sample inspection and test forms.
9. Diagram of magnetic door holder, mounting, backing, etc.
10. A complete battery load calculation with work sheets for project.

C. Tests and Submittals:

1. Before certification, test the system per NFPA 72 requirements.
2. The system shall be tested and certified by the manufacturer's certified personnel per NFPA 72.
3. Submit to the City of Key Colony Beach and the City of Key Colony Beach District Alarms a signed "Record of Completion" per NFPA 72 at least 5 working days before the first BCC formal inspection of the installed fire alarm system. All signatures shall be notarized, and contractor's license number provided. Inspection shall not commence until Certification is approved by District Alarms.

D. Substantial Completion Submittal Requirements:

1. Provide 3 complete sets of Operating and Maintenance (O&M) manuals, literature, and information concerning equipment indexed and bound in accepted loose-leaf binders.
2. Furnish 1 set of Contractor mark-up drawings to the A/E indicating accurate plan layout, conduit runs, and wiring diagrams as actually installed. Typical wiring diagrams are not allowed. Prior to submittal, the Contractor's mark-up drawings shall be updated daily and shall be made available at all times for review by the City of Key Colony Beach and the A/E.
3. Provide 3 sets of record drawings for the complete system. Show connections, numbering system of every device including wiring and cabling identification, raceways, and junction and terminal cabinets.
4. Fire Alarm Log Book: According to SFM Chapter 4A-48 provide fire alarm system required decal at the panel and system log book with Record of Completion at the facility on site.
5. Provide required decal by certifying installer affixed to front of main fire alarm control panel per SFM Chapter 4A 48.
6. Device Floor Plan Legend or Zone Map: Shall be professionally plotted in color, using a minimum scale of 1 inch = 20 feet, framed and laminated, and wall mounted in vicinity of main fire alarm control panel and at all remote annunciator panels. Zone map(s) shall identify all individual device addresses, including NAC panels and end-of-line devices, with room number locations clearly noted.
7. Provide the City of Key Colony Beach District Alarms, one (1) spare manufacture's (OEM) Main Motherboard for the FA panel.
8. Provide 6 original notarized NFPA 72 Certificate of Completion (certification)according to NFPA 72 and as specified herein. Part 2 shall be completed, notarized, and copies submitted after acceptance by the BCC, the A/E and the City of Key Colony Beach.
9. Provide the City of Key Colony Beach District Alarm, on a flash thumb-drive, a copy of the "Zone Map" and a duplicate copy of the system program stored at the panel, including pass-codes necessary to provide maintenance and programming of the system.
10. Name, address, and telephone numbers of local supplier and local factory trained Technical Representative (TR). Provide 3 copies of TR's certificate verifying factory training on the submitted system.
11. Ten (10) Keys and/or wrenches necessary to reset manual fire stations.

1.5 QUALITY ASSURANCE

A. The equipment manufacturer shall have a local branch office or authorized distributor staffed with factory trained, full-time employees capable of performing installation, testing, inspection, repair, and maintenance services for the life of the fire alarm system.

B. Furnish wiring diagrams and wire runs for the raceway system installed by the licensed electrical contractor, under Division 16.

C. Installer Qualifications:

1. The contractor installing the fire detection alarm system shall be licensed by the State of Florida Department of Business and Professional Regulation under Section 489, Part II of the Florida Statue as an EC-Unlimited electrical contractor or an EF-Alarm contractor I. The installing contractor shall possess a valid occupational license, and a current certificate of insurance.
2. The installing contractor shall ensure that a qualified representative of the fire alarm system manufacturer monitors and coordinates the installation and is present at the Acceptance Inspection to test and instruct the City of Key Colony Beach as to the use of the system.
3. Provide a minimum of 1 Electrical Master, Electrical Journeyman, Master Specialty or Journeyman Specialty in the fire alarm trade for every 3 apprentices performing the installation of the fire alarm system.

D. Fire Detection Alarm System:

1. Listed and labeled by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL) approved by OSHA.
2. Listed and labeled for commercial use. Residential devices are not allowed.

E. Components, Parts, and Assemblies shall be listed for compatibility by the fire alarm system manufacturer.

1.6 WARRANTY

A. Fire alarm system, including but not limited to fire alarm panels, fire alarm components, raceways, wiring, etc., shall be warranted in writing by the system manufacturer, against defects in labor and materials for 1 year after Substantial Completion.

B. Provide 5 notarized original copies of the warranty certificate signed by the authorized manufacturer's representative giving detail of the warranty being provided, and listing components that are included and not included in the warranty

C. Warranty service shall be performed by a certified factory trained and approved fire alarm technician of the equipment manufacturer's representative or distributer.

1. The Contractor shall respond to routine warranty service requests by completing repairs within 24 hours of service request by the City of Key Colony Beach.
2. The Contractor shall respond to emergency warranty service requests with the arrival of service technician at affected site within 4 hours of notification of emergency. Repairs shall be expedited to bring system online as soon as possible. Emergencies include, but are not limited to, the following:

a. Total system failure.
b. Inability to acknowledge, silence, or reset audibles or panel troubles.
c. Failure of air-conditioning to reset after an alarm.
d. Failure of any gas system to reset after an alarm.
e. Failure of alarm system to communicate with the City of Key Colony Beach monitoring center.
f. Loss of battery power.
g. Damage caused to system due to transients and power surges.
h. Complete zone or loop failure.
i. Fire at a facility.
j. If problem is not correctable within specified time frames, the Contractor shall provide in writing an expected completion date to the City of Key Colony Beach.

D. Inspections at End of Warranty:

1. Prior to the end of the 1-year warranty period, the City of Key Colony Beach Project Manager, and representatives from the City of Key Colony Beach Warranty Dept, the City of Key Colony Beach District Alarms, the Contractor and the fire alarm installer, shall meet at the site to address any pending warranty items to the satisfaction of the City of Key Colony Beach.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Detection Alarm System:

1. Edwards Systems Technology.
2. Notifier.
3. Siemens Fire Safety.
4. Johnson Controls International (JCI). Auto Call System
5. Fire Control Instruments (FCI)

B. Lightning Protection and Transient Voltage and Surge Suppression: See Section 16709.

C. Fire Alarm Cables for Wet Locations: Cable shall be listed by a NRTL for use in wet locations.

2.2 COMPONENTS

A. System Types Per Facilities

1. All Facilities:

a. Provide a multiple panel network type system of same manufacture for the USPS Building and the master control panel at the City Hall Building. The system shall be a 24-Volts Direct Current (VDC), fully analog addressable using multiple Signaling Line Circuits (SLC) Style 4 (Class B) and multiple Style Y (Class B) Notification Appliance Circuits (NAC), wired in dedicated conduits, electrically supervised and power limited.

B. Addressable System:

1. The fire alarm system shall consist of:

    a. A UL 864 listed intelligent microprocessor based main control panel.
    b. UL listed annunciator panel(s).
    c. UL fire listed printer.
    d. Automatic detection devices.
    e. Manual stations.
    f. Notification appliance devices wired according to the schedule on the Drawings and function as specified.
    g. “Voice Evacuation” features shall be provided when required by Code.

2. Equipment shall allow a one-person walk-through test of either the complete system or each individual SLC while maintaining full functionality of SLC not being tested. If no test activity occurs for a specified period, as determined by the manufacturer, the system shall automatically return to the normal operating mode.
3. System shall be capable of being programmed in the field, by a laptop computer. Store programmed information in non-volatile memory. System programming shall be password protected by fire alarm system manufacturer and include full upload and download capability.
4. In a facility designated as an Enhanced Hurricane Protection Areas (EHPA), the fire alarm system shall be provided with all provisions necessary to permit one-way voice communication between the main Fire Alarm control panel located in the EHPA Manager’s Office, and all EHPA designated areas.
5. At a minimum, the panel shall have behind a lockable door, the following switches:

    a. Audible silence.
    b. Trouble silence.
    c. Supervisory silence.
    d. Panel reset.
    e. Occupancy recall.
    f. Bypass buttons for horns, strobes, air handler shutdown, gas shutdown, door release. (Password protected)

6. System shall have a real time history log stored in non-volatile memory and capable of containing a minimum of 400 events.
7. The input AC power to the fire alarm control panel and the Digital Alarm Communicator Transmitter (DACT) shall be from a dedicated branch circuit of the facility emergency backup system. AC breaker shall be marked "WARNING - AC POWER TO FIRE DETECTION ALARM SYSTEM - DO NOT TURN OFF OR DISCONNECT".
8. Provide 1 dry form C relay contact for central monitoring for each of the following:

    a. System alarm.
    b. System trouble.
    c. Sprinkler supervisory.

9. Provide battery backup capable of operating the fire alarm system under maximum normal load for 24 hours and then operating in the alarm mode for 5 minutes after loss of input power. Include remote power supplies.
10. Initiating devices for portables (relocatables) shall be listed for and connected to the facility's main fire alarm panel.

    a. The wiring shall match the existing conditions to avoid conflict with products of different manufacturers.

11. Detection devices shall contain an integral alarm LED. Detectors shall be individually identifiable from the control panel and shall comply with the following:

    a. Smoke detector shall be UL 268 listed.
    b. Thermal detector shall be UL 521 listed.
    c. Detector sensitivity shall be individually adjustable from the control panel. It shall also be possible to accurately measure each detector's sensitivity from the control panel.

12. The intelligent monitoring module shall incorporate a custom microprocessor based integrated circuit, supervised and uniquely identifiable by the control panel. The intelligent interface module shall be used to uniquely identify water flow switches, tamper switches, and OS & Y valves.
13. The intelligent manual fire station shall be non-coded, single action, and operate on any SLC. The intelligent manual fire station shall be individually annunciated on the control panel.

    a. Intelligent Manual Fire Station: UL 38 listed.
    b. Manual Stations: Mount semi-flush where possible.
    c. If it is not possible to mount a semi-flush station, the supplier shall provide the proper manufacturer's surface mounted box.

14. The air duct detector shall operate on a cross-sectional air sampling principal to overcome stratification and the skin effect. The air duct detector shall consist of a standard intelligent/analog ionization detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the (intelligent/analog) ionization detector and be installed in the ventilating duct as indicated in the devices if both are required.

    a. Intelligent/analog air duct detector shall be UL 268A listed.
    b. When used for air handling control, the relay within the base of the duct detector shall be capable of operating from general alarm.

15. Remote NAC power supplies shall be ADAAG compliant, NRTL fire listed with battery backup and an addressable interface module for NAC location at the main panel. The primary 120-volt power shall be in compliance with NFPA 72 Chapter 1.
16. System shall have the ability to silence all horns and horn/strobes during an alarm.
17. Horns shall be polarized 24VDC type with capability of alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal.

    a. UL 464 listed.

b. Operate using a distinctive three-pulse temporal pattern per NFPA 72 during alarm condition.
c. Locate horns at heights according to NFPA 72 and ADAAG.
d. Provide horns of the same type and sound throughout the facility.

18. Horn/Strobes shall be polarized 24VDC type and meeting ADAAG requirements. The audio portion shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal.

    a. Horn/Strobes: UL 464 and UL 1971 listed respectively.
    b. Horns: Operate using a distinctive three-pulse temporal pattern per NFPA 72 during alarm condition.
    c. Provide horns of the same type and sound throughout the facility.
    d. Locate horns/strobes at heights according to NFPA 72 and ADAAG.

19. Strobes shall be polarized 24VDC type meeting ADAAG requirements. The strobes shall remain on during any alarm condition and until the system is reset.

    a. Strobes: UL 1971 listed.
    b. Install at heights according to NFPA 72
    c. Protect each strobe with a UL listed transparent protective cover.

C. SYSTEM ANNUNCIATOR

1. The Fire Alarm System Annunciator shall be of an LCD or graphic LED type and display the exact origin of the alarmed device with a custom user defined message. Locate as shown on the Drawings. The annunciator shall duplicate the information available at the main panel.

D. Fire Alarm Cables:

1. Wiring shall be power limited and meet the intent of NFPA 70, article 760. The systems shall be wired Style 4(Class B) and Style Y (Class B).

    a. Wiring shall be UL 1424 listed for indoor installations.
    b. Fire Alarm Cables for Wet Locations: Cables shall be suitable for use in raceways and in wet locations, comply with NEC 70, articles 725 and 760.
    c. Provide #12 green THHN/THW equipment grounding conductor at all fire alarm raceways.

2. Circuits:

    a. Notification Appliance Circuits:

        1) Cable shall be 4 conductor non-shielded cable manufactured according to UL 1424 and NEC 70, articles 725 and 760 type Fire Power Limited (FPL) or as directed by fire alarm system manufacturer.
        2) Single conductor, FPL wire type, manufactured according to UL 1424 and NEC 70, articles 725 and 760.
        3) AWG of Conductors: per NFPA 70 (NEC) article 760.
        4) Number of Conductors in cable: Four.

5) Conductor Insulation: 0.010 tri-rated semi-rigid PVC rated for 105C.
6) Cable Jacket: 0.015 PVC.
7) Nominal Cable Diameter: 0.225 inches.
8) Applicable UL Designation: Type FPL, 75C.
9) Meet the low capacitance requirements for the manufacture of the fire alarm system being installed.

b. Signaling Line Circuits and Initiating Circuits:

1) Cable description: 2-conductor shielded or non-shielded cable according to manufacturer's requirements and UL 1424 and NEC, articles 725 and 760 - type fire power limited or as directed by fire alarm system manufacturer.
2) AWG of Conductors: per NFPA 70 (NEC) article 760.
3) Number of Conductors: Two.
4) Conductor Insulation: 0.020 PVC rated for 105C.
5) Cable Shield: Overall aluminum backed polyester tape shield, aluminum facing outward, and 100 percent shield coverage.
6) Cable Drain: 20 AWG stranded tinned copper.
7) Cable Jacket: 0.015 PVC.
8) Nominal Cable Diameter: 0.225 inches.
9) Applicable UL Designation: Type FPL, 75C.
10) Meet the manufacturer's low capacitance requirements for the fire alarm system being installed.

E. Transient voltage surge protection:

1. Provide lightning protection and transient voltage and surge suppression for the input AC power and all load side circuits.

a. Lightning protection and transient voltage and surge suppression for load side circuits shall be UL 497B listed.
b. Furnish lightning/surge protection integral with panel. Provide additional surge protection at 120 VAC disconnect breaker.
c. Furnish and install additional transient suppression Isolated Loop Circuit Protector devices (ILCP) on fire alarm wiring, (including shield), extending beyond the main building by either aerial, underground, or other methods (walkways, bridges, or other aboveground connectors). The ILCP shall be located as close as practicable to the point the circuits leave or enter the building containing the fire alarm control panel.

1) The ILCP grounding conductor shall be a No.12 AWG minimum wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to the building grounding electrode system (unified ground) according to Article 800-31 of the National Electrical Code - 1999. The ILCP shall have a line-to-line response time of less than one nano second capable of accepting 2,000 amps (10 x 50uS pulse). Line to earth response time shall be less than 25 nano seconds with maximum current of 2,000 amps (8 x 20uS pulse) to earth Shield to earth current shall be 5,000 amps maximum.
2) The ILCP shall be protected by a high dielectric insulating material and be of small enough size to mount in a standard 4-11/16" square by 2-1/8" deep electrical box. Spark gap devices or devices incorporated in or installed

within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

2.3 SEQUENCE OF OPERATION

A. Sequence of Operation/Alarm Activation:

1. The system shall function as follows, when an initiating device such as an area or duct detector, manual station, or water flow switch, is activated:

    a. When a device in the USPS Building activates, the USPS fire alarm control panel shall sound an audible alarm to the entire facility, send a recorded message via land line as directed by USPS representative, and communicate with the City Hall Building master control panel.
    b. When a device in the City Hall Building activates, the City Hall master control fire alarm panel shall sound an audible alarm to the entire facility, send a recorded message via land line as directed by City of Key Colony Beach representative, and communicate with the USPS Building control panel
    c. Sound required audible in accordance with NFPA 72 and activate devices and strobes throughout the building.
    d. Display individual detector or zone number on alphanumeric display with user defined message.
    e. Light an indicating LED on the device initiating the alarm. Smoke detectors and monitor modules only.
    f. Shut down the HVAC system and operate selected dampers.
    g. Interface of the elevator(s) shall be per FBC
    h. There shall be no limit, other than maximum system capacity, as to the number of intelligent/analog devices that may be in alarm simultaneously.

2. When an alarm has been acknowledged and silenced, the audible devices shall silence but the strobes shall remain on.

    a. The block acknowledge feature of addressable system is not allowed and shall be disabled except for system start-up and maintenance.

3. Fire Alarm System Special Requirements:

    a. To allow monitoring of signals through the telephone lines to DCOM, provide all network fire alarm panels with 3 form C (open, common, close) auxiliary contacts to close/open on:

        1) System alarm.
        2) System trouble.
        3) Sprinkler supervisory.

    b. Provide a dual line Digital Alarm Communicator Transmitter (DACT) UL 1635 listed meeting NFPA 72 and power limited to monitor the signals described in this section. DACT can be internal or external to the FACP.
    c. Connect fire alarm DACT to the 2 separate telephone outlets as per NFPA 72 requirements, provided by the City of Key Colony Beach adjacent to the DACT.
    d. Upon activation of its inputs, the DACT shall not sound an audible alert tone.

2.4 FLOW SWITCHES AND TAMPER SWITCHES (provided by Division 15)

A. Flow switches and tamper switches serving the fire protection sprinkler system shall be provided with their own independent addressable module.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount control panels with sufficient clearance for observation and testing of the display and panel controls to comply with ADA and Florida Accessibility Code for Building Construction, Article 4.27 - Controls and Operating Mechanisms. Provide decal with telephone contact number for warranty work at the inside face of the panel door.

B. Clearly mark fire alarm junction boxes for easy identification according to established color codes as outlined in Section 16112 - Raceway and Conduit. Wiring shall be in conduit, EMT thin-wall or other approved methods, refer to Section 16112 - Raceway and Conduit. Use flexible metal raceways for devices mounted in suspend ceiling panels. Conduit, mounting boxes, junction boxes, and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the system.

C. No wiring other than that directly associated with fire alarm detection, alarm, or auxiliary fire protection functions shall be allowed in fire alarm conduits.

1. Avoid wiring splices to the extent possible and, if needed, splices shall be made only in junction boxes and be by NEC approved methods.
2. Transposing or changing color coding of wires is not allowed.
3. Conductors in conduit containing more than 1 wire shall be labeled on each end with "E-Z markers" or accepted equivalent.
4. Conductors in cabinets shall be carefully formed and harnessed so that each drop off directly opposite to its terminal.
5. Cabinet terminals shall be numbered and coded.
6. Provide clearly labeled controls, function switches, etc., on equipment panels.
7. In junction or pull boxes with splices, provide:

    a. Minimum dimension of junction or pull boxes according to NEC Articles 370-18a.1.a. and 370-18a.2, the conductor size notwithstanding.
    b. Terminal strips.

8. Color Codes:

    a. Color codes shall be consistent throughout the facility’s fire alarm system. Each circuit type must use different colors.

D. Fire Alarm Conductors Splicing:

1. Splicing of fire alarm initiation & notification circuit conductors shall only be allowed for connection of fire alarm devices or inside wall or ceiling mounted terminal cabinets on terminal strips. All circuit conductors shall have wire markers with corresponding typewritten wiring schedule inside enclosure. Fire alarm circuit initiation & notification conductors shall not be spliced underground.

2. “T” tapping of addressable data circuits shall only be allowed when necessary to meet system manufacturer’s maximum impedance requirements. “T” taps shall only be allowed inside wall or ceiling mounted terminal cabinets on terminal strips. All circuit conductors shall have wire markers with corresponding typewritten wiring schedule inside enclosure.

E. Check and test wiring to ensure grounds, opens or shorts are not present.

F. Manual pull stations shall be installed with a protective cover, 4'-0" AFF, at locations indicated on the Drawings.

G. Audible Alarms shall be mounted on walls in compliance with FBC chapter 11 and ADA. Dimensional tolerances apply. Use combination horn/strobe, with protective covers.

H. Visual Alarms and Combination Horn/Strobes: Mount on walls in compliance with FBC chapter 11 and ADA. Dimensional tolerances apply. Provide protective covers.

I. Conduit: Refer to Section 16112 - Raceway and Conduit.

3.2 TERMINAL CABINETS AND BACKING BOARDS

A. Fire Alarm Terminal Cabinets:

1. Above ceiling boxes: Minimum 24 inches x 24 inches x 6 inches with a hinged cover, red stenciled “FIRE ALARM’” on cover, and interior to match above.
2. Isolate and identify separately the terminals for:

    a. Data Loop
    b. 24-volt power.
    c. NAC, Horns
    d. NAC, Strobes.

3. Provide terminal box at or near the control panel whether or not shown on the drawings.
4. Enter control panel with only those wires to terminal at panel.

3.3 SITE INVESTIGATION

A. Contractor shall apprise himself fully regarding equipment peculiarities and limitations of space available for installation of materials under contract. Include all necessary contingencies for the above in base bid.

B. Do all cutting, sleeving, excavating and backfilling necessary for installation of equipment and patching thereafter, but do not cut other work without consent of the City of Key Colony Beach.

3.4 CLEANING UP

A. Contractor responsible for making arrangements for removal of cartons, boxes, paper, scrap wire, conduit, etc. off the site.

3.5 LOCATION OF BATTERIES

A. Fire alarm batteries shall not be located above 6.5 feet or mounted above the ceiling.

3.6 DEMONSTRATION

A. Manufacturer's Training:

1. Upon completion of the fire alarm system, the contractor shall provide training System operation training for City of Key Colony Beach staff, to include but not limited to the office personnel. Training shall be a minimum of 2 classes, at 2 hours minimum for each class.

a. Provide each trainee, an operator’s manual incorporating a quick reference operating instructions sheet.

END OF SECTION