McKEE & ASSOCIATES
ARCHITECTS, INC.

Project Manual

VOLUME 2 OF 2

Additions to Robertsdale High School

for the

Baldwin County Board of Education

Bay Minette, Alabama

Project No: 23.195

October 11 2023

Alabama Division of Construction Management No. 2023533

STATE OF ALABAMA
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REGISTERED ARCHITECT

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Additions to Robertsdale High School

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SECTION 10100 - MARKABLE BOARDS AND TACKBOARDS

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 of this section.

1.2 DESCRIPTION OF WORK

A. Extent of markable boards (M.B.) and tackboards (T.B.) is shown on drawings.

B. Types of markable boards and tackboards specified in this section include the following:

1. Markable Boards
2. Vinyl Fabric-Faced Cork Tackboards

1.3 QUALITY ASSURANCE

A. Manufacturer: Unless otherwise acceptable to Architect, furnish all markable boards and tackboards by one manufacturer for entire project.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

B. Samples: Submit full range of color samples for each type of markable board, tackboard, trim and accessories required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

C. Shop Drawings: Submit for each type of markable board and tackboard. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.

1.5 SPECIAL PROJECT WARRANTY

A. Warranty on Porcelain Enamel Markable Boards: Provide written warranty, signed by manufacturer, agreeing to replace, within warranty period, porcelain enamel remarkable boards which do not retain original writing and erasing qualities, defined to include surfaces which become slick and shiny, or exhibit crazing, cracking or flaking; provided manufacturer's instructions for handling, installing, protecting and maintaining markable boards have been adhered to during the warranty period. Replacement is limited to material replacement only and does not include labor for removal and reinstallation.

1. Warranty Period: 50 years from date of substantial completion or lifetime of the building.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

B. Manufacturers of Markable Boards and Tackboards:

1. Claridge Products and Equipment, Inc.; www.claridgeproducts.com; 601 Highway 62-65 South, P.O. Box 910, Harrison, AR. 72602-0910; Phone: 800.434.4610 or 870.743.2200.
2. Corona Group, Inc.; www.coronagroupinc.com; 3650 Messer Airport Hwy, Birmingham, AL 35222; Ph.: 205.941.1942.
3. ASI Visual Display Products; www.asi-visualdisplayproducts.com; 2210 Dunwin Drive, Mississauga, ON L5L 1C7, Canada; Ph.: 833.632.0878.

4. PolyVision, Inc.; www.polyvision.com; 10700 Abbotts Bridge Road, Suite 100, Johns Creek, GA. 30097; Phone: 888.325.6351 or 678.542.3100.
5. Marsh Industries, Inc.; www.marsh-ind.com; 2301 East High Avenue, New Philadelphia, OH, 44663; Phone: 800.426.4244.

C. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. Markable Boards (M.B.) - Markable boards shall be porcelain enamel writing surface as manufactured by PolyVision, Inc. Writing surface shall have magnetic properties and perform as follows:

1. As a Writing Surface: The writing surface shall accept various writing medium including but not limited to chalk, pencil, water base marker, ball point pen, and fiber tip pen. All markings shall be clearly visible and easily cleaned.
2. As a Projection Surface: Projected images shall be clearly visible from any angle.
3. Board Construction shall include the following:
    a. Facing sheet shall be porcelain enamel (P3 ceramicsteel) fused to 28 gauge steel face at approximately 1500 degrees F. Core shall be 1/2:" particleboard with 0.005" aluminum backing sheet.
    b. Provide single piece units up to 4' x 16'. Where overall sizes exceed manufacturer's maximum size, provide two or more panels of equal size as acceptable to the Architect.

B. Tackboards (T.B.): "Fabricork" Vinyl faced fabric (Koroseal) complying with FS CCC-W-408, Type II, mildew resistant, laminated to 1/4" thick cork backing sheet. Furnish materials as required for tack strips.

1. Unless otherwise indicated, make up rigid panels by factory-laminating under pressure to 1/4" thick exterior type plywood or hardboard backing.
2. Color: Color and Pattern to be selected from manufactures standards.

C. Colors and Textures: Color to be selected from manufactures standards.

D. Trim and Accessories:

1. General: Fabricate frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible and keep joints to minimum. Miter corners to neat, hairline closure.
2. Aluminum Finish: Furnish exposed aluminum trim, accessories and fasteners with the following finish:
    a. Finish: Manufacturer's standard satin aluminum finish.
3. Chalk-trough: Furnish continuous aluminum chalk-troughs for each markable board, unless otherwise indicated, as follows:
    a. Solid extrusion, manufacturer's standard ribbed section, enclosed chalk tray with solid end caps, smoothly curved with concealed mounting.
4. Map-rails and Map hooks: Furnish continuous aluminum maprails with cork tackstrip inserts for each markable board. Provide one pair of paper holders and one pair of maphooks for each 4 foot of remarkable board length. Provide flag holder and 1 pair of roller brackets.

2.3 FABRICATION

A. Assembly: Provide factory-assembled markable board and tackboard units unless field-assembled units indicated.

B. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

C. Provide manufacturer's standard vertical joint system between abutting sections of markable board.

1. Provide mullion trim at joints between markable board and tackboard.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. **Verify mounting heights with Owner prior to installation.**

B. Deliver factory-built markable board and tackboard units completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit at factory, disassembled for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.

C. Install units in locations as shown on drawings and mounted at heights as directed by the Owner, keeping perimeter lines straight, plumb, and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories for complete installation.

3.2 ADJUST AND CLEAN:

A. Verify accessories required for each unit properly installed and operating units properly functioning.

B. Clean units in accordance with manufacturer's instructions, breaking in only as recommended.

END OF SECTION

SECTION 10160 - TOILET PARTITIONS

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 of this section.

1.2 DESCRIPTION OF WORK

A. Extent of toilet partitions is indicated on drawings.

B. Types of toilet partitions and screens required include the following:

1. Solid phenolic with fused surface laminate, floor-supported, overhead-braced.

C. Toilet accessories are specified elsewhere in Division 10.

1.3 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

C. Samples: Submit full range of color samples for each type of unit required. Submit 6" square samples of each color and finish on same substrate to be used in work, for color selections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. Bobrick Wasroom Equipment
2. General Partitions
3. Global (ASI)
4. Bradley Partitions
5. Columbia Partitions

B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Materials: Doors, panels and pilasters are composed of compressed cellulose fibers impregnated with resins. The surface laminate is fused to the resin-impregnated core. All edges are machined and finished smooth wth beveled edge. Material will not delaminate even under extreme conditions. Materials are non-absorbent, impact and graffiti resistant. Materials are impervious to steam, soaps and detergents and will not mildew.

C. Panels: Shall be 1/2” thick with eased edges uniformly machined to a 1/16” radius. Panels are 58” high and anchored to walls with 18 gauge stainless steel continuous brackets and continuous stainless steel brackets at panel to pilaster locations.

D. Doors: Shall be 3/4” thick with eased edges uniformly machined to a 1/16” radius. Doors are 58” high and mounted to pilasters with continuous stainless steel surface mounted hinge. Pre-threaded inserts are to be provided for all door hardware. Each door is furnished with one coat hook/bumper, slide latches, stops and pulls (for outswing doors) to be made of stainless steel. Door hardware shall allow for lift up emergency access.

E. Pilasters: Shall be 3/4” thick with eased edges uniformly machined to a 1/16” radius. Pilasters are 83” high (or as indicated on the drawings) and anchored to panels and walls with continuous stainless steel brackets. The pilasters contain no less than two level adjusting bolts on the bottom and attach to the floor with two 3/4“ expansion bolts and are braced at the top with aluminum headrail.

F. Stainless Steel Pilaster Shoes: Shall be 3” high, and constructed of 20-gauge stainless steel. Pilaster shoes are bolted onto pilaster with stainless steel, tamper resistant sex bolts and screws.

G. Latches and Keepers: Shall be fabricated from stainless steel with a satin finish. Latch is mounted onto door with 1/4“ stainless steel torx head bolts pre-threaded inserts and acts as the stop for inswing doors. Keepers are mounted on the pilasters with stainless steel toex head screws.

H. Headrail: Shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with bright-dip anodized finish. Headrail is anti-grip and attaches to the top of the pilasters with stainless steel, tamper resistant torx screws. Headrail is attached to the adjacent wall construction with a stainless steel headrail bracket.

I. Headrail Bracket: Shall be made of 16 gauge stainless steel and is attached to the adjacent wall construction with #14 x 1½” stainless steel phillips-head screws and plastic anchors.

J. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel with pinhead, torx screws and bolts.

2.3 FABRICATION

A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

B. Door Dimensions: Unless otherwise indicated, furnish 24" wide inswinging doors for ordinary toilet stalls and 32" wide (clear opening) outswinging doors at stalls equipped for use by handicapped.

C. Overhead-Braced Partitions: Furnish stainless steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.

D. Floor-Supported Partitions: furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

E. Floor-Supported Over-Head Braced Screens: Furnish pilasters not less than 3/4" in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.

F. Accessories: Furnish units with chromium-plated finish, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's recommended procedures and installation sequences. Install partitions rigid, straight, plumb, and level.

B. Provide clearances of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with full length stainless steel brackets. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

C. Overhead-Braced Partitions and Screens: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.

D. Floor-Supported Partitions: Set pilaster units with anchorages having not less than 2" penetration into structural floor, unless otherwise recommended by partition manufacturer. Level, plumb and tighten installation with devices furnished. Hang doors and adjust so that tops of doors are level with tops partition when doors are in closed position.

E. Screens: Attach with concealed anchoring devices, as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.

F. Accessories: Mount accessories to partition units in accordance with manufacturer's instructions.

3.2 ADJUST AND CLEAN

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 10350 - FLAGPOLE

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 of this section.

1.2 DESCRIPTION OF WORK

A. Extent of flagpoles is indicated on the drawings.

1.3 QUALITY ASSURANCE

A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings accessories, bases and anchorage devices.

B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.

C. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.

B. Shop Drawings: Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

C. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be requested.

1.5 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.

B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. Morgan-Francis Flagpoles and Accessories | www.morgan-francis.com | PH: 1.800.814.9568.
2. Acme Lingo Flagpoles | www.acmelingo.net | PH: 1.800.260.1897.
3. American Flagpole, Div. of Kearney-National | www.concordamericanflagpole.com | PH: 972.380.8186.
4. Eder Flag & Baartol Company / A Division of Eder Flag Manufacturing Co., Inc. | www.ederflag.com | PH: 1.800.558.6044 or 414.764.3522.
5. Equal products of other manufacturers may be used provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 FLAGPOLE TYPE

A. Aluminum Flagpoles: Fabricate aluminum flagpoles from seamless extruded tubing complying

with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 35,000 psi and a yield point of 30,000 psi. Heat-treat and age-harden flagpoles after fabrication.

B. Flagpole Heights as follows:

1. 40 feet above grade.

C. Provide cone tapered aluminum flagpole.

2.3 FLAGPOLE MOUNTING

A. Provide manufacturer's standard base system for the type of flag pole installation required.

B. Base Plate: For anchor-bolt mounting, furnish manufacturer's standard cast metal shoe base of same material as flagpole. Furnish and install anchor bolts and lightning ground spike as required.

C. Foundation Tube: For ground-set flagpoles, proved 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lighting ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

1. Provide manufacturer's standard flash collar, finished to match flagpole.

2.4 SHAFT FINISH

A. Aluminum: Fine, directional, mechanical satin polish (NAAMM-32), finished as follows:

1. Color: Clear anodized finish complying with NAAMM-C22A42, Class I (0.7 mil.)

2.5 FITTINGS

A. Finial Ball: Manufacturer's standard flush seam ball, size as indicated or, if not indicated, to match pole butt diameter.

1. 14 ga. spun aluminum,

2. Brass color.

B. Truck: Ball-bearing non-fouling, revolving, double-track assembly of cast metal, finished to match pole shaft.

C. Cleats: Two 9" cast metal cleats with fasteners, finished to match pole shaft.

D. Halyards: Provide 2 continuous halyards for each flagpole, as follows:

1. Polypropylene, bronze, braided

2. Size: 3/8" (No. 12).

E. Halyard Flag Snaps:

1. Provide 2 swivel snaps per halyard

2. Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flagpole Installation: Install flagpoles as shown and in compliance with final shop drawings and manufacturer's instructions.

END OF SECTION

SECTION 10410 - IDENTIFYING DEVICES

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 of this section.

1.2 DESCRIPTION OF WORK

A. Types of identifying devices specified in this section include the following:

1. Room Signs (See Door Schedule)
2. Metal Letters
3. Plaque
4. Project Sign

B. Note to the Contractor: If the Contract Sum (as awarded) is $100,000.00 or more, the Contractor shall furnish and erect a project sign and interior plaques as shown in “Detail of Project Sign” (DCM Form C-15) and “Plaque Detail” bound in the Project Manual at the end of “General Conditions”. The project sign shall be erected in a prominent location selected by the Architect and Owner and shall be maintained in good condition until completion of Work.

C. Extent of signs and plaque is indicated on the drawings.

1.3 QUALITY ASSURANCE

A. Drawings and Specifications are based on one manufacturer's standard products. Another standard system of a similar and equivalent nature may be acceptable when the differences do not materially detract from the design concept or intended performance as judged solely by the Architect.

B. General Contractor is responsible for verifying signage requirements and correct wording, names etc. with Owner and Architect before ordering.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings for each type of device. Include large scale sections of typical members and other components. Provide dimensioned elevations. Show anchorages, grounds and reinforcement and indicate finishes.

PART 2 - PRODUCTS

2.1 ROOM SIGNS

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.

a. ASI Sign Systems, Inc., 8181 Jetstar Drive, Suite 100, Irving, TX 75063; www.asisignage.com; 1-800-274-7732

b. Best Sign Systems, www.bestsigns.com; 1202 N. Park Avenue, Montrose, CO 81401-3171, Phone (970) 249-2378 or 1-800-235-2378; Fax (970) 249-0223

c. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699-3342

d. Bayuk Graphic Systems, Inc., www.bayukgraphics.com; 5005 Old Lincoln Highway Parkesburg, PA 19365; Phone: (717)-442-0274; Fax: (717)-442-1289

e. Mohawk Sign Systems; www.mohawksign.com; 5 Dandreano Dr, Amsterdam, NY 12010; Ph. 518.842.5303.

2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

1. Provide 6" x 8" high laminated plastic with raised lettering complying with the Americans with Disabilities Act (ADA).
2. All Signs MUST include 1” Slide In Window Slot.
3. Color to be selected by the Architect after bid date from manufacturer standards.
4. Use International Symbols of accessibility for identifying facilities as accessible.
5. Letters and numerals shall be raised 1/32 in (0.8 mm) minimum, upper case, sans serif or simple serif type and shall be accompanied with Grade 2 Braille.
6. Raised characters shall be at least 5/8 in (16 mm) high, but no higher than 2 in (50 mm).
7. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6 in (152 mm) minimum in height.
8. **See Door Schedule. If not shown provide 20 letter characters per room sign.**
9. **The Supplier will be required to meet with the Owner for exact wording for all room signs before preparation of the shop drawing submittal to the Architect for approval.)**
10. Tactile characters on signs shall be located 48 inches (1220 mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches (1525 mm) maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.
    a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.
    b. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf.
    c. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.
    d. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
    e. Signs containing tactile characters shall be located so that a clear floor space of 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position. Mounting devices shall be concealed.

2.2 METAL LETTERS

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
    a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525: (708) 469-7178; impact@impactsigns.com
    b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699- 3342
    c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
    d. A.R.K. Ramos Architectural Signage, www.arkramos.com; 1321 S. Walker Ave., Oklahoma City, OK; Ph. 800.725.7266

2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Provide standard cast aluminum letters for exterior architectural signage shown on drawings and as follows:
2. Building Signage: Provide full size sample prior to manufacture of all letters.
   a. Mounting shall be projected mount without collars set in adhesive.
   b. Color shall be anodized aluminum.
   c. Style of letter shall be as follows:
      I. Height: 15” High - Upper Case.
      II. Depth: 1 ¼” Deep – Upper Case.
      III. Font: Arial Bold
      IV. Letters to read as indicated on drawings.

2.3 PLAQUE

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
   a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525: (708) 469-7178; impact@impactsigns.com
   b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699- 3342
   c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
   d. A.R.K. Ramos Architectural Signage, www.arkramos.com; 1321 S. Walker Ave., Oklahoma City, OK; Ph. 800.725.7266
2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Refer to *Detail Of Plaque (ABC Form C-16, August 2001)* at the front end of the project manual.
2. Size: 24" high x 30" wide.
3. Cast aluminum with bronze finish of standard alloy, hand tooled and chased.
4. Raised letters and border.
5. Satin finish.
6. Background pebbled finish and oxidized to a darker finish.
7. Casting to be free of pits and holes, square and true with no warping.
8. Border style to be single line.
9. Letters to be flat face classic design.
10. Furnish Rubbing to Architect for approval.

C. Wording on the plaque shall read as follows.

(NAME OF PROJECT)
(CITY NAME), ALABAMA

ERECTED (Year)

STATE OF ALABAMA

THE (NAME) COUNTY BOARD OF EDUCATION
MR. (NAME), PRESIDENT
MRS. (NAME), VICE PRESIDENT
MR. (NAME), BOARD MEMBER
MR. (NAME), BOARD MEMBER
MR. (NAME), BOARD MEMBER
MRS. (NAME), BOARD MEMBER
MRS. (NAME), BOARD MEMBER
DR. (NAME), SUPERINTENDENT

SUPERVISED BY

Alabama Real Property Management, Division of Construction Management

McKEE AND ASSOCIATES ARCHITECTS, INC

(COMPANY NAME), CONTRACTOR

2.4 PROJECT SIGN

A. MATERIALS

1. Refer to *Detail of Project Sign (DCM Form C-15, August 2021)* at the front end of the project manual.

B. Wording on the project sign shall read as follow.

STATE OF ALABAMA

THE (NAME) COUNTY BOARD OF EDUCATION
MR. (NAME), PRESIDENT
MRS. (NAME), VICE PRESIDENT
MR. (NAME), BOARD MEMBER
MR. (NAME), BOARD MEMBER
MR. (NAME), BOARD MEMBER
MRS. (NAME), BOARD MEMBER
MRS. (NAME), BOARD MEMBER
DR. (NAME), SUPERINTENDENT

KAY IVEY, GOVENOR

"Investing in Alabama's Future"

(NAME OF PROJECT)
(CITY NAME), ALABAMA

Alabama Real Property Management, Division of Construction Management

McKEE AND ASSOCIATES ARCHITECTS, INC

(COMPANY NAME), CONTRACTOR

2.5 FABRICATION

A. General: Fabricate signs to comply with requirements indicated including, dimensions, design details, quality, thickness and finish of materials. Use materials and shapes of sufficient thickness, with reinforcing, if needed, to produce sufficient flatness, free of "oil canning", and to impart sufficient strength for size, design and application indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units plumb and level, in locations and with mounting shown. Securely attach to the supporting structure with concealed fasteners, in accordance with the manufacturer's installation instructions.

3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 10440 - FIRE EXTENGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire Extinguishers.
2. Extinguisher cabinets.
3. Accessories.

B. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International (ASTM):
   a. ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems.

2. International Code Council (ICC):
   a. International Building Code (IBC) - Current Edition.

3. Intertek Testing Services/Warnock-Hersey International (ITS/WHI)

4. National Fire Protection Association (NFPA):
   a. NFPA 10-2010, Standard for Portable Fire Extinguishers: For criteria covering installations for Class A, B, C, D, and K hazards as well as the selection, inspection, maintenance, recharging, and testing of portable fire extinguishing equipment.
   b. NFPA 70-2011, National Electrical Code.

5. Underwriters Laboratories, Inc. (UL)

6. United States Code (USC):
   a. Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008: For restrictions relating to cabinet projections in corridors.

1.3 ACTION SUBMITTALS

A. Submit in accordance with Section 01600:

1. Product Data:

   a. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.

   b. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.

   c. Installation instructions for each product specified.

2. Shop Drawings:

   a. Small-scale plans showing locations of fire extinguisher cabinets and individual fire extinguishers.

   b. Schedules showing each type of cabinet and extinguisher to ensure proper fit and function.

   c. Indicate installation procedures and accessories required for a complete installation.

3. Samples:

   a. Extinguisher Cabinet Door and Trim Finishes: For each type of exposed finish required, prepared on samples of size indicated below:

      i. Size: 6 inches (150 mm) square.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Comply with standards referenced in Article 1.02 - REFERENCES.

B. Provide fire extinguishers, cabinets and accessories produced by a single manufacturer.

C. Provide fire extinguishers of type approved by UL, State Fire Marshal's Office, and local regulatory agencies, if any.

D. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle fire protection specialties and related materials using means and methods that will prevent damage, deterioration, or loss.

   1. Deliver components in manufacturer's original packaging, properly labeled for identification.

1.7 WARRANTY

A. All Fire Protection Products (except fire extinguishers) carry a one year warranty after date of shipment against defects in materials or workmanship. Fire extinguishers carry a longer warranty. We will replace or repair any product found defective within this period. No other warranty expressed or implied is valid. Manufacturer’s warranty, terms and conditions apply in all cases. Please see complete warranty on our website for more details.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SPECIALTIES MANUFACTURERS

A. Acceptable Manufacturers:

   1. J. L. Industries, Inc., a division of Activar Construction Products Group; 9702 Newton Av S

Bloomington, MN 55431; (800) 554-6077, (952) 835-6850, (952) 835-2218 (FAX); SALES@ACTIVARCPG.COM; www.activarcpg.com
2. Larsen's Manufacturing Company
3. Modern Metal Products

B. Substitutions: Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 FIRE EXTINGUISHERS

A. Multi-Purpose Chemical Type: Extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.

1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.

2. Finish: Factory powder-coated; Red.

3. Effectiveness (Rating): Class A, B, and C fires.

4. Model Identification and UL Rating: Cosmic **10E; 4A-80BC**.

5. "Start Up Tags" for each fire extinguisher must be provided and approved by Local Fire Department before Final Inspection.

2.3 EXTINGUISHER CABINETS

A. Cabinet with Steel Trim and Door:

1. **Ambassador Series, Model 1017F10** at Non-Fire Rated Walls.

2. **Ambassador Series, Model 1017F10FX2** at Fire Rated Walls.

B. Cabinet Style: **Semi-recessed**.

1. Tub: Cold-rolled steel.

a. Finish: Factory-applied powder coat paint finish.

i. To be selected by Architect after bid date from manufacturer Standard Colors.

2. Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated handle with roller catch.

a. Finish: Factory-applied powder coat paint finish.

i. To be selected by Architect after bid date from manufacturer Standard Colors.

3. Trim Style and Depth: Cabinets located in corridors shall not protrude into the hall way more than 2 1/2".

a. Semi-Recessed Cabinet:

i. Rolled Edge**:** 2-1/2 inch (63.50 mm).

b. Trim Dimensions: 1-3/4 inch (44.45 mm) face trim on frame and 1-1/4 inch (31.75 mm) face trim on door.

C. Fire-Rating: Provide Fire-Rated cabinets for 1-hour and 2-hour combustible and noncombustible wall systems as required.

2.4 CABINET DOOR STYLES, GLAZING TYPES, AND ADDITIONAL OPTIONS

A. Door Style:

1. Style F: Full glazing; with pull handle.

B. Door Glazing:

1. Type 10: Clear acrylic.

C. Additional Options:

1. Cabinet Lettering:

a. Text: FIRE EXTINGUISHER.

b. Color(s): [Red] [Black] [White]. To be selected by Architect after bid date.

2.5 SOURCE QUALITY CONTROL

A. Ship extinguishers to the Project site fully charged, EXCEPT those which contain water as an extinguishing agent, if any.

B. Obtain Fire Extinguishers and Fire Extinguisher Brackets from same manufacturer to ensure compatibility.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed and blocking where surface mounted cabinets will be installed.

1. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the installation.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer=s instructions.

3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.

B. Cabinet Lettering:

1. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk screen process. Provide lettering on door as indicated, or if not indicated, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

3.3 FIELD QUALITY CONTROL

A. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10500 - LOCKERS

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 of this section.

1.2 DESCRIPTION OF WORK

A. Products in this section include the following:

1. Furnish and install factory-assembled Heavy-Duty MIG-Welded Metal Lockers, complete, as shown and specified per contract documents.

1.3 RELATED WORK

A. Section 03310, Cast-In-Place Concrete.

B. Section 06100, Rough Carpentry.

1.4 QUALITY ASSURANCE

A. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. **Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable.** Grind exposed welds and metal edges flush and make safe to touch.

B. MANUFACTURING STANDARD: Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.

C. FABRICATOR QUALIFICATIONS: Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

D. INSTALLER QUALIFICATIONS: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.

E. Lockers shall be GREENGUARD Children & Schools Certified[SM]

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for metal locker units.

B. Samples: Submit color samples on squares of same metal to be used for fabrication of lockers.

C. Shop Drawings: Submit shop drawings for metal lockers, showing locker types, sizes, quantities, Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

1.6 PRODUCT HANDLING

A. GENERAL: All work shall be fabricated in ample time so as to not delay construction process.

B. DELIVERY: All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.

C. STORAGE: Store all materials in a dry and well ventilated place adequately protected from the elements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers' products have been used to established minimum standards for materials, workmanship and functions:

1. List Industries Inc., Superior (Basis of Design); 401 Jim Moran Blvd., Deerfield Beach, Florida 33442; www.listindustries.com; PH: 1.800.776.1342.

2. ASI Storage Solutions; 900 Clary Connector, Eastanollee, Georgia 30538; www.asistorage.com; PH: 706.827.2720.

3. Penco; 1820 Stonhenge Drive, Greenville, NC 27858; www.pencoproducts.com; PH: 800.562.1000.

4. LockersMFG | P.O. Box 383258 Germantown, TN 38183 | Ph:901.367.3930 or 901.207.6573. | www.lockersmfg.com.

2.2 LOCKERS

A. ATHLETIC TEAM FULLY FRAMED ALL-WELDED LOCKERS

1. Location(s): As indicated on Drawings

   a. Single Tier – 18” x 18” x 72” high – Equal to List Industries “Athletic Team Lockers”

2. Materials:

   a. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.
   b. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slotless type; self locking nuts or lock washers.
   c. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum.
   d. Handle: Seamless drawn 304 stainless steel recessed handle.
   a. Number Plates: To be aluminum with not less that 3/8" high etched numbers attached to door with two aluminum rivets. **NOTE: Prior to placing any orders for Number Plates, the General Contractor is responsible for verifying Locker numbering sequence with the Owner.**

3. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.

4. Frame / Vertical Side panels: Shall be of 13 gauge ½” flattened expanded metal framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all

four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel. Note: Diamond perforated sheet steel or 3/4" expanded metal will NOT be accepted.

5. Integral Frame Locker base: At Single Tier Lockers (See Drawings for Concrete Base for double Tier Lockers).

6. Wardrobe Doors: Doors 20" high and over and 15" wide and under are to be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides. The channel formed by the double bend at the latch side is designed to fully conceal the lock bar. Doors for 18" and wider lockers shall include a 3" wide minimum 18 gauge full height channel door stiffener MIG welded to the hinge side of the door as well as to the top and bottom door return bends and spot welded to the inside of door face to form a rigid torque-free box reinforcement for the door. Doors to be perforated with 5/8" x 1-1/2" diamonds.

7. Latch: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Lock bar shall be hot dip galvanized and installed after paint to ensure proper paint coverage and lock bar operation. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking devise shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 11 gauge (minimum) with riveted bumpers and shall be MIG welded to vertical frame member. Provide three latch hooks for doors 48" and over and two for doors under 48".

8. Handle: Seamless Drawn Locker Handle: All wardrobe doors 20" high and over shall have a seamless drawn not less than 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recessed handle shall be deep enough to have the lock be completely flush with the outer door face.

9. Door Hinges: Hinges for wardrobe and side hinged gym doors shall not be less than 3-1/2" long 13 gauge seven knuckle pin type, securely riveted to frame and welded to the door. Doors are to be secured to frame with a minimum of two tamper resistant rivets per hinge. Provide 3 hinges for doors 48" and higher and 2 for doors shorter than 48". All doors shall be right hand side hinged except top hinged gym doors as noted above. Top hinged gym doors shall be hinged using a 3/16" diameter continuous hinge rod completely recessed into the door with a concealed fastener.

10. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.

11. Hat Shelves, Intermediate Shelves And Bottoms: Shall be 16 gauge galvanneal sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. Locker bottom shelf located less than 2" above floor level will not be acceptable.

12. Backs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple framed unit and be welded to each vertical side panel frame member.

13. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish.

a. Color to be selected by Architect from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.

14. Equipment: Furnish each locker with the following items, unless otherwise shown.

    a. Single tier lockers: Openings 60” and 72” shall include one galvanneal hat shelf, one double prong ceiling hook and a minimum of two single prong wall hooks.

    b. Double and Triple tier lockers: Openings 20” thru 36” high shall include one double prong ceiling hook and a minimum of two single prong wall hooks.

    c. Finished End Panels (If required): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.

    d. Continuous Slope Tops: Not less than 18 gauge sheet steel approximately 18 degrees pitch, in lengths as long as practical but not less than four lockers. To be installed in addition to the locker flat top with end closures for support. Finished to match lockers.

    e. Fillers (if required): Provide where indicated, of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.

15. LOCKS:

    a. Not Required.

16. Lifetime Warranty: Lockers shall be covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

PART 3 - EXECUTION

3.1 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 wherever taking of field measurements before fabrication might delay work.

3.2 INSTALLATION

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

B. Space fastenings about 48" o.c., unless otherwise recommended by manufacturer, and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.

C. Install trim, and metal filler panels where indicated, using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch up marred finishes but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended of furnished by locker manufacturer**.**

END OF SECTION

SECTION 10501 - LOCKERS

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 of this section.

1.2 DESCRIPTION OF WORK

A. Products in this section include the following:

1. Furnish and install factory-assembled Heavy-Duty MIG-Welded Metal Lockers, complete, as shown and specified per contract documents.

1.3 RELATED WORK

Section 03310, Cast-In-Place Concrete.

A. Section 06100, Rough Carpentry.

1.4 QUALITY ASSURANCE

A. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. **Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable.** Grind exposed welds and metal edges flush and make safe to touch.

B. MANUFACTURING STANDARD: **Imported Manufactured Lockers will not be accepted.**

Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.

C. FABRICATOR QUALIFICATIONS: **Imported Fabricated Lockers will not be accepted**. Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

D. INSTALLER QUALIFICATIONS: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.

E. Lockers shall be GREENGUARD Children & Schools Certified[SM]

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for metal locker units.

B. Samples: Submit color samples on squares of same metal to be used for fabrication of lockers.

C. Shop Drawings: Submit shop drawings for metal lockers, showing locker types, sizes, quantities, Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

1.6 PRODUCT HANDLING

A. GENERAL: All work shall be fabricated in ample time so as to not delay construction process.

B. DELIVERY: All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.

C. STORAGE: Store all materials in a dry and well ventilated place adequately protected from the elements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers' products have been used to established minimum standards for materials, workmanship and functions:

1. List Industries Inc., Superior (Basis of Design); 401 Jim Moran Blvd., Deerfield Beach, Florida 33442; www.listindustries.com; PH: 1.800.776.1342.
2. Penco; 1820 Stonhenge Drive, Greenville, NC 27858; www.pencoproducts.com; PH: 800.562.1000.
3. De Bourgh Manufacturing Co. | 27505 Otero Ave. La Junta, CO 81050 | Ph: 800.328.8829 | www.debourgh.com.
4. Tennsco Corp. | 201 Tennsco Drive, Dickson, TN 37055 | PH: 866.446.8686 | www.tennsco.com.

2.2 LOCKERS

A. SUPERIOR MARQUIS PROTECTOR FULLY FRAMED ALL-WELDED LOCKERS

1. Location(s): As indicated on drawings.
2. Type:
   a. Double Tier
3. Materials:
   a. Doors: 14 gauge solid sheet steel with recessed handle, and single-point latching
   b. Sides: Fully-framed 18 gauge solid sheet steel.
   c. Tops, Bottoms, Shelves: 16 gauge solid sheet steel
   d. Backs: 18 gauge solid sheet steel
4. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.
5. Frame / Vertical Side panels: Shall be of 18 gauge solid cold rolled sheet steel framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel.
6. Doors: Marquis Protector Wardrobe And Gym Doors: Outer door to be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides with a 3" wide 18 gauge full height channel door stiffener MIG welded to the hinge side of the door as well as to the top and bottom door return bends and spot welded to the inside of door face to form a rigid torque-free box reinforcement for the door. Doors are to be solid (non-perforated) with ventilating perforations in the top and bottom door flanges.
7. Handle: Marquis Seamless Drawn Stainless Steel Recessed Locker Handle: All locker doors shall have a seamless drawn not less than 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have

the lock be completely flush with the outer door face. The pull handle shall be drawn into the left side of the handle for easy opening of the locker door.

8. Latch Assembly: The latching mechanism shall be single-point rigid non-moving positive latch by means of a heavy gauge (minimum 11 gauge) latch securely welded to the framed vertical divider. The latch assembly must be made of a single piece of steel and have a padlock loop that inserts through the recess pan. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 11 gauge (minimum) with riveted bumpers and shall be MIG welded to vertical frame member.
9. Door Hinges: Hinges shall not be less than 3-1/2" long 13 gauge seven knuckle pin type, securely riveted to frame and welded to the door. Doors are to be secured to frame with a minimum of two tamper resistant rivets per hinge. Provide 3 hinges for doors 48" and higher and 2 for doors shorter than 48". All doors shall be right hand side hinged.
10. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.
11. Hat Shelves, Intermediate Shelves and Bottoms: Shall be 16 gauge galvanneal sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. Locker bottom shelf located less than 2” above floor level will not be acceptable.
12. Backs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple framed unit and be welded to each vertical side panel frame member.
13. Finished End Panels (If required): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
14. Continuous Slope Tops (If required): Not less than 18 gauge sheet steel approximately 18 degrees pitch, in lengths as long as practical but not less than four lockers. To be installed in addition to the locker flat top with end closures for support. Finished to match lockers.
15. Fillers (if required): Provide where indicated, of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.
16. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected by Architect from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.
17. Equipment: Furnish each locker with the following items, unless otherwise shown.
    a. Single tier lockers: Openings 60” and 72” shall include one galvanneal hat shelf, one double prong ceiling hook and a minimum of two single prong wall hooks.
    b. Double and triple tier lockers: Openings 20” thru 36” high shall include one double prong ceiling hook and a minimum of two single prong wall hooks.
18. LOCKS:
    a. Not Required.
19. Lifetime Warranty: Superior Fully-Framed All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

PART 3 - EXECUTION

3.1 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 wherever taking of field measurements before fabrication might delay work.

3.2 INSTALLATION

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

B. Space fastenings about 48" o.c., unless otherwise recommended by manufacturer, and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.

C. Install trim, and metal filler panels where indicated, using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch up marred finishes but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended of furnished by locker manufacturer**.**

END OF SECTION

SECTION 10531 - ALUMINUM HANGER ROD CANOPY

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 of this section.

1.2 DESCRIPTION OF WORK

A. The work covered by this section shall include furnishing and installing aluminum hanger rod canopy, with decking and fascia material. The canopy shall consist of structural aluminum panels bound by a framework of fascia which also acts as a water collecting gutter. All components shall be as required to support design loads in accordance with engineering prints and calculations provided by the manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and erection of assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

C. Samples: Submit full range of color samples for each type of unit required.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following except as otherwise indicated.

1. International Building Code, latest addition with amendments, if any. AWS (American Welding Society) standards for structural aluminum welding.

B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer, although several may be indicated as offering products complying with requirements.

C. Installer Qualification: Firm with not less than three (3) years experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.

D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.

E. Shop Assembly: Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Coordination: Furnish inserts and anchorages which must be built into other work for installation of rod canopy’s and related work; coordinate delivery with other work to avoid delay.

1.5 PERFORMANCE REQUIREMENTS

A. System Performance: Provide aluminum covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:

B. The system shall be designed by a registered Engineer in the State of Alabama, certifying the system meets all wind, foundation and all other applicable loads and requirements set forth by local or state building requirements.

1. Live Load:

a. 30 p.s.f. minimum

2. Structural design for wind forces:
    a. Comply with ANSI A58.1-1982
3. Design Wind Velocity:
    a. 130 m.p.h.
4. Importance Factor:
    a. 1.1.
5. Stability Criteria:
    a. 2015 International Building Code

C. Sizes shown on drawings are to be considered minimum.

D. Structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting a concentrated load such as being walked upon.

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. The following manufacturers products have been used to establish minimum requirements for materials, workmanship, and function:

1. Tennessee Valley Metals, Inc. **(Basis of Design and Standard or Quality) |** 190 Industrial Park Road, Oneonta, Alabama 35121 | (205) 274-9500 | www.tvmetals.com.
2. Dittmer Architectural Aluminum | 1006 Shepherd Road, Winter Springs, Florida 32708 |(800) 822-1755; (407) 699-1755 | www.dittdeck.com; info@dittdeck.com.
3. Superior Mason Products LLC. | 116 Citation Court, Birmingham, Alabama 35209 |(877) 445-1200 | www.superiormetalproducts.com; canopysales@superior-mason.com.
4. Mitchell Metals | 1761 McCoba Dr. SE Suite B, Smyrna, Georgia 30080 | (770) 285-5875 | www.mitchellmetals.net; sales@mitchellmetals.net.
5. Gulf South Metals | 17869 Samantha Drive, Foley, Alabama 36535 | (251) 943-6443; www.gulfsouthmetals.com; info@gulfsouthmetals.com.
6. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. All aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.

B. Standard finish for all components shall be satin anodize 204-R1 meeting Aluminum Association Specification AA-M-10C-22A-21.

C. Fasteners:

1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
4. Tek Screws: not permitted

2.3 WARRANTY

A. Manufacturer shall warrant the entire system against defects in labor and materials for a period of one (1) year commencing on the date of substantial completion as established in Division One of these specifications.

B. Intention of this warranty is the manufacturer will come onto the jobsite and do all necessary to effect corrections of any deficiencies.

C. Prima Facie Evidence of defects in labor and material may include but is not limited to, one or more of the following:

1. Moisture leaks
2. Metal failure including excessive deflection
3. Fastener failure
4. Finish failure

2.4 FABRICATION

A. Comply with indicated profiles, dimensioned requirements and structural requirements.

B. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.

C. All welding do be done by heli-arc process.

D. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.

E. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.

F. Roof Deck: Flush deck extruded aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'- 0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.

G. Expansion joints, design structure for thermal expansion and contraction. Provide expansion joints as required.

H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.

I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

J. Finish: Provide enameled finish on all components from manufacturers standards selected by Architect, fascia and related components designed for optimum performance in exterior installations under all environmental conditions. The finish shall be applied in accordance with and conform to, or exceed the Painted Sheet "Quality Standards" and recommended ASTM, Military and/or Federal Test Methods specified by the Aluminum Association in their publication "Aluminum Standards & Data" 1972-1973. Finishes shall be updated as necessary to conform to future editions of this publication.

K. Component Accessories: Roof Brackets, Flashing, etc., shall be of similar materials and finishes as specified for prime components. Each part and its use is described in the engineering prints and calculations provided by the manufacturer. Each part shall be used as specified in the aforementioned prints. Posts shall be used as specified.

L. Hanger rod shall be galvanized steel pipe with finish to match other components.

M. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be hot dip galvanized to withstand 200 hours salt spray test of maximum resistance to rust and corrosion.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle covered walkway system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid excessive stresses.

3.2 EXAMINATION

A. Examine adjacent work for conditions that would prevent quality installation of system.

B. Do not proceed until defects are corrected.

C. Installations:

1. Installed units shall have the following minimum pitch for water drainage of the roof.
2. Minimum pitch for all panels and fascia - Up to 10' - 1/8th/ft.
3. Installed unit shall be properly caulked with a suitable, high quality material where needed and where specified.
4. Installed unit shall meet local building code requirements and conform to the engineering prints provided by manufacturer.

3.3 FIELD DIMENSIONS

A. General contractor shall field confirm bent locations, dimensions and elevations shown on shop drawings prior to fabrication.

3.4 CLEANING AND PROTECTION

A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.

B. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 10670 – ATHLETIC AND BAND STORAGE UNITS

PART 1 – GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

DESCRIPTION OF WORK

Gliding, high-density storage carts for Band apparel.

SUBMITTALS

Product Data: Manufacturer's data sheets, assembly and installation instructions, and description of furnished specialties and accessories.

Shop Drawings: Project-specific drawings indicating details of storage specialties layout and installation, including clearances, spacing, and relation to adjacent construction in plan, elevation, and section. Show components, assemblies, connections, attachments, and anchorage. Show details of floor recesses.

Samples: For each color and finish for each exposed storage specialties component.

Maintenance Data.

Warranty: Submit sample meeting warranty requirements of this Section.

QUALITY ASSURANCE

Source Limitations: Obtain storage specialties through one source from a single approved manufacturer.

COORDINATION

Coordinate installation of storage specialties to ensure proper installation and operation of each component. Coordinate clearances required for movement of gliding, portable and mobile units.

WARRANTY:

Manufacturer's written warranty indicating manufacturer's intent to repair or replace storage specialties components that fail in materials or workmanship within 5 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:

1. Fracturing or breaking of unit components which results from normal wear and tear and normal use other than vandalism.
2. Delamination or other failures of glue bond of components.
3. Warping of components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.

PART 2 – PRODUCTS

MANUFACTURERS: The following manufacturers products have been used to establish minimum requirements for materials, workmanship, and function:

1. Wenger Corporation, Owatonna, MN - Rack and Roll Garment Rack

Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

MATERIALS

Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

Steel Sheet: Cold-rolled, ASTM A 1008/A 1008M, commercial steel, Type B.

Steel Tubing: ASTM A 500, cold-formed steel tubing.

Medium-Density Fiberboard: ANSI A208.2, Grade MD, urea formaldehyde-free.

MDF Thermoset Panels: Particleboard finished with thermally-fused polyester surfacing on both sides meeting performance properties of NEMA LD 3 for VGS grade, edge-banded, including the following:

1. Surface Abrasion Resistance: Taber Wheel, 400 cycles, for solid colors.

ROLLING CARTS - BAND

• 028B002 6' (1829 mm) Rack 'n Roll 163 lbs (74 kg) including Four baskets each.

• Load Capacities • 6' (1829 mm) Rack 'n Roll total load capacity - 300 lbs (136 kg), includes top shelf load capacity of 25 lbs (11 kg) and hanger bar load capacity of 150 lbs (68 kg). • Equipped with full-length hanger bar with space for full-length costumes. • 14-gauge bottom shelf protects longer garments from dragging on the floor. • 16-gauge top shelf Durable black powder-coat paint finish. • Hanger bar constructed of 1-1/4" 11-gauge tubing. • Uprights constructed of 13-gauge, 1-1/2" inch outside diameter (38 mm) round tubing. • 5" (127 mm) swivel, locking, non-marking casters provide easy maneuverability.

• Basket is 20-7/8" x 14" w x 10-7/8" h (530 x 356 x 276 mm) when open; 20-7/8" x 14" w x 2-5/8" h (530 x 356 x 67 mm) when folded.

• 6' (1829 mm) model stores compactly in 24" x 72" (610 x 1829 mm) floor space. Allow 70-1/2" (1791 mm) for height (unloaded) plus 3/8" (9.5 mm) brake protrusion on one side. • Top of hanger bar to top of bottom shelf is 5' 1" (1550 mm).

• Dust Covers have security straps and two zippers on one side. Constructed with 600 Denier material. Black in color.

• Five-year warranty. Accessories • 028B007 Folding Basket, 4.1 lbs (1.9 kg). • 028B013 Costume Divider Tags, pack of 25. • 210B230 Hanger Retainer Clips, pack of 40. • 028B014 4' (1219 mm) Dust Cover. • 028B015 6' (1829 mm) Dust Cover.

PART 3 – EXECUTION

EXAMINATION

Examine installation areas for storage specialties for compliance with requirements for installation tolerances, including required overhead clearances and floor levelness, and other existing conditions affecting installation and performance of storage specialties.

Proceed with installation of storage specialties upon correction of unsatisfactory conditions.

DEMONSTRATION

Train Owner's personnel to adjust, operate, and maintain storage specialties.

Turn over keys, tools, and operation and maintenance instructions to Owner.

END OF SECTION

SECTION 10800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL

A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 RELATED DOCUMENTS

A. Section 06100, Rough Framing for Blocking

1.3 DESCRIPTION OF WORK

B. Extent of each type of toilet accessory is indicated on drawings and schedules.

C. NOTE: Prior to placing any orders for items within this section, the General Contractor is responsible for verifying all toilet accessories with the Owner. Should the owner choose to provide/supply any of these toilet accessories, the General Contractor shall issue a deductive Change Order for material only. The General Contractor will maintain responsibility for installation.

D. Toilet Accessories as follows:

1. Soap Dispensers
2. Toilet Tissue Dispensers
3. Paper Towel Dispensers
4. Grab Bars
5. Mirror Units
6. Utility Shelf/Mop Rack
7. Double Robe Hook at Shower Units
8. Baby Changing Station

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless other- wise acceptable to Architect.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function.

1. Soap Dispensers: **Furnished by Owner installed by Contractor.**

a. Wall Mounted over each sink
b. Approved Products:

i. Bobrick #B-2112
ii. ASI #0345
iii. Bradley #6562

2. Toilet Tissue Dispensers: **Furnished by Owner installed by Contractor.**

a. Roll Type: (One each water closet)
b. Approved Products:

i. Bradley #5425
ii. ASI #0040

3. Paper Towel Dispensers: **Furnished by Owner installed by Contractor.**

a. Roll Type
b. Surface Mounted
c. Approved Products:

i. Bobrick #B52860

4. Grab Bars:

a. Where shown on Plans with Safety-Grip Finish.
b. Approved Products:

i. Bradley Corporation #8122
ii. Series ASI #3200P
iii. Bobrick #B6806.99

5. Mirror Units:

a. 18” x 38” One over each lavatory
b. 24” x 48” One at each Gang Toilet
c. Approved Products:

i. Bradley #780
ii. Bobrick #B290
iii. ASI #0600

6. Utility Shelf/Mop Rack:

a. At locations indicated on drawings. If not indicated, provide One (1) at each Janitor Closet containing water closet. If location is not indicated, contractor is to coordinated location(s) with architect.
b. Approved Products:

i. ASI #1308-4 (44”)
ii. Bradley #9934 (44’)
iii. Bobrick #B239 x 44

7. Double Robe Hook:

   a. At Shower Units
   b. Finish: Polished stainless steel.
   c. Approved Products:

      i. Bradley #9125
      ii. ASI #7345
      iii. Bobrick #B-7672

8. Baby Changing Station

   a. At locations indicated on drawings..
   b. Approved Products:

      i. Koala Kare Model No. KB200
      ii. Color to be selected by Architect after bid date from manufacture standards.
      iii. Include 1 case of Bed Liners Model No. KB150-99.

B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.

B. Mirror Units: Mirror glass shall be FS DD-G-451, Type I, Class I, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411. Mirror shall be provided in stainless steel frames.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; in obtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project.

B. Furnish two keys for each lock.

C. Surface Mounted Toilet Accessories General: Except where other- wise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

D. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing labels and protective coatings.

END OF SECTION

SECTION 11200 - GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gymnasium Equipment:
   1. Overhead-supported basketball backstops.
   2. Basketball backstop winches.
   3. Basketball backboards.
   4. Basketball backboard padding.
   5. Basketball goals.
   6. Backstop Height Adjustment Units.
   7. Indoor Volleyball Systems.
   8. Indoor Volleyball Nets.
   9. Indoor Volleyball Sleeves & Cover plates.
   10. Indoor Volleyball Net Antennas.
   11. Indoor Volleyball Boundary Markers.
   12. Indoor Volleyball Protective Padding.
   13. Gymnasium control systems – Key Switches.
   14. Gymnasium control systems – Wiring.
   15. Gymnasium Wall Padding.

1.2 RELATED SECTIONS

A. Division 5 (Division 05) Metals Sections: Structural steel and steel joists.

B. Division 9 (Division 09) Finishes Section: Finish painting of factory-primed surfaces.

C. Division 16 (Division 26) Electrical Section: Installing electrical power to operate gymnasium equipment.

1.3 REFERENCES

A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM F 2440 – Standard Specification for Indoor Wall/Feature Padding.

C. Federal Standard 191 – Textile Test Methods.

D. NFPA 101 – Life Safety Code.

E. NFPA 255 – Surface Burning Characteristics of Building Materials.

F. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

G. NFPA 701 – Methods of Fire Tests for Flame-Resistant Textiles and Films.

H. UL 214 – Test for Flame-Propagation of Fabrics and Films.

1.4 DESIGN REQUIREMENTS

A. Basketball Backstops: Locate overhead attachments of basketball backstops in keeping with

static equivalent loading and point reactions.

1.5 SUBMITTALS

A. Comply with Section 01330 (01 33 00) – Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.

C. Shop Drawings:
   1. Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating locations, quantities, dimensions, tolerances, materials, fabrication, connections, hardware, fasteners, finish, electrical wiring diagrams, options, and accessories.
   2. Show location and detail of attachment to building structure.

D. Samples: Submit manufacturer's color samples.
   1. Basketball backboard padding.
   2. Wall wainscot padding.

E. Design Data:
   1. Basketball Backstops:
      a. Submit manufacturer's design data, indicating static loads and point reactions.
      b. Submit calculations complete, showing hanger and hoist pulley points.
      c. General load charts or generic product laboratory test data will not be considered sufficient data.

F. Test Reports: Submit manufacturer's certified test reports from testing performed by accredited independent testing laboratory, indicating compliance of materials with requirements as specified.

G. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

H. Manufacturer's Project References: Submit manufacturer's list of recently completed projects, including project name and location, name of architect, and type and quantity of gymnasium and play field equipment installed.

I. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; parts list; and electrical wiring diagrams.

J. Warranty: Submit manufacturer's standard, lifetime, and additional warranties.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Provide gymnasium equipment from single manufacturer.

B. Manufacturer's Qualifications: Minimum of 5 consecutive years experience manufacturing gymnasium and play field equipment similar to that specified.

C. Installer's Qualifications: Trained and approved by manufacturer.

D. Regulatory Requirements: Gymnasium equipment shall conform to latest rules and regulations.
   1. Federation Internationale de Football Association (FIFA).

2. International Basketball Federation / Federation International de Basketball (FIBA).
3. National Association for Girls and Women in Sport (NAGWS).
4. National Basketball Association (NBA).
5. National Collegiate Athletic Association (NCAA).
6. National Federation of State High School Associations (NFHS).
7. USA Volleyball (USAV).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Keep temporary protective coverings in place.

C. Handling: Protect materials and finish from damage during handling and installation.

1.8 WARRANTY

A. Provide 1-year warranty against defects in materials and workmanship, unless otherwise specified.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Porter Athletic, Inc. [Basis of Design] | 601 Mercury Drive, PO Box 1790, Champaign, Illinois 61824-1790. | Phone (217) 367-8438. Fax (217) 239-2255. | www.porterathletic.com.

B. Jaypro Sports, LLC. | 976 Hartford Tpk, Waterford, CT 06385 | PH: 800-243-0533 (Toll Free) | 860-447-3001 | www.jayprosports.com.

C. Draper, Inc. | 411 South Pearl St., Spiceland, Indiana 47385 | 765-987-7999 | 800-238-7999 | www.draperinc.com.

D. Performance Sports System | 9200 E 146th St. | Noblesville, Indiana 46060 | (317) 774-9840 | www.perfsports.com.

E. AALCO Manufacturing | 1650 Avenue H St. Louis, MO 63125 | 314-544-4300 | 314-544-4300 | email: sales@aalcomfg.com | www.aalcomfg.com.

F. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 OVERHEAD-SUPPORTED BASKETBALL BACKSTOPS

A. Model No. 955 Side Folding – Side Braced overhead-supporting basketball backstop:
1. Refer to drawings for Location(s) and Quantities.
2. Vertical Frame Assembly: Main vertical support of 6-5/8-inch O.D. heavy-wall structural tube with rear diagonal brace of 1-7/8-inch O.D. structural pipe. Suspended by adjustable hangers, with 2-inch adjustment, to provide for precise plumbing of frame during installation, and further supported from 3-1/2-inch O.D. pipe anchored to overhead framing system by heavy, formed, die-cut steel support fittings.
3. Top Horizontal Mast Hinge Spreader: Heavy-wall 3-1/2-inch O.D. tubing to form rigid triangular design.

4. Goal: Mount directly through backboard and into heavy structural steel weldment clamped to vertical 6-5/8-inch O.D. center support to eliminate strain on backboard, should player hang on front-mounted goal. Direct-mount feature shall conform to NCAA rules. Transfer load on goal directly to backboard support Center-Strut, to minimize stress to glass backboard.
5. Upper Backboard Extension Assembly: Official NCAA and NFSHSA regulation 6 inches from front of Center-Strut to face of backboard.
6. Support Fittings: Attached to overhead framing. Capable of supporting load exceeding 10,000 pounds, with sufficient attachment points to acquire 60:1 safety factor for support of entire backstop superstructure system. Furnish certified test results with submittals.
7. Superstructure Pipes: Reinforced with truss-type bridging or bracing when truss centers exceed spans of 14'-0", as required.
8. Pipe Ends: Cap when exposed.
9. Backstop: Operate with 1-7/8-inch O.D. side-brace assembly for proper adjustment during installation.
10. Knee Joint: Locks backboard in playing position with torsion spring within hinge assembly. Disengaged by upward force of hoist cable.
11. Finish of Metal Parts, Pipes, and Fittings: Flat enamel, 1 coat. Color to be selected by Architect from manufacturers standards.

B. **Model No. 917 - Forward Fold / Rear Braced / Overhead Supporting**

1. Refer to drawings for Location(s) and Quantities.
2. Fully welded, vertical front frame assembly consisting of main center mast of 6-5/8-inch O.D. heavy-wall structural steel tube with diagonal side sway braces of 2-1/2-inch rectangular steel tube. Bolt-together frames are not acceptable.
3. Ends of Diagonal-Brace Tubes and Internal Web Bracing: Precision machine-cut to provide maximum weld surface contact to form unitized, back-to-back, triangular-type structural design to provide superior lateral stability.
4. Top Horizontal Mast Hinge Spreader: Heavy 4-inch structural steel channel.
5. Backstop: Supported from 3-1/2-inch O.D. pipe anchored to overhead framing members with heavy formed-steel support fittings. Capable of supporting load exceeding 10,000 pounds with sufficient attachment points and meeting safety factor of 60 to 1. Furnish certified test results with submittals.
6. Goals: Mount directly through backboard and into heavy structural steel weldment Center-Strut, clamped to vertical 6-5/8-inch O.D. center support to eliminate strain on backboard, should player hang on front-mounted goal and to be in compliance with NCAA and NFSHSA requirements.
7. Fittings: Attached to 6-5/8-inch O.D. vertical drop tube by heavy 1/4-inch thick precision saddle die-cut formed-steel fittings secured in place by 5/8-inch diameter U-bolt hardware.
8. Upper Backboard Extension Assembly: Provide official NCAA and NFSHSA regulation 6 inches from front of Center-Strut to face of backboard.
9. Main Backstop Frame Assembly: Suspended from overhead 3-1/2-inch O.D. pipe by adjustable hangers, with 2 inches of vertical adjustment, to provide for precise plumbing of frame during installation.
10. Hangers: Tested to 20,000 pounds maximum breaking point to achieve safety factor of 50 to.
    1. Furnish certified test results with submittals.
11. Support Hangers: Offset 1-1/2 inches from center line of main center mast to properly weight lock unit in playing position.

12. Backstop: Operate with 1-7/8-inch O.D. front-brace assembly with folding-knee joint.
13. Knee Joint: Lock backboard in playing position, with torsion spring within hinge assembly.
14. Hoist Cable: Disengage knee joint, allowing front brace to fold.
15. Backstop 6-5/8-Inch O.D. Main Stem: Suspended diagonally from superstructure with 15 degree angle and 4'-6" long vertical member for attachment of basketball backboard.
16. Rear Diagonal Back-Brace Assembly: Heavy-wall 1-7/8-inch O.D. pipe with internal telescoping-tube arrangement.
17. Adjustable Collar: Permanently set during installation to plumb face of backboard and to level goal.
18. Finish of Metal Parts, Pipes, and Fittings: Flat enamel, 1 coat. Color to be selected by Architect from manufacturers standards.

2.3 BASKETBALL BACKSTOP WINCHES

A. Basketball Backstop Winches, General:
   1. Hoist Cable: Of sufficient length to each backstop. 1/4-inch diameter galvanized aircraft-type cable, minimum of 7,000 pounds ultimate.
   2. Swivel Pulleys: 4-inch diameter cast ductile iron pulley sheave with maintenance-free, oil-impregnated bearing for proper hoist cable routing to winch.
   3. Pulley Assembly and Attachment to 3-1/2-Inch O.D. Support Structure: Rated at minimum 9,000-pound load rating. Furnish certified test results with submittals.

B. Standard-Duty Electric Winches: Model No. 712.
   1. For each backstop.
   2. Hold units at any position when raising or lowering.
   3. Electric Motor: Individually operate units by 3/4-hp, 13-amp, capacitor-type, 60-cycle, 110-V AC, single-phase, electric motor with automatic thermal-overload protection, manufactured to NEMA specifications.
   4. Fully Enclosed Gear Set: Set in oil bath and factory sealed to eliminate need for lubrication.
   5. Cable Drum: Grooved to provide neat and consistent cable tracking.
   6. Gear Shaft: Connect directly to drum hoist without use of chain.
   7. Electric Winch: Incorporate rotary up and down limit switches and flush wall-mounted dual-key (separate up and down keys) switch to prevent improper operation of system.
   8. Key Switches: Key switches, operating basketball backstops and gymnasium dividers, shall be furnished identical.

C. Safety Locks: Model No. 797 Saf-Strap safety lock.
   1. For each court backstop.
   2. Lock: Inertia sensitive to automatically lock basketball backstop in position at any time in storage or during raising or lowering cycle, due to sudden surge of speed created by possible malfunction of hoisting apparatus.
   3. Reset: Fully automatic reset requiring no poles, ropes, levers, or buttons.

2.4 BASKETBALL BACKBOARDS

A. Basketball Backboards: Model No. 208 rectangular backboard.
   1. Provide for each 917 and 955 backstop.
   2. Backboards: 2-5/16-inch thick frame, 72 inches by 42 inches, 1/2-inch tempered plate glass cushioned in unitized steel-tubing frame.
   3. Perimeter: Glare-free aluminum.
   4. Standard White Borders and Target Area: Fired into glass permanently.

5. Warranty: Limited lifetime warranty against breakage.

2.5 BASKETBALL BACKBOARD PADDING

A. Basketball Backboard Padding: Model No. 326 Pro Pad bolt-on positive-attachment backboard pad.
   1. Provide for each rectangular glass backboard, along bottom of backboard and up 15 inches on each side, meeting NCAA and NFSHSA rules.
   2. Pads: 2-inch thick, molded from 9-pound density polyurethane foam with integral skin.
   3. Color: To be selected by Architect from manufacturer standards. Gray, Scarlet, Royal, Navy, Kelly, Forest Green, Maroon, Orange, Black, Purple, and Gold
   4. Warranty: 8 years.

2.6 BASKETBALL GOALS

A. Basketball Goals: Model No. 236054 Ultra – Flex II Goal [Breakaway Goal]
   1. Provide for each Model No. 208 backboard.
   2. Goal: Positive-lock, pressure-release mechanism which is preset to provide rebound characteristics identical to those of a non-movable ring. Spring-loaded to automatically and instantaneously return to playing position.
   3. Pressure Release Mechanism: Factory preset with capability for field adjustment to comply with NCAA recommendation to test goals for rebound elasticity.
   4. Breakaway goals with plastic-pivot bearings are not acceptable.
   5. Rim: 18 inch diameter, made with 5/8 inch diameter cold drawn, alloy steel, rigidly braced by 3/16-inch thick steel formed and die-cut steel brace welded in position on underside of rim for maximum support.
   6. Net Attachment: Tube-tie net attachment system on rim to eliminate conventional wire-formed net locks.
   7. Net: Anti-whip, white net.
   8. Finish: Official orange powder coated.

2.7 HEIGHT ADJUSTMENT UNITS

   1. Model No. 00900xxx for each backstop, height adjustment unit for adjusting goal height to any position between 8’-0” and 10’-0” above floor, with Center-Strut direct-goal attachment to eliminate strain on backboard.
   2. Height Scale: Located on side of slide tube to visually determine height settings.
   3. Guide Tubes: Fabricated with dual, 2-3/16-inch square, heavy-wall, zinc-plated, guide tubes. Tubes to be welded to upper and lower clamps that attach securely to 6-5/8-inch diameter backstop mast. Tubes shall support heavy steel center weldment, which shall support backboard and be factory drilled for direct goal attachment.
   4. Warranty: Limited lifetime warranty against breakage for backboards mounted on height adjustment unit.
   5. Height Locking Device: Automatically engages when hand crank is removed.
   6. Unit shall operate by 3/4-inch diameter Acme-threaded rod and removable hand crank.
   7. Include Height Adjuster Crank.

2.8 INDOOR VOLLEYBALL

A. Volleyball System: Model No. 01991000 Powr-Line **Competition** volleyball system.
   1. Posts: Telescoping type that does not extend above net and impede official's vision.
   2. Post Material: 3-1/2-inch diameter, Alloy 6063-T6 aluminum extrusion with reinforcing rib pattern. Finished with plastic-molded foot to protect against gymnasium floor damage.
   3. Upper Telescoping Upright: Extruded from same aluminum alloy as bottom upright. Height adjustable for heights from 6’-1” to 7’-11-5/8” with pressure-lock T-handle assembly.

Counterbalanced with constant-tension spring mechanism to eliminate possibility of accidentally falling while making height adjustments.
4. Upper End of Upright: 3-inch diameter pulley to reduce cable drag and unnecessary system tension.
5. Winch Post: Heavy-duty Powr-Winch®.
6. End Post: Heavy-duty collar assembly for net tie-off.
7. Powr-Winch®: Heavy-duty, self-locking ratchet with disc-brake release mechanism for safest tensioning system. 1-3/4-inch wide, high-tensile nylon strap and durable snap hook. Removable handle to prevent unauthorized use.
8. Height Indicator Labels: Apply after assembly of posts.
9. Each System: Consists of 1 winch post and 1 end post.
10. Finish: Clear anodized.

C. Volleyball Nets: Model No. 02295640 volleyball net.
1. Nets: 32 feet by 39 inches with 42'-6", 1/4 inch diameter nylon braided cord with a Kevlar core. Use with Model No. 01991 competition standards.
2. End Hems: 4-inch width with 1/2-inch diameter fiberglass dowel to provide rigidity and tailored square hanging net.
3. Each End Hem: Equipped with three 1-inch wide polypropylene web-tension straps and quick-adjust tension clips.
4. Netting: 4-inch square, heavy-duty, #24 black nylon mesh with 2-inch wide, vinyl-coated, polyester hem double-stitched across top of net.

D. Floor Sleeves and Cover Plates: Model No. 00870100 floor sleeve.
1. Floor Sleeve: 3-3/4-inch O.D. heavy-wall steel tubing, extending 9 inches into concrete footing.
2. Cover Plate: Brass plated. 5-inch O.D. by 1/2-inch thick recessed collar, cork gasket, and cover.
3. Swivel Retainer Pin in Collar: Prevent theft.
4. Cover removal key.

E. Net Antenna: Model No. 02296100 Powr-Line net antenna with clamp.
1. Antenna Clamps: Included with net antenna. As 1 complete unit, clamps shall snap easily and securely into place.
2. Antenna Size: 3/8-inch diameter by 6-foot long fiberglass dowels. Check no spec measurements
3. Antenna Markings: Alternately marked red and white.

F. Boundary Markers: Model No. 02297 boundary markers.
1. 2-inch wide, durable, white, polyester-reinforced vinyl material with white Velcro attachment strips sewn in place for securing to competition volleyball net.

G. Protective Padding: Model No. 00839000 protective padding.
1. Compliance: Meet current competition requirements as prescribed by USAV, NFHS, and NCAA for player protection and safety.
2. Padding: Extend to height of 6'-0".
3. Construction: Fabricated with a firm, 1-1/2-inch thick closed cell polyethylene foam covered in durable vinyl coated polyester.
4. Pads Installed on Uprights: Narrow profile to provide for maximum visibility for judges and spectators.
5. Color: Custom colors available.

6. Net Attachment: One side of pad has cut-out to accommodate net attachment.

H. Judge's Platforms: Model No. 00999000 judge's platform.
1. Attach to volleyball system in cavities of post.
2. Platform Size: 23-5/16 inches square, at height of 3’-10” above playing floor.
3. Platform Support Side Frames: Formed 1-5/16-inch O.D. steel tube handrail/ladder sections.
4. Casters: 2, for ease of moving.
5. Protective Pads: Model No. 00993100.

2.9 GYMNASIUM CONTROL SYSTEMS

A. Key Switches: Model No. XELE007911xx
1. Wall-Mounted Dual-Key Switch: Switch with separate “up” and “down” keys to prevent improper operation of system. Single key systems or “toggle” type switches are not approved. Operates quantity of winches required.
2. Momentary Switch: Switch automatically returns to “off” position if released.
3. Cover Plate: Flush-mounted stainless steel cover plate with manufacturer's label including operating instructions.
4. Key Switches: Key switches for all gymnasium equipment to be furnished identical.

B. Wiring: Install electric power and hook-up of electric controllers.
1. Materials: Conduit, wire, and boxes for power and control of key switches, touch pad, and motors to be furnished and installed as specified in Division 16 (Division 26) electrical section.
2. Hook-Ups: Complete and final hook-up of motors and electrical devises as specified in Division 16 (Division 26) electrical section.

2.11 GYMNASIUM WALL PADDING:

A. Model No. 005600XX 2” ImpactSafe Wall Pad. [Non-Fire Retardant]
1. Shock Absorption: ASTM F 2440, meet minimum standard.
    a. The Maximum gMAX values for the padding shall not exceed 200 and the HIC shall not exceed 1000 when tested at a 4 foot Drop Height.
2. Cover Material: Designated as flame resistant in accordance with NFPA 701 and State of California.
3. Wall Pad Dimensions: 2’-0” wide by 6’-0” high by 2-1/4” thick.
4. Nailing Margin: 1-inch nailing margin top and bottom for securing panels to wall.
5. Foam: 2-1/4-inch thick polyethylene foam.
6. Interior Foam: Bonded to 7/16-inch OSB to minimize warping.
7. Entire Face of Panel, Including Nailing Margins: Upholstered in 15-ounce, fire-retardant, high-tensile, vinyl-coated polyester fabric material with leather-like embossed finish.
8. Cover Material Tear Strength: 100 psi.
9. Cover Material Properties: Mildew resistant, rot resistant, with infection-combating fungicide.
10. Fold and securely staple cover to backside of OSB.
11. Color: To be selected by Architect from manufacturer standards. Light Blue, Royal Blue, Red, White, Orange, Yellow, Tan, Gray, Maroon, Purple, Black, Navy Blue, Kelly Green, Dark Green
12. Column Pads: Same construction as wall pads mounted on ¾” plywood backing mounted to columns, equal to Aalco Model #CCP-1. Height of column pads shall be 8’-0” high. Color to match wall pads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and supporting structure to receive gymnasium and play field equipment. Notify Architect in writing of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install gymnasium and play field equipment in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Install equipment plumb, level, straight, square, accurately aligned, correctly located, to proper elevation, and secure.

C. Install equipment using manufacturer's supplied hardware and fasteners.

D. Electrical: Install electrical power as specified in Division 16 (Division 26) electrical section.

E. Wall Padding: Form or cutout panels for columns, electrical outlets, wall switches, and other items as required.

F. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

G. Remove and replace damaged components that cannot be successfully repaired, as determined by Architect.

3.3 ADJUSTING

A. Adjust basketball backstops, backboards, and goals for plumb and level.

B. Adjust operating equipment to function properly and for smooth operation without binding.

C. Set and adjust electric winch upper and lower limit controls.

3.4 CLEANING

A. Clean gymnasium and play field equipment promptly after installation in accordance with manufacturer's instructions.

B. Remove labels and temporary protective coverings.

C. Do not use harsh cleaning materials or methods that would damage finish.

3.5 DEMONSTRATION

A. Demonstrate operation and maintenance of gymnasium and play field equipment to Owner's personnel.
B. Furnish Owner with keys to equipment after demonstration.

3.6 PROTECTION

A. Protect installed gymnasium and play field equipment to ensure equipment will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 11451 – SPORTS WHIRLPOOL

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 of this section.

1.2 DESCRIPTION OF WORK

A. This section includes contractor furnished and installed sport whirlpool equipment.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings as per requirements. Drawings shall show schedules showing location and sizes, and complete details.

1.4 GUARANTEE

A. All equipment shall be guaranteed to be free from defects of workmanship of materials for a period of one year from date of acceptance.

PART 2 – MATERIALS

2.1 MANUFACTURERS

A. Subject to requirements specified herein furnish products by one of the following:

1. Appliance Model Numbers specified are as manufactured by Whitehall Sports Whirlpool Company.

B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than five (5) days prior to scheduled bid opening, provide the following or equal;

2.2 MATERIALS

A. Whitehall Mobile Whirlpool (Model S-90-M) with a 90-gallon capacity, 46”L x 24”W x 25”D.

1. Whirlpool shall be fabricated from heavy gauge, type 304 stainless steel.
2. Construction shall be seamless welded and exposed surfaces shall be polished to satin finish.
3. Tank shall have a reinforced rim and shall be fitted with an auxiliary drain valve.
4. Bottom of tank shall be a seamless, rounded coved design to minimize bacteria build up.
5. Whirlpool shall have heavy duty swivel casters with locking device on rear pair of casters.
6. Provide a turbine assembly with raising and lowering device which functions both as agitator and emptying device, permits adjustment of desired height, direction of water agitation, and can be locked into place. Turbine assembly shall be UL and SA listed 1/2 HP jet pump motor with automatic thermal overload protector, and lifetime-sealed bearings.
7. Provide a thermometer with a stem retainer to prevent rattle when whirlpool is in operation.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Equipment shall be installed in strict accordance with manufacturer’s recommendations.

B. Owner’s Manuals: Contractor shall insure that owner’s manuals and other data packed with the equipment is turned over to the Owner’s representative after installation is completed.

C. Clean up: Contractor shall remove all packing, blocking, protective coatings and tapes after installation. Wash down exterior of units with mild detergent and water.

END OF SECTION

SECTION 11664 - SCOREBOARD

PART 1– GENERAL

1.1 SECTION INCLUDES

A. Single-sided LED basketball scoreboard

1.2 REFERENCES

A. Standard for Electric Signs, UL 48
B. Standard for CSA C22.2 #207
C. Federal Communications Commission Regulation Part 15
D. National Electric Code

1.3 SUBMITTALS

A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
B. Shop drawings: Submit mechanical and electrical drawings.
C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Product delivered on site
B. Scoreboard and equipment to be housed in a clean, dry environment

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
B. Field Measurements: Provide size, weight and mounting location for coordination. If shot clock is to be mounted to a backstop, mounting hardware shall be supplied by the backstop provider.
C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

1.6 QUALITY ASSURANCE

A. For indoor use only
B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.
C. ETL listed to UL 48
D. NEC compliant
E. FCC compliant
F. ETLC listed to CSA 22.2 #207

1.7 WARRANTY

A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects
B. Provide toll-free service coordination
C. Provide technical online and phone support during Daktronics business hours

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. MANUFACTURERES: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. Daktronics, Inc., 201 Daktronics Drive, P.O. Box 5128, Brookings, SD 57006-5128

B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PRODUCT

A. Daktronics BB-2103 single-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FOULS to 19, PLAYER number to 99, player FOUL to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Scoreboard can also score volleyball, wrestling and any sport requiring a clock, score and period function.

2.3 SCOREBOARD

A. General information
   1. Dimensions: 6'-0" (1.83 m) high, 8'-0" (2.44 m) wide, 0'-6" (152 mm) deep
   2. Base weight: 180 lb (82 kg) – options may increase weight
   3. Base power requirement: 210 W – options may increase wattage
   4. Color: provide over 150 colors to choose from

B. Construction
   1. All-aluminum construction
   2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick
   3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens

C. Digits & Indicators
   1. LED digit technology
      (**SELECT ONE DIGIT TYPE IN BRACKETS ONLY**):
      [PanaView® (PV) – discrete LEDs protrude through the scoreboard face]
      [UniView® (UV) – enhanced digits with diffusant lenses over the LEDs that blend the light for a uniform bar look and 140° viewing angle]
   2. LED color (**SELECT ONE DIGIT COLOR IN BRACKETS ONLY**):
      [Amber clock/colon, PERIOD and PLAYER/FOUL digits and bonus indicators with Red core and FOULS digits and possession indicators] [All White digits and indicators (*anaView only*)]
   3. Clock and score digits: 13" (330 mm) high
   4. PERIOD, FOULS and PLAYER/FOUL digits: 10" (254 mm) high
   5. Bonus indicators: 4" (102 mm) high
   6. Possession arrows: 3" (76 mm) high
   7. Seven bar segments per digit

D. Captions
   1. Vinyl applied directly to scoreboard face
   2. HOME and GUEST captions: 6" (152 mm) high
   3. PERIOD, FOULS/SCORE and PLAYER/FOUL/MATCH captions: 4" (102 mm) high
   4. Color: standard white or others available upon request

E. Horn
   1. Vibrating horn mounted inside the scoreboard cabinet behind the face
   2. Sounds automatically when period clock counts down to zero
   3. Sounds manually as directed by operator

F. Power Cord
   1. Cord is 11' (3.35 m) long
   2. Cord plugs into a standard grounded outlet
G. Accessory Equipment
   (SELECT ONE ACCESSORY IN BRACKETS PER NUMBER OR DELETE ENTIRE NUMBER)
   1. **[Vinyl striping applied around the clock and scoreboard face]**
   2. **[Custom team name caption in place of HOME] [Team names on changeable panels] [Two 6" (152 mm) high Programmable Team Name Message Centers (TNMCs) in place of vinyl HOME and GUEST captions – add 15 lb (7 kg) and 60 W]**
   3. **[Volleyball and wrestling captions on changeable panels]**
   4. **[Double bonus indicators in place of single bonus indicators]**
   5. **[Two 17" (432 mm) high, 21" (533 mm) wide aluminum panels in upper corners with vinyl logo/sponsor decoration]**
   6. **[Two 7" (178 mm) T.O.L. digits and two 3" (76 mm) vinyl captions]**
   7. **[Standalone Time of Day (scoreboard acts as a clock when control console is unplugged/off)]**
   8. **[Advantage time option for wrestling mode – PLAYER and FOUL digits reversed]**
   9. **[Different sounding 12 VDC horn in place of buzzer horn]**
   10. **[Hinged metal mesh protective screen – painted to match scoreboard]**
   11. **[Hardware for suspension installation] [Hardware for corner mounting]**

2.4 SCORING CONSOLE

A. Console is an All Sport® 5000 controller
B. Scores multiple sports using changeable keyboard inserts
C. Controls multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by customer
D. Recalls clock, score, and period information if power is lost
E. Runs Time of Day and Segment Timer modes
F. Console includes:
   1. Rugged aluminum enclosure to house electronics
   2. Sealed membrane water-resistant keyboard
   3. 32-character backlit LCD to verify entries and recall information currently displayed
   4. Power cord that plugs into a standard grounded outlet; 6 watts max
   5. Control cable to connect to the control receptacle junction box (wired system only)
   6. Hand-held switch for main clock start/stop and horn
   7. Soft-sided carrying case
G. Accessory Equipment
   (SELECT ONE ACCESSORY IN BRACKETS PER NUMBER OR DELETE ENTIRE NUMBER)
   1. **[2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard(s)]**
   2. **[Hard carrying case]**
   3. **[Battery pack]**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.2 INSTALLATION

A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is also responsible for any required wire and terminators between each scoreboard and control location.
B. Mount shot clock to wall or to backstop in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.3 INSTALLATION—CONTROL CENTER

A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.
B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.
C. Conduct operator training on the scoreboard/controller operation.

END OF SECTION

SECTION 12304 - LAMINATE CLAD CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 WORK INCLUDED

A. The extent of laminate clad casework as shown on the drawings.

B. The work includes the fabrication and installation of laminate clad casework components of base cabinets, wall cabinets, tall cabinets, shelf units, cubbies and other units as indicated.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Sinks and Service Fixtures: Furnished and installed under Mechanical and Electrical Divisions 15 and 16.

B. Base Molding: Furnished and installed under Finishes Division 9.

C. Refer to Section 04412, Granite Countertops.

1.4 QUALITY ASSURANCE

A. Provide laminate clad casework and countertops furnished by the same supplier for single responsibility and integration with other building trades.

B. Manufacturers shall show evidence of at least five (5) years experience and installations for similar types of projects.

C. Millwork must conform to design quality of materials, workmanship and function of casework specified and shown on drawings.

1.5 SUBMITTALS

A. Product Data: In addition to the general conditions as relates to prior approvals, submittals of manufacturer's data, installation instructions and samples are required upon architect's request.

B. Samples:

1. Submit 2, 2" x 3" samples of casework manufacturer's standard decorative laminate colors, patterns and textures for exposed and semi-exposed materials for architect's selection.

2. Samples will be reviewed by architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the contractor.

3. Submit one full-size sample base cabinet unit with hardware, doors and drawers, without countertop.

4. Submit one full-size sample wall cabinet unit complete with hardware, doors, and adjustable shelves.

5. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.

6. Remove sample units from the premises when directed by the architect.

C. Shop Drawings:

1. Submit shop drawings for laminate clad casework and counter- tops showing layout, elevations, ends, cross-sections, service run spaces, and location of services. Show details and location of anchorages.

2. Include layout of units with relation to surrounding walls, doors, windows, and other building components.

3. Coordinate shop drawings with other work involved.

1.6 PRODUCT HANDLING

A. Deliver laminate clad casework and countertops only after wet operations in building are completed.

B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.

C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.7 JOB CONDITIONS

A. Humidity and Temperature Controls:

1. Advise contractor of requirements for maintaining heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.

1.8 WARRANTY

A. All materials and workmanship covered by the section will carry a one (1) year warranty from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERES

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. TMI Systems - Dickson, N.D.
2. Case Systems- Midland, MI.
3. L.S.I.
4. Stevens Industries - Teutropolis, IL.
5. Cabinets by Design, LLC; 770.418.1200
6. PR Bean Company, LLC; 812.254.3761
7. Varner Woodworks, Montgomery, AL.

2.2 MATERIALS

A. Definitions: Identification of casework parts by surface visibility.

1. Unit Body Open Interiors: Any storage unit surface without solid door or drawer fronts and units with glass sliding or glass framed doors.

2. Unit Body Closed Interiors: Any storage unit surface behind solid door or drawer fronts.

3. Unit Body Exposed Side: Any storage unit exterior side surface is visible.

4. Concealed Surfaces: Any surface not normally visible after installation.

2.3 CORE MATERIALS

A. Particleboard: Minimum density 45 lb. western particleboard of fir or pine meeting or exceeding ANSI A 208 1-1979, 1-M-3 requirements. Thickness used are 1/4", 1/2", 3/4" and 1". (Thickness of particleboard excluding skins).

B. Hardboard: Prefinished hardboard in 1/4" thickness meeting or exceeding commercial standards CS-251.

C. Plywood: Shall be 9-ply hardwood plywood.

2.4 DECORATIVE LAMINATES

A. High pressure decorative laminate GP50 (.050), NEMA Test LD-3 - 1985.

B. High pressure decorative laminate GP38 (.038), NEMA Test LD-3 - 1985.

C. High pressure decorative laminate GP28 (.028), NEMA Test LD-3 - 1985. Laminate shall be counter balanced.

D. High pressure decorative laminate PF42 (.042), NEMA Test LD-3 - 1985.

E. High pressure decorative laminate PF30 (.030), NEMA Test LD-3 - 1985

F. High Pressure cabinet liner CL20 (.020), NEMA Test LD-3 - 1985.

G. Laminate shall be counter balanced.

H. Melamine laminate tested to meet NEMA Test LD-3 - 1985. Laminate shall be counter balanced.

I. High pressure backer BK20 (.020). Laminate shall be counter balanced.

J. Laminate Color Selection(s):

1. Colors for cabinet surfaces grade GP28 shall be selected from Wilsonart's standard solid and pattern offering. A maximum of one (1) color to be selected per unit face and five (5) colors per project.

2. Melamine colors shall be light beige or dove grey. One color only per project.

3. Colors: To be selected by architect after bid date / during submittal phase of project.

2.5 PLASTIC EDGING

A. 1mm PVC hot melt glue applied.

B. 3mm PVC hot melt glue applied.

2.6 METAL PARTS

A. Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and powder painted in light beige, sienna brown, dove grey or black colors.

2.7 CABINETS HARDWARE

A. Hinges: Shall be five knuckle, 2-3/4 inch, overlay type, hospital tip, .095 inch thick steel. Hinges shall have a minimum of eight (8) edge and leaf fastenings. Doors 48 inches and over in height shall have three (3) hinges per door. Available in light beige, sienna brown, dove grey, black colors, or brushed chrome finish. Magnetic door catches are required with this hinge and shall be magnetic type with a minimum ten (10) pound pull, attached with screws and slotted for adjustment.

B. Pulls: Door and drawer fronts shall be a semi-flush ABS plastic recessed and fastened with glue and screws. Available in light beige, sienna brown, dove grey or black colors.

C. Drawer Slides: Shall be Blum bottom mount style No. BS 230E with epoxy finish. Slides will have a 100 pound load rating at full extension and a built-in, positive stop both directions. Slides shall have a life time warranty as offered by the slide manufacturer.

D. Adjustable Shelf Supports: Shall be heavy-duty to support two hundred (200) pounds, self-locking nylon, to fit 32mm pre-drilled holes in cabinet ends and vertical partitions. The self supports shall have two (2) pins 5mm in diameter, to prevent the shelf support from rotating and tipping. Available for 3/4 inch or 1 inch thick shelves.

E. Locks:

1. Door and Drawer Locks: Shall be National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys.

2. Locks for sliding 3/4" doors shall be disc type plunger lock, sliding door type with strike locks for sliding glass doors shall be a rachet type sliding showcase lock. Install locks on all teacher’s cabinets.

3. Chain bolts shall be 3 inches long, shall have a 18 inch pull and an angle strike to secure inactive door on cabinets over 72 inches in height. Elbow catches shall be used on inactive doors up to and including 72 inches in height.

F. Coat Rods: Shall be 1-1/4 inch, 14 gauge chrome plated steel.

G. Mirrors: Shall be 1/4 inch thick polished mirror plate.

H. Computer Grommets: Shall be 2 ½ inch dia. plastic insert and cover to be located at each computer station.

2.8 FABRICATION

A. Fabricate laminate clad casework to dimensions, profiles and details shown.

B. Cabinet Joinery: Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels at each joint for twenty- four (24) inch deep cabinets and a minimum of four (4) dowels at each joint for twelve (12) inch deep cabinets. All dowels are to be industrial grade hardwood laterally fluted, with chamfered ends and a minimum diameter of ten (10) millimeters. Internal cabinet components such as fixed horizontals, rails and verticals are to be doweled in place. Dowels are to be securely glued and cabinets clamped under pressure during assembly to assure secure joints and cabinets and squareness.

C. Unit Door and Drawer Fronts:

1. Shall be 3/4 inch thick particleboard and laminate with high pressure decorative laminate GP28 color as selected on the exposed surface and high pressure laminate cabinet liner CL20 on the interior surface light beige or dove grey color.

2. All edges shall be finished with 3mm PVC in light beige, sienna brown, dove grey or black color.

3. Framed glass insert doors shall be 1/4 inch thick plate glass trimmed with extruded PVC plastic in light beige, sienna brown, dove grey or black color only.

4. Double doors shall be used on all cabinets in excess of 24 inches in width.

D. Unit Body Open Interiors:

1. Exposed cabinet sides shall be 3/4 inch thick particleboard laminated on the exterior with high pressure decorative laminate GP28 in color as selected and balanced with high pressure cabinet liner CL20 in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.

2. Unexposed cabinet sides shall be 3/4 inch thick particleboard laminated both sides with melamine in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.

3. Unit top or subtop shall be 3/4 inch thick particleboard laminated both sides with melamine and front edge with 1mm PVC to match the door and drawer front edge color. All subtops shall be full depth.

4. Bottom of base and wardrobe units shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color.

5. Fixed intermediates shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. An intermediate will be provided on all units over 36 inches wide.

6. Standard unit backs shall be 1/2 inch thick prefinished particleboard. Color to match interior. Exposed back on fixed or movable cabinet to be 3/4 inch thick particleboard laminated with CL20 on the interior to match melamine color and GP28 on the exterior as selected.
7. Adjustable shelves shall be 3/4 inch thick particleboard up to 30 inches wide and 1 inch thick particleboard over 30 inches wide, laminated both sides with melamine in light beige or dove grey color.

8. Shelves shall be edged front edge only with 1mm PVC to match the self color.

E. Unit Body Closed Interiors:

1. Exposed cabinet sides shall be 3/4 inch thick particleboard laminated on the exterior with high pressure decorative laminate GP28 in color as selected and balanced with high pressure

cabinet liner CL20 in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.

2. Unexposed cabinet sides shall be 3/4 inch thick particleboard laminated both sides with melamine in light beige or dove grey color. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color.
3. Unit top or subtop shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. All sub- tops shall be full depth. Sink base units shall have a 1 inch x 1 inch x 1/8 inch angle iron rail in lieu of full sub- top.

4. Bottom of base and wardrobe units shall be 3/4 inch thick particleboard laminated both sides with melamine and front edges with 1mm PVC to match the door and drawer front edge color. Sink cabinet bottoms shall be laminated both sides with CL20.

5. Fixed intermediates shall be 3/4 inch thick particleboard laminated both sides with melamine and front edged with 1mm PVC to match the door and drawer front edge color. An intermediate will be provided on all units over 36 inches wide.

6. Standard unit backs shall be 1/2 inch thick prefinished particleboard. Color to match interior. Exposed back on fixed or movable cabinet to be 3/4 inch thick particleboard laminated with CL20 on the interior to match melamine color and GP28 on the exterior as selected.

7. Adjustable shelves shall be 3/4 inch thick particleboard up to 30 inches wide and 1 inch thick particleboard over 30 inches wide, laminated both sides with melamine in light beige or dove grey color.

8. Shelves shall be edged front edge only with 1mm PVC to match the shelf color.

F. Wall Unit Bottom:

1. For units with open interiors shall be 3/4 inch thick particleboard laminated both sides with melamine laminate in light beige or dove grey color.

2. For units with closed interiors shall be 3/4 inch thick particleboard laminated both sides with melamine laminate in light beige or dove grey color.

3. The front edge shall be edgebanded with 1mm PVC to match the door and drawer front edge color. The exposed bottom edge of each wall cabinet side shall be edgebanded with 1mm PVC.

G. Drawers:

1. Sides, back and sub-front shall be particleboard, 1/2 inch thick, laminated with melamine in light beige or dove grey color. The back and sub-front are dowelled and glued into sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of eight (8) millimeters. To edge is banded with 1mm PVC edging in a matching color.
2. Drawer bottom shall be 1/2 inch thick prefinished particle- board with color to be light beige or dove grey, screwed directly to the bottom edges of the drawer box.

3. Paper storage drawers are of heavy-duty 3/4 inch particle- board laminated both sides with melamine color to be light beige or dove grey, and constructed with retaining hood at the rear of each drawer.

H. Continuous or Unit Tops:

1. All cabinets over 42" and up to 72" in height shall be supplied with a ¾” plywood continuous top.

2. All cabinets over 42" and up to 72" in height shall be supplied, where indicated on drawings, with a finished 1" continuous top laminated with high pressure decorative laminate GP28 and balanced with high pressure backer BK20.

I. Bases:

1. Provide and install all base and tall units with finished integral base. Provide ¾" thick marine grade plywood bases. All bases shall have finished facings unless rubber vinyl base covering is being furnished and applied by others.

2.9 DECORATIVE LAMINATE COUNTERTOPS

A. NONE

B. Refer to Section 04412, Granite Countertops.

PART 3 - EXECUTION

3.1 INSPECTION

A. The installer must examine the jobsite and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION

A. Conditions laminate clad casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION

A. Install casework with factory-trained supervision authorized by manufacturer. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Lubricate operating hardware as recommended by Manufacturer.

3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.

C. Advise contractors of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner.

END OF SECTION

SECTION 12355 – MUSIC EDUCATION STORAGE CASEWORK

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 of this section.

1.2 DESCRIPTION OF WORK

A. Music Instrument Storage Casework.

1.3 RELATED SECTIONS

A. Division 06 Section "Rough Carpentry" for blocking in frame walls required to anchor casework.

B. Division 09 Section "Resilient Base and Accessories" for finish base materials applied to casework.

1.4 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A208.1 – Particleboard.

B. ASTM International (ASTM):

1. ASTM E 488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

C. Audio Engineering Society (AES):

1. AES-4id – AES information document for room acoustics and sound reinforcement systems -- Characterization and measurement of surface scattering uniformity.

D. Builders Hardware Manufacturers Association (BHMA):

1. ANSI/BHMA A156.9 – Cabinet Hardware.

E. National Electrical Manufacturers Association (NEMA):

1. NEMA LD 3 – High Pressure Decorative Laminates.

F. U.S. Department of Commerce, National Institute of Standards and Technology (NIST):

1. DOC PS 1 – U.S. Product Standard for Construction and Industrial Plywood.

1.5 SYSTEM DESCRIPTION

A. Modular instrument storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.

B. Robe and uniform storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.

1.6 PERFORMANCE REQUIREMENTS

A. Storage Casework Component Load Capacities:

1. Storage Casework Wire-Grille Door Hinge: Each weld capable of resisting 400 lbf (1779 N) pull test without visible damage or permanent deformation.

2. Storage Casework Full Grille Door Hinge: Full length door capable of supporting 315 lbs. Through open and close cycle without permanent damage.

3. Robe and Uniform Storage Casework Garment Hanger Rods: Capable of supporting vertical load applied uniformly along width of unit of 200 lbf (890 N).

4. Sheet Music Storage Casework: Units shall support 35 lb/lin. ft. (52 kg/m) uniform shelf loading with maximum 1/16 inch (1.6 mm) deflection.

1.7 SUBMITTALS

A. Product Data: Manufacturer's data sheets, installation instructions, and maintenance recommendations.

B. Shop Drawings: Prepared by manufacturer. Include elevations showing casework components, details of each condition of installation, and types and locations of hardware and fasteners. Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other Work.

C. Samples: For each color and finish for each exposed casework component.

D. Operation and Maintenance Data.

E. Warranty: Submit sample meeting warranty requirements of this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in manufacture of similar products in use in similar environments. Obtain music education storage casework through one source from a single approved manufacturer.

B. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time period allowed for substitution review:

1. Product data, including certified independent test data indicating compliance with requirements for acoustical performance.
2. Project references: minimum of 5 installations not less than 5 years old, with owner contact information.
3. List of successful installations of similar products available for evaluation by Architect.
4. Sample warranty.
5. Submit substitution request not less than 5 days prior to bid date. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
6. Approved manufacturers must meet separate requirements of Submittals Article.

C. Deliver, store, and handle music education storage casework in accordance with manufacturer's recommendations. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept casework and recommended temperature and humidity levels will be maintained during the remainder of construction.

1.9 COORDINATION

A. Coordinate installation of blocking and supports in frame wall assemblies under work of other sections where required for anchoring of music education storage casework.

1.10 WARRANTY

A. Warranty: Manufacturer's written warranty indicating manufacturer's intent to repair or replace components of music education storage casework that fail in materials or workmanship within 10 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:

1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.
2. Delamination or other failures of glue bond of components.
3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
4. Failure of operating hardware.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. Wenger Corporation (Basis of Design), 555 Park Drive, Owatonna, MN | Ph: 507.455.4258 | www.wengercorp.com.
2. Case Systems | 2700 James Savage Road, Midland, WI 48642 | Ph.: 989.496.9510 | www.casesystems.com.
3. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. Particleboard: ANSI A208.1, minimum 45 lb/cu. ft. (721 kg/cu. m) density.

1. Particleboard Thermoset Panels: Particleboard finished with thermally-fused polyester surfacing on both sides meeting performance properties of NEMA LD 3 for VGS grade, edge-banded, including the following:

B. Surface Abrasion Resistance: Taber Wheel, 400 cycles, for solid colors.

C. Polyethylene Shelves: High-density, one-piece, blow-molded or polyethylene, with radiused front edge, for abuse-resistant shelves.

D. PVC Edge Banding: Radiused PVC extrusions, 3 mm thick.

2.3 INSTRUMENT STORAGE AND ROBE AND UNIFORM STOARGE CASEWORK

A. General: Provide through-ventilating instrument storage and robe and uniform storage casework meeting requirements in System Description and Performance Requirements Articles.

B. Side Panels and Divider Panels: Particleboard thermoset panel with no urea formaldehyde added, 3/4 inch (19 mm) thick. Side panels machined to accept unit-to-unit through-bolting.

C. Panel Edge Banding: 3 mm thick, heat-bonded, with radiused and profiled edges and corners.

D. Shelving: Sized with adequate gap between shelving and casework side panels to allow air movement inside casework.

E. Up to 27 inches (686 mm) wide: Removable molded polyethylene shelf, with impact-resistant, radiused front edge, mounted to cabinet wall with self-locking clip.

F. Over 27 inches (686 mm) wide: For large instrument casework: Removable formed polyethylene shelf, ribbed, with high-impact-resistant, radiused front edge, supported by steel tube frame.

G. Corner cabinet revolving shelving: 0.053 inch (1.3 mm) min. thickness steel sheet bolted to revolving steel center post, with radiused hardboard deflector panel.

H. Casework Panel Color: As selected by Architect from manufacturer's standard colors.

2.4 HARDWARE

A. Butt Hinges: 2-3/4 inch (70 mm), 5-knuckle steel hinges made from 0.090 inch (2.29 mm) thick metal, ANSI/BHMA A156.9, Grade 1, with powder-coated finish, through-bolted to door and side panels and welded to grille door frames. Provide 2 hinges on compartment doors, and 4 hinges on full-height doors.

B. Slide Latch: 0.105 inch (2.67 mm) min. thickness steel, with padlock eye, powder-coat finish, through-bolted to panel door and side panel and welded to grille door frames. Latches securely without padlock. Provide with clear plastic label holder for use with standard size labels; number system available for user to print. Padlocks furnished by Owner.

C. Panel Connectors: 1/4–20 by 1.77 inch (45 mm) panel connectors, with steel thread inserts, powder coated to match panels.

D. Cabinet Levelers: Leveling glides with 3/8 inch (9.5 mm) diameter threaded steel rod in steel corner brackets, minimum two each per cabinet side, accessible from within unit, and concealed in completed installation.

E. Fasteners: Manufacturer-recommended fasteners as required for casework substrate and project performance requirements, consisting of one or more of the following:

F. Sheet Metal Screws: SAE J78, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

G. Wood Screws: ASME B18.6.1.

H. Expansion Anchors in Concrete and Concrete Masonry Units: Carbon-steel, zinc plated.

2.5 FINISHES

A. Steel Sheet, Steel Wire, and Exposed Fasteners: Urethane-based electrostatic powder coating, color as indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine casework installation areas for compliance with requirements for installation tolerances, location of blocking and other anchoring reinforcements, and other existing conditions affecting installation and performance of casework. Proceed with casework installation upon correction of unsatisfactory conditions.

3.2 CASEWORK INSTALLATION

A. Install plumb, level, and true; using integral levelers. Install in accordance with manufacturer's recommendations and approved submittals.

B. Install hardware uniformly and precisely. Set hinges snug and flat. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

C. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind and close with uniform reveals.

3.3 CLEANING AND PROTECTING

A. Repair or replace defective work as directed by Architect upon inspection.

B. Clean casework surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

C. Turn over operation and maintenance instructions to Owner.

END OF SECTION

SECTION 12500 - WINDOW TREATMENT

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 of this section.

1.2 DESCRIPTION OF WORK

A. The extent of window treatment is indicated on drawings and in schedules. Types of window treatment work in this section include:

1. 2” Horizontal Faux Wood Slat Blinds and operating hardware.

B. Location: All exterior windows.

1.3 QUALITY ASSURANCE

A. General: Provide window treatment units which are complete assemblies produced by one manufacturer for each type required, including hardware, accessory items, mounting brackets, and fastenings.

B. Furnish materials in colors and patterns as indicated, or, if not indicated, as selected by Architect from manufacturer's standard colors/patterns.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.4 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Corded Window Covering Products; Window Covering Manufacturers Association; 2010. (ANSI/WCMA A101.1)

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of window treatment unit required. Include methods of installation for each type of opening and supporting structure.

B. Shop Drawings: Submit shop drawings for special components and application conditions of window treatment units which are not fully dimensioned or detailed in manufacturer's product data. Show relationship to adjoining work.

1. Include typical elevation layout indicating proposed division between blind units and meeting edges at corners. Provide sections and details at head and sill between blind units and corners including inclined installations.

2. Provide schedule of all units to be furnished, including field measurements at each location.

C. Samples: For selection of colors, submit manufacturer's color charts consisting of sections of exposed components with integral or applied finishes showing full range of colors, materials, etc. available for each type of window treatment assembly required.

1.6 WARRANTY

A. Products shall be manufactured exempt of any sharp edges, burrs, or other defects.

B. Provide manufacturer's limited lifetime warranty on head rail and other components.

C. Provide 5 year manufacturer's warranty for slats.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. CACO, Inc. Window Fashions; www.cacoinc.com; 119 Perma R Rd., Johnson City, TN 37604; PH: 1.800.552.5278
2. Bali; www.www.baliblinds.com; 8467 Route 405 Highway South, P.O. Box 500, Montgomery, PA 17752; Phone: 877.792.0002
3. Levolor; www.levolor.com; 3 Glenlake Parkway NE, 10th Floor, Atlanta, GA 30328; 1.800.752.9677
4. Graber Industries, Inc.; www.graberblinds.com; 8467 Route 405 Highway South, P.O. Box 500, Montgomery, PA 17752; Phone: 877.792.0002

B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.1 BLINDS AND BLIND COMPONENTS

A. Head Rail:

1. U shaped configuration
2. 2 1/2" deep by 2" high with rolled edges at the top.
3. Fabricate from 0.024 inch thick iron phosphate treated steel.
4. Acrylic primed with a finish coat of baked on polyester enamel in color selected by Architect.
5. Provide reinforcing end caps in color to match head rail.

B. Slats:

1. Extrude to a flat rigid form from PVC foam.
2. Provide an anti-static dust inhibiting coating to surface to minimize dust accumulation.
3. Nominal Width: 2 inches wide
4. Nominal Thickness: .122 inches
5. PVC foam to meet or exceed requirements of NFPA 701.

C. Bottom Rail:

1. Profile: Trapezoidal
2. Nominal Thickness: 7/8 inches
3. Nominal Width: 2 inches
4. Fabricate from extruded PVC, finish to match slats.

D. Valance:

1. Provide manufacturer's standard valance.
2. Nominal Thickness: 3/8 inch
3. Nominal Width: 2 1/2 inches

2.2 ACCESSORIES

A. Tapes and Ladders:

1. Standard color coordinate braided ladders shall be constructed of polyester yarn with a double crossed inter-braided cable thread design.
2. Supported latter ladders using ladder tape without any visible distortion.
3. Ladder rung distances shall not exceed 44mm.
4. Distances between ladders shall not exceed 12-inches.

5. Distance from end of ladder to end of slat shall not exceed 5-inches.

B. Tape Rolls and Supports:

1. Fabricate from low friction thermoplastic which are self lubricating and maintenance free for smooth operation and diminished wear on lift cords and braded ladders.
2. Tape rolls shall be designed to hold tape end by means of a "U" shaped brass grommet which shall be inserted into tape rolls, allowing for a more precise placement of ladders when secured.
3. Tape rolls shall include a projecting thermoplastic cylindrical collar integrated on each end. Tilt rod is centered though both tape drum and collar project.
4. Self lubricating thermoplastic collars are designed to snap securely into tape drum supports for near effortless tilting operation.

C. Crash Proof Cord Lock:

1. Snap-in design with nylon roller. Provided a secured steel roller on a hinged lock to facilitate "crash-proof" feature.

D. Tilt Wand:

1. Standard wand tilter.
   a. Self-lubricating thermoplastic worm and gear mechanism with fully encased plastic housing.
   b. Color coordinate plastic.
   c. 3/8" diameter
   d. Length as required to coordinate with window sizes.
   e. Provide corrosion resistant metal clip for attachment of wand to tilter shaft.

E. Lift Cords:

1. Color coordinate lift cords constructed of braided polyester jacket with a rayon center core.
2. Provide in lengths required to properly facilitate the raising and lowering of blinds.
3. 1.8mm diameter.
4. End Support Brackets:
5. Galvanized steel bracket with riveted hinged cover.
6. Nominal thickness: 0.038 inch
7. Baked polyester enamel finish.
8. Color to coordinate with blind assembly.
9. Coordinate bracket anchorage with jamb and sill conditions.

2.3 FABRICATION AND OPERATION

A. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings. Cooperate with other trades for securing tracks to substrates and other finished surfaces.

B. Fabricate window treatment components from non-corrosive, non- staining, non-fading materials which are completely compatible with each other, and which do not require lubrication during normal expected life.

C. Fabricate blind units to completely fill the openings as shown, from head-to-sill and jamb-to-jamb.

D. For continuous window wall installations, fabricate blinds so that ends occur only over mullions or other defined vertical separation, unless otherwise indicated.

E. Space supporting ladders to comply with manufacturer's standards, unless otherwise indicated.

F. Space louver blades to provide a minimum overlap of 3/8" for light exclusion when in fully-closed position. Gear operating equipment for reduction of the ratio of hand-movement to louver position, so that blinds operate easily and can be set accurately and smoothly.

G. Equip horizontal blind units, unless otherwise indicated for the following operation.

1. Full-tilting operation with slats rotating approximately 180°. Place tilt operating controls on left-hand side of blind units, unless otherwise indicated.
2. Full-height raising to manufacturer's minimum stacking dimension, with lifting cord locks for stopping blind at any point of ascending or descending travel.
3. Place pull cords on right-hand side of blind units, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install window treatment units in manner indicated to comply with manufacturer's instructions. Position units level, plumb, secure, at proper height and location relative to adjoining window units and other related work. Securely anchor units with proper clips, brackets, anchorages, suited to type of mounting indicated.

B. Coordinate the placement of concealed blocking to support blinds.

C. Verify that openings are ready to receive the work.

D. Ensure structural blocking and supports are correctly placed.

E. Provide adequate clearance between sash and blinds to permit unencumbered operation of sash hardware.

F. Isolate metal parts from concrete and mortar to prevent galvanic action. Use tape or thick coating or other means recommended by manufacturer to effect separation.

G. Protect installed units to ensure their being in operating condition, without damage, blemishes, or indication of use at completion of project. Repair or replace damaged units as directed by Architect.

H. Adjust blinds for smooth operation.

I. Clean blind surfaces just prior to occupancy.

J. Furnish the following for the Owner's use in maintenance of project:

1. Extra Blind Assemblies: One of each size.
2. Extra Slats: 20 of each type and size.
3. Extra Lift Cords, Control Cords, and Wands: Two of each type.

END OF SECTION

SECTION 12661 – TELESCOPIC BLEACHERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Telescoping Gym Seating includes, either manually or electrically operated systems of multiple-tiered seating rows comprising of seat, deck components, understructure that permits closing without requiring dismantling, into a nested configuration for storing or for moving purposes.

1. Typical applications include the following:
   a. Wall Attached Telescoping Gym Seats.

2. Special applications include the following:
   a. Column Cutouts
   b. Extended Rear Deck Filler

B. Related Sections:
1. Division 9 finishes sections for adequate floor & wall construction for operation of Telescoping Gym Seats. Flooring shall be level and rear wall plumb within 1/8" [3mm] in 8'-0 [2438mm]. Maximum bleacher force on the floor, of a 25'-6" [7772] section, shall be a static point load of less than 300 psi [2.068 N/mm^2].
2. Division 16 Electrical sections for electrical wiring and connections for electrically operated Telescoping Gym Seats.

C. QUALIFICATIONS

1. BIDDER QUALIFICATIONS
   Bidders are required to be an authorized dealer or manufacturer for equipment proposed which on a day-to-day basis regularly provide the equipment offered. Bidders are further advised that only standard production models or standard options will be acceptable for award. Equipment offered shall be currently manufactured on an active assembly line. The State is only interested in proven equipment; provided, installed, and serviced by Authorized Dealers capable of providing references.
2. INSTALLER QUALIFICATIONS:
   Bleacher installer shall be Factory Certified by the Manufacturer. Proof of Factory Certified Installation Certificate shall be provided along with the Invitation to Bid. Failure to provide this information shall result in rejection of bid. (No Exceptions Taken)
3. SERVICE CAPABILITY:
   The Bleacher Contractor must be able to show proof of full time service capability by factory certified technicians directly employed by the Bleacher Contractor. Sub-Contractors of the Bleacher Contractor or Factory Technicians located outside of the State do not qualify under this service response requirement. Adequate and satisfactory availability of repair parts and supplies, and ability to meet warranty and service requirements are a requirement of this Invitation to Bid. The State reserves the right to satisfy itself by inquiry or otherwise as to bidder's capabilities in this regard. A four (4) to eight (8) hour maximum on-site repair response is required during normal working hours, 8 a.m. to 5 p.m. weekdays (excluding holidays) All Full Time Service Personnel shall be Factory Authorized and Trained. Proof of Service Capability along with a listing of service parts regularly maintained

in inventory shall be provided along with the Invitation for Bid. Failure to provide this information shall result in rejection of bid.

1.02 REFERENCES

A. National Fire Protection Association (NFPA)
   1. NFPA 102 Standard for Assembly Seating, Tents and Membrane Structures.
B. American Welding society (AWS):
   1. AWS D1.1 Structural Welding Code - Steel.
   2. AWS D1.3 Structural Welding Code - Sheet Steel.
C. American Institute of Steel Construction (AISC):
   1. AISC - Design of Hot Rolled Steel Structural Members.
D. American National Standards Institute (ANSI).
E. American Iron & Steel Institute (AISI):
   1. AISI - Design Cold Formed Steel Structural Members.
F. Aluminum Association (AA):
   1. AA - Aluminum Structures, Construction Manual Series.
G. American Society for Testing Materials (ASTM):
   1. ASTM - Standard Specification for Properties of Materials.
H. National Forest Products Association (NFoPA):
   1. NFoPA - National Design Specification for Wood Construction.
I. Southern Pine Inspection Bureau (SPIB):
   1. SPIB - Standard Grading Rules for Southern Pine.
J. National Bureau of Standards/Products Standard (NBS/PS):
   1. PS1 - Construction and Industrial Plywood.
K. Americans with Disability Act (ADA)
   1. ADA - Standards for Accessible Design.

1.03 MANUFACTURER'S SYSTEM ENGINEERING DESCRIPTION

A. Structural Performance: Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each gym seat unit.
   1. Design Loads: Comply with ICC 300 – 2012 Edition.

B. Manufacturer's System Design Criteria:
   1. Gymnasium seat assembly; Design to support and resist, in addition to it's own weight, the following forces:
      a. Live load of 120 lbs per linear foot [162.69 N/m] on seats and decking
      b. Uniformly distributed live load of not less than 100 lbs per sq. ft. [135.58N/m] of gross horizontal projection.
      c. Parallel sway load of 24 lbs. [32.53 N/m] per linear foot of row combined with (b.) above
      d. Perpendicular sway load of 10 lbs. [13.56 N-m] per linear foot of row combined with (b.) above
   2. Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:
      a. Concentrated load of 200 lbs. [90.72 kg] applied at any point and in any direction.
      b. Uniform load of 50 lbs. per foot [.344 N/mm^2] applied in any direction.
   3. Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:
      a. Concentrated load of 200 lbs. [90.72 kg] applied at any point and in any direction along top rail.

b. Uniform load of 50 lbs. per foot [.344 N/mm^2] applied horizontally at top rail and a simultaneous uniform load of 100 lbs. per foot [.689 N/mm^2] applied vertically downward.

4. Member Sizes and Connections: Design criteria (current edition) of the following shall be the basis for calculation of member sizes and connections:
   a. AISC: Manual of Steel Construction
   b. AISI: Specification for Design of Cold Formed Steel Structural Members
   c. AA: Specification for Aluminum Structures
   d. NFOPA: National Design Guide For Wood Construction.

1.04 SUBMITTALS

A. Section Cross-Reference: Required submittals in accordance with "Conditions of the Contract" and Division 1 General Requirements sections of this "Project Manual."

B. Project Data: Manufacturer's product data for each system. Include the following:
   1. Project list: Ten (10) seating projects of similar size, complexity and in service for at least five (5) years.
   2. Deviations: List of deviations from these project specification.

C. Shop Drawings: Indicate Telescoping Gym Seat assembly layout. Show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types and finishes.
   1. Wiring Diagrams: Indicate electrical wiring and connections.
   2. Graphics Layout Drawings: Indicate pattern of contrasting or matching seat colors

D. Samples: Seat materials and color finish as selected by Architect from manufacturers offered color finishes.

E. Manufacturer Qualifications: Certification of insurance coverage and manufacturing experience of manufacturer, and copy of a telescopic load test to all loads described in 1.03 above, observed by a qualified independent testing laboratory, and certified by a registered professional structural engineer verifying the integrity of the manufacturer's geometry design and base structural assumptions.

F. Installer Qualifications: Installer qualifications indicating capability, experience, and official Certification Card issued by manufacturer of telescopic seating.

G. Engineer Qualifications: Certification by a professional engineer registered in the state of manufacturer that the equipment to be supplied meets or exceeds the design criteria of this specification.

H. Operating/Maintenance Manuals: Provide to Owner maintenance manuals. Demonstrate operating procedures, recommended maintenance and inspection program.

I. Warranty: Manufacturers five year warranty documents.

1.05 QUALITY ASSURANCE

A. Seating Layout: Comply with current ICC 300 – 2012 Edition Standard for Bleachers, Folding Telescopic Seating, and Grandstands, except where additional requirements are indicated or imposed by authorities having jurisdiction.

B. Welding Standards & Qualification: Comply with AWS D1.1 Structural Welding Code - Steel and AWS D1.3 Structural Welding Code - Sheet Steel.

C. Insurance Qualifications: Mandatory that each bidder submit with his bid an insurance certificate from the manufacturer evidencing the following insurance coverage:
   1. Workers Compensation - including Employers Liability with the following limits:
      $500,000.00 (US) Each Accident
      $500,000.00 (US) Disease - Policy Limit
      $500,000.00 (US) Disease - Each Employee
   2. Commercial General Liability - including premises/ operations, independent contractors and products completed operations liability. Limits of liability shall not be less than $5,000,000.00 (US).

D. Manufacturer Qualifications: Manufacturer who has a minimum of 40 years of experience manufacturing telescoping gym seats and can demonstrate continual design enhancement and 25-year minimum product life-cycle support of telescopic seating.

E. Installer Qualifications: Engage experienced Installer who has specialized in installation of telescoping gym seat types similar to types required for this project and who carries an official Certification Card issued by telescoping gym seat manufacturer.

F. Engineer Qualifications: Engage licensed professional engineer experienced in providing engineering services of the kind indicated that have resulted in the successful installation of telescoping bleachers similar in material, design, fabrication, and extent to those types indicated for this project.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver telescopic gym seats in manufacturers packaging clearly labeled with manufacturer name and content.
B. Handle seating equipment in a manner to prevent damage.
C. Deliver the seating at a scheduled time for installation that will not interfere with other trades operating in the building.

1.07 PROJECT CONDITIONS

A. Field Measurements: Coordinate actual dimensions of construction affecting telescoping bleachers installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.08 WARRANTY

A. Manufacturer's Product Warranty: Submit manufacturer's five-year warranty form for telescoping bleachers. This warranty is in addition to, and not a limitation of other rights Owner may have under Contract Documents.
   1. Warranty Period: Five years from Date of Acceptance.
   2. Beneficiary: Issue warranty in legal name of project Owner.
   3. Warranty Acceptance: Owner is sole authority who will determine acceptance of warranty documents.

1.09 MAINTENANCE AND OPERATION

A. Instructions: Both operation and maintenance shall be transmitted to the Owner by the manufacturer of the seating or his representative.
B. Service: Maintenance and operation of the seating system shall be the responsibility of the Owner or his duly authorized representative, and shall include the following:
   1. Operation of the Seating System shall be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturer's instructions.
   2. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.
   3. An annual inspection and required maintenance of each seating system shall be performed to assure safe conditions. At least biannually the inspection shall be performed by a professional engineer or factory qualified service personnel.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Hussey Seating Company, U.S.A.
   1. Address: North Berwick, Maine, 03906
   2. Telephone: (207) 676-2271; Fax: (207) 676-9690
   3. Product: MAXAM Telescopic Gym Seat System by Hussey Seating Company

      a. Model: MAXAM26 Series Telescopic Gym Seats, adjustable row spacing 26 inches [660].
      b. MAXAM26 Series Telescopic Gym Seats, Select Rise Spacing: 9 5/8”
      c. Aisle Type: foot level aisles, front steps, intermediate aisle steps.
      d. Seat Type: 10” Courtside Collection
         1) Seat color finish: manufacturers 15 standard for Courtside Collection
         2) Courtside graphic logos and custom Signature logos: (See Personalization and Creativity under Accessories section)
      e. Rail Type: Self-storing end rail and Self – Storing Aisle hand rails
         1) Rail color finish: Standard black
      f. Operation: Electric
         1) Electrical Power System: Integral power with pendant control

   4. Product Description/Criteria:
      a. Bank Length: See Contract Drawings
      b. Aisle Widths: See Contract Drawings
      c. Number of Tiers: 8
      d. Row Spacing(s): 26”
      e. Row Rise: 9 5/8”
      f. Open Dimension: See Contract Drawings
      g. Closed Dimension: See Contract Drawings
      h. Overall Unit Height: See Contract Drawings
      i. Net Capacity: 400

   5. Miscellaneous Product Accessories: end curtains.
   6. Special Applications: extended rear deck filler and column cutouts
   7. Handicap Seating Provisions: Provide first tier modular recoverable Flex-rows per requirements of (ADA) Americans with Disability Act located as indicated.

B. Irwin Seating Company – Telescopic Division | 610 E. Cumberland Road, Altamont, IL 62411 | Ph: 618.483.6157 | www.irwinseating.com.

C. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.03 MATERIALS

A. Lumber: ANSI/Voluntary Product 20, B & B Southern Pine
B. Plywood: ANSI/Voluntary Product PS1, APA A-C Exterior Grade.
C. Structural Steel Shapes, Plates and Bars: ASTM A 36.
D. Uncoated Steel Strip (Non-Structural Components): ASTM A569, Commercial Quality, Hot-Rolled Strip.
E. Uncoated Steel Strip (Structural Components): ASTM A570 Grade 33, 40, 45, or 50, Structural Quality, Hot-Rolled Strip.
F. Uncoated Steel Strip (Structural Components): ASTM A607 Grade 45 or 50, High-Strength, Low Alloy, Hot-Rolled Strip.
G. Galvanized Steel Strip: ASTM A653 Grade 40, zinc coated by the hot-dip process, structural quality.
H. Structural Tubing: ASTM A500 Grade B, cold-formed.
I. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation; in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
J. Fasteners: Vibration-proof, of size and material standard with manufacturer.

2.04 UNDERSTRUCTURE FABRICATION

A. Frame System:
   1. Wheels: Not less than 5" [127] diameter by 1 1/4" [32] with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil-impregnated bushings to fit 3/8" [10] diameter axles secured with E-type snap rings.
   2. Lower Track: Continuous Positive Interglide System interlocks each adjacent CPI unit using an integral, continuous, anti-drift feature and through-bolted guide at front to prevent separation and misalignment. CPI units at end sections of powered banks and manual sections shall contain a Low Profile Posi-Lock LX to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacings.
   4. Slant Columns: High tensile steel, tubular shape.
   5. Sway Bracing: High tensile steel members through-bolted to columns.
   6. Deck Stabilizer: High tensile steel member through-bolted to nose and riser at three locations per section. Interlocks with adjacent stabilizer on upper tier using low-friction nylon roller to prevent separation and misalignment. Incorporates multiple stops to allow field adjustment of row spacings.
   7. Deck Support: Securely captures front and rear edge of decking at rear edge of nose beam and lower edge of riser beam for entire length of section.
B. Deck System:
   1. Section Lengths: Each bank shall contain sections not to exceed 25’-6” [7772] in length with a minimum of two supporting frames per row, each section.
   2. Nose beam and Rear Riser beam: Nose beam shall be continuously roll-formed closed tubular shape of ASTM A653 grade 40, Riser beam shall be continuously roll-formed of ASTM A653 grade 40. Nose and Riser beam shall be designed with no steel edges exposed to spectator after product assembly.
   3. Attachment: Through-Bolted fore/aft to deck stabilizers, and frame cantilevers.
   4. Decking: 5/8" [16], AC grade clear-top-coated tongue and groove Southern Yellow Pine of interior type with exterior glue, 5-ply, all plies with plugged crossbands, produced in accordance with National Bureau of Standards PS-1-97. Plywood shall be cut and installed

with top, center and bottom ply grain-oriented from front of deck to rear of deck (nose beam to riser beam). Adjacent pieces shall be locked together with tongue and groove joint from front to rear of deck. Longest unsupported span: MAXAM 26, 21 ½" [546];

5. Deck End Overhang: Not to exceed frame support by more than 5'-7" [1702].

2.05 SEATING FABRICATION

A. Plastic Seat System – Courtside Collection XC10 (10"):

Hussey Courtside Collection Series embodies the latest leading edge innovations in linear telescopic seating modules. Courtside seats utilize a harmonious blend of advanced ergonomic principals, architecturally appealing design, safety, value and performance.

1. Seat Modules: 18" [457] long assembled, gas assisted injection-molded, high density, 100% recyclable HDPE (high density polyethylene) modules in monochromatic colors providing, dual textured scuff resistant 10" [254] wide seat surface with ½" [13] minimum interlock on seat and face. Unit structural tested to 600 lbs occupant load.

Courtside XC10 Seat Module

2. XC10 – 10" Comfort Profile
   - ✓ 10" wide continuous comfort curve style bench seat
   - ✓ Ergonomically contoured forward "waterfall" edge for enhanced spectator comfort and minimization of sensitive pressure point area, regardless of leg positioning.
   - ✓ Fore & Aft contoured seat surface for uniform support and minimize high pressure points under the buttocks.
   - ✓ Seat height ranges from deck to t/o seat range from 16-1/8" to 18-1/8"
   - ✓ 21-1/2" clear foot space area, regardless of leg positioning.
3. Integrally molded end caps at aisle end locations for clean finished appearance.
4. Custom color graphic logo design application for end cap insert.(See Personalization and Creativity under Accessories section)
5. Integrally molded recess pockets to accept seat number and row letters.
6. Integrally molded rear closure panel at back of seat to allow for "continuous clean sweep" of debris at deck level and minimized visibility of structural ribbing.
7. Seat Attachment: Each plastic seat module shall be securely anchored by a 12 ga steel clamp bracket that provides a steel-to-steel, through bolted attachment to the front nose beam of the bleacher. Attachment eliminates fore / aft movement of the seat module on the nose beam.

2.06 SHOP FINISHES

A. Understructure: For rust resistance, steel understructure shall be finished on all surfaces with black "Dura-Coat" enamel. Understructure finish shall contain a silicone additive to improve scratch resistance of finish.

B. Wear Surfaces: Surface subject to normal wear by spectators shall have a finish that does not wear to show different color underneath:
   1. Steel nosing and rear risers shall be pre-galvanized with a minimum spangle of G-60 zinc plating.
   2. Decking shall have use-surfaces to receive both a sealer coat and wear-resistant high gloss clear urethane finish. Optional decking to have 0.030" laminated polyethylene wear surface.
   3. Injection Molded Courtside seats shall be per manufacturer standard 15 colors.
   4. Railings: Steel railings shall be finished with powder-coated semi - gloss black or optional 15 standard colors to match plastic seat color.

2.07 FASTENINGS:

A. Welds: Performed by welders certified by AWS standards for the process employed.

B. Structural Connections: Secured by structural bolts with prevailing torque lock nuts, free-spinning nuts in combination with lock washers, or Riv-nuts in combination with lock washers.

2.08 ELECTRICAL OPERATION

A. Integral Power: Furnish and install Hussey PF(1/2/3/4), an integral automatic electro-mechanical powered frame propulsion system, to open and close telescopic seating. Integral Power and Control System shall be Underwriters Laboratories, Inc. (UL) approved and listed as well as CE Compliant for EU applications.
   1. Operation shall be with a removable pendant control unit which plugs into seating bank for operator management of stop, start, forward, and reverse control of the power operation.
   2. Each Powered Frame unit shall consist of output shaft gear reducer with 6" [152] diameter x 4" [102] wide wheels covered with non-marring 1/2" [13] thick composite rubber. Reducers shall be fitted with 3 phase induction motors which will provide an average operating speed of (46/25) f.p.m [.23/ .12 M/s].
   3. Operating Loads: Each Powered Frame provides (220 / 550) lbs pull force [978 / 2446 N] which equals approximately (28 / 35) psi [.192 / .241 N/mm^2] lateral force on the floor
   4. Electrical: Seating Manufacturer shall provide all wiring within seating bank including pendant control.
      a. The electrical contractor shall provide required power source with no greater than 4% voltage drop at the seatings' junction box. The electrical contractor shall perform all wiring connections in junction box that are attached to or a part of the building.
      b. Each integral power system provided is U.L. Listed and or C.E. Compliant.

2.10 ACCESSORIES

Standard Telescopic Gymseat Accessories

A. Flex-Row: Provide first row modular recoverable seating units to be utilized by persons in wheelchairs and able-bodied persons. Each Flex-Row unit shall have an unlock handle for easy deployment if wheelchair or team seating access is needed. Unlock handle shall lock the bleacher seats into position when fully opened.

   1. Provide a black full-surround steel skirting with no more than ¾" floor clearance for safety and improved aesthetics.
   2. Provide a black injection molded end cap for the nose beam for safety and improved aesthetics.
   3. Provide a mechanical positive lock when the Flex-Row system is in the open and used position.
   4. Flex-Row modular units are designed to achieve multi-use front row seating to accommodate team seating, ADA requirements and facility specific requirements. Flex-Row units are available in modular units from 2 to 7 seats wide as well as full section widths.

B. Front Aisle Steps: Provide at each vertical aisle location front aisle step. Front steps shall engage with front row to prevent accidental separation or movement. Steps shall be fitted with four non-skid rubber feet each 1/2" [13] in diameter. Blow molded end caps shall have full radius on all four edges. Quantity and location as indicated.

C. Non-Slip Tread: Provide at front edge of each aisle location an adhesive-backed abrasive non-slip tread surface.

D. Foot Level Aisles: Provide deck level full width vertical aisles located as indicated.

E. Intermediate Aisle Steps: Intermediate aisle steps shall be of boxed fully enclosed type construction. Blow molded end caps shall have full radius on all four edges. Step shall have adhesive-backed abrasive non-slip tread surface. Quantity and location as indicated.

F. Auto-Rotating Aisle Hand Rail:
Provide single pedestal mount handrails [34 inches (864mm)] high with terminating mid rail. Permanently attached handrail shall rotate in a permanently mounted socket for rail storage. Rail shall automatically rotate, lock in the use position, unlock and rotate back to the stowed position as the gym seats open and close. Ends of the handrail shall return to the post, and not extend away from it. Rails having openings to avoid interference with closed decks are not acceptable

G. Self-Storing End Rails: Provide steel self-storing 42" [1066] high above seat, end rail with tubular supports and intermediate members designed with 4" [102] sphere passage requirements.

H. Safety Accessories: Provide the following safety features:
1. Coin Round or Roll all edges of exposed metal on top and underneath Bleacher to eliminate sharp edges. Provide safety ease edges, coined edges, or rounded edges for the bleacher understructure components as follows. Diagonal or X braces and deck support or deck stabilizers. Systems provided with sharp edges or corners, to be rounded off in the field and field painted.
2. Provide plastic end cap on nose metal at Bank ends to close off edges to prevent spectator injury.
3. Provide plastic end cap on back of deck supports on 1st 7 Rows to prevent spectator injury.
4. On 1st Row, provide front and side skirt boards any where there is an exposed end to prevent players/balls from sliding underneath the 1st Row.
5. Provide metal cover over motor chains and wheels to protect chains from debris and provide a safety switch that if cover is taken off the power system will not work.
6. Provide metal end deck cover on each row to cover exposed edge of plywood at the ends of the bleachers.
7. Powered frames systems without a metal protective housing, covering drive chain and drive wheels are not permitted under this specification

I. Extended Rear Deck Filler: Provide at rear deck level an extended rear deck filler mounted between rear wall building columns. Select extended rear deck filler from (12) twelve standard sizes to meet site conditions.

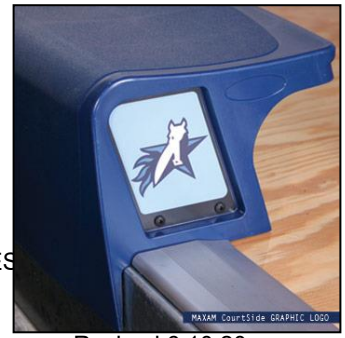
J. Rear Wall Column Cutouts: Provide custom bleacher cutouts at rear wall building columns. Top row(s) to be cut out and fitted to meet wall column conditions.

Personalization and Creativity--Accessory Options and Solutions

Courtside Graphic Logo

1. Decorative graphic logo that is applied to the integrally molded end cap recess area of the CourtSide 10 XC or 12XCS seat module.

2. Logo is approximately 4.7" (h) x 3.5" (w) w/full color CMYK vector art output on FujiFlex crystal archive printing material. (FujiFlex Specs. Available)



3. Color logo is laminated with a 5-mil Hard Guard Matte laminate (Specs. Available)

4. Laminated logo is bonded to a Flex-Con L – 606 laminating adhesive layer (Specs. Available)

5. Logo is trimmed to a precise custom cut shape with two mounting holes

Full Bleed Graphic Vinyl End Closure Curtains

1. Provide closure curtains fabricated of vinyl-coated 14oz Polyester fabric on open ends of telescopic seating. Curtains to be permanently attached to wall or rear closure panel and secured to individual rows of seating. Curtain to open with seating unit into taught secure configuration and fold automatically as seating unit closes.

2. Curtain to have high resolution "full bleed" graphic logo or photograph located across entire visible surface area of the end curtain

Custom Signature Logo

1. Factory or Dealer designed logo that incorporates school letters or graphical representation of school logo across the front of the bleachers.

2. Logo is visible when the bleachers are in the stored position.

3. Select up to three colors for maximum color contrast and creativity.

a. Choose platform deck finish of UV clear coat or Panelam (polydeck) finish

b. Safety rails and steps (when required) are included

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify area to receive telescoping gym seats are free of impediments interfering with installation and condition of installation substrates are acceptable to receive

telescoping gym seats in accordance with telescoping gym seats manufacturer's recommendations. Do not commence installation until conditions are satisfactory.

3.02 INSTALLATION

A. Manufacturer's Recommendations: Comply with telescoping gym seats manufacturer's recommendations for product installation requirements.

B. General: Manufacturer's Certified Installers to install telescoping gym seats in accordance with manufacturer's installation instructions and final shop drawings. Provide accessories, anchors, fasteners, inserts and other items for installation of telescoping gym seats and for permanent attachment to adjoining construction.

3.03 ADJUSTMENT AND CLEANING

A. Adjustment: After installation completion, test and adjust each telescoping gym seats assembly to operate in compliance with manufacturer's operations manual.

B. Cleaning: Clean installed telescoping gym seats on both exposed and semi-exposed surfaces. Touch-up finishes to restore damage or soiled surfaces.

3.04 PROTECTION

A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure telescoping gym seats are without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 13120 - PRE-ENGINEERED BUILDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications sections apply to work specified in this Section.

1.2 SUMMARY

A. Extent of pre-engineered buildings work is shown on drawings.

B. Building Type: The pre-engineered building system shown is a single story, rigid frame type metal building of the nominal length, width, eave height and roof pitch indicated.

1. Manufacturer's standard components may be used, providing components, accessories, and complete structure conform to architectural design appearance shown and to specified requirements.
2. Concrete floor and foundations and installation of anchor bolts are specified in a Division 3 section. Provide anchor bolts (including sizes and lengths) and anchor bolt plan to Contractor for work by others.
3. Sealants and caulking are specified in Division 7 section.
4. Provide blanket insulation under roof and inside walls as indicated on drawings and specified in Section 07200, Insulation.
5. Provide prefinished metal roof panels as indicated on drawings and specified in Section 07410, Preformed Metal Roofing.
6. Provide interior and exterior wall panels as indicated on drawings and specified in Section 07411, Metal Wall Panel and Section 09800, Acoustical Metal Wall Panel System
7. Provide prefinished facia, vented/non-vented soffit systems, flashing, drip edge, trim, gutters and downspouts as indicated on drawings and specified in Section 07600, Flashing and Sheet Metal.

1.3 DESCRIPTION

A. Provide all materials, labor, equipment and services, and perform all operations in connection with the furnishing and installing of pre-engineered building, in accordance with the drawings and specifications, including the following:

1. Metal Framing Components
2. Metal Building Accessories
3. Workmanship
4. Inspection of Surfaces
5. Protection
6. Delivery, Samples and Shop Drawings
7. Guarantee and Warranty

1.4 SUBMITTALS

A. **Any deviation (deletions, additions or revisions thereof) from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal in 'RED' and, in a letter transmitting the Submittal to the Architect, the Supplier and Contractor shall direct the Architect's attention to, and request specific approval of, the specific deviations. Otherwise, the Architect's approval of a Submittal does not constitute approval of any deviation from the requirements of the Contract Documents contained in the Submittal.**

Should any deviation be found at a later date, the Supplier and Contractor shall bear the responsibility and cost of all corrections required.

B. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories. Submit sample warranty.

C. Shop Drawings: Submit complete erection drawings showing anchor bolts settings, sidewall, endwall, and roof framing, transverse cross sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.

1. **The shop drawings *MUST* be submitted as an "overlay" drawing to the Architectural drawings.**
2. **The Contractor/supplier *MUST* provide the "overlay" drawings *including* the Architectural drawings in the complete submittal.**
3. **The "overlay" drawings must be submitted in 'RED' with the Architectural drawings in 'BLACK'.**

D. Samples: The contractor shall submit roofing samples of finished roofing system for pre-engineered buildings per Section 07410, Preformed Metal Roofing.

E. Certification: Submit written Certification and all structural calculations prepared and signed by a Professional Engineer, registered to practice in the State where building is to be erected, verifying that building design meets indicated loading requirements and codes of authorities having jurisdiction. Calculations shall clearly show all loads used for the design of each member. All column reactions at the foundation shall be provided for verification of the foundation design.

1.5 QUALITY ASSURANCE

A. Design Criteria:

1. **All items below shall be designed within the architectural design furring spaces. Refer to submittal requirements above for deviations made from the requirements of the Contract Documents.**
2. Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual".
3. Structural Steel: For design of structural steel members, comply with requirements of the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
4. Light Gage Steel: For design of light gage steel members, comply with requirements of the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
5. Welded Connections: Comply with requirements of the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.
6. Impact Resistance: Roof coverings installed on low-slope roofs (roof slope <2:12) shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test " FM 4470.

B. Design Loads: Building shall meet all applicable Codes.

1. Basic design loads include live load, wind load and up-lift, in addition to the dead load. Minimum acceptable design loads and deflection criteria are shown on the drawings.
2. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual".

C. Manufacturer's Qualifications: Provide pre-engineered metal buildings as produced by a manufacturer with not less than 5 years successful experience in the fabrication of pre-engineered metal buildings of the type and quality required. Manufacturer will be a member of the MBMA.

D. Erector's Qualifications: Pre-engineered building shall be erected by a firm that has not less than 5 years successful experience in the erection of pre-engineered buildings similar to those required for this project, and that has been licensed by the manufacturer of the building system.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.

B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. ACI Building Systems
2. American Buildings Company
3. Bigbee Steel Buildings, Inc.
4. Butler Buildings Company
5. Ceco Building Systems
6. Mesco Buildings
7. Morin Building Systems
8. NCI Buulding Systems
9. Nucor Building Systems
10. Varco-Pruden Building System

2.2 MATERIALS

A. Hot-Rolled Structural Shapes: Comply with requirements of ASTM A36 or A529.

B. Tubing or Pipe: Comply with requirements of ASTM A500, Grade B, ASTM A501, or A53.

C. Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with requirements of ASTM A529, A570 or A572.

D. Members Fabricated by Cold Forming: Comply with requirements of ASTM A607, Grade 50.

E. Bolts for Structural Framing: Comply with requirements of ASTM A307 or A325 as necessary for design loads and connection details.

2.3 PRIMARY FRAMING

A. Rigid Frames shall be fabricated from hot-rolled structural steel. Provide built-up "I-beam" shape rigid frames consisting of either tapered or parallel flange beams and straight columns. Provide frames factory welded and shop painted. Furnish frames complete with attachment plates, bearing plates and splice members. Factory drill frames for bolted field assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standard, and if approved by the Architect.

2. Provide rigid frames at endwalls where indicated.

B. End Wall Columns: Provide factory welded, shop painted endwall columns built-up "I" shape welded plate.

C. Wind Bracing: Provide horizontal and adjustable wind bracing at roof only using diagonal cables or threaded steel rods; comply with requirements of ASTM A36 or A572, Grade D.

2.4 SECONDARY FRAMING

A. The spacing of all purlins as shown on the drawings is diagrammatic, therefore, the Registered Professional Engineer for the Pre-Engineered Building shall be responsible for the design of the roof structure to support the framing to meet all state, federal and local code restrictions and structural requirements set forth by the structural engineer. It shall be the responsibility of the Pre-Engineered Building manufacture to coordinate with the Bidding Contractor the amount of erection required for the roof framing before bidding.

B. Provide not less than 16-ga. shop painted rolled formed sections for the following secondary framing members unless shown otherwise on structural contract drawings.

1. Purlins.
2. Eave struts.
3. Endwall rafters.
4. Flange bracing.
5. Sag bracing.

C. Provide not less than 14-ga. cold-formed galvanized steel sections for the following secondary framing members:

1. Base channels.
2. Sill angles.
3. Endwall structural members (except columns and beams).
4. Purlin spacers.

D. Bolts: Provide ASTM A307 bolts, at secondary structural connections. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels. Primary structural connections to be made with ASTM A325 bolts.

E. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SPI for solvent cleaning.

1. Prime structural steel primary and secondary framing members. See Structural Steel 05500 page 3 - Structural Steel Prime Paint and page 5 - Shop Painting.
2. Prime galvanized members, after phosphoric acid pretreatment with manufacturer's standard zinc dust-zinc oxide primer.

2.5 ROOFING, WALL PANELS, SHEET METAL ACCESSORIES & MISC. MATERIALS

A. See Section 07410 – Preformed Metal Roofing

1. Manufacturer’s Warranty

a. Manufacturer’s roofing warranties which contain language regarding the governing of the warranty by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such warranties.

B. See Section 07411 – Metal Wall Panels

2.6 FACIA, SOFFIT, FLASHING, DRIP EDGE, TRIM, GUTTERS AND DOWNSPOUTS

A. See Section 07600 – Flashing and Sheet Metal

2.7 FABRICATION

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.

1. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.

B. Structural Framing: Shop fabricate structural framing components to the indicated size and section complete with base plates, bearing plates and other plates required for erection, welded in place. Provide required holes for anchoring or connections either shop drilled or punched to template dimensions.

1. Shop Connections: Provide power riveted, bolted or welded shop connections.

2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.1 ERECTION

A. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.

B. Purlins and Girts: Provide rake or gable purlins with tight fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.

C. Bracing: Provide Temporary Cross Bracing as required for full height of bays. Temporary cross bracing shall be removed upon completion of final cross bracing.

D. Final Cross Bracing shall be as shown and described on the Structural Drawings. The Contractor shall furnish and install cross bracing as directed by the Structural Engineer – no exceptions. Portal frames are not permitted.

E. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.2 ROOFING, WALL PANELS, SHEET METAL ACCESSORIES & MISC. MATERIALS

A. See Section 07410 – Preformed Metal Roofing

1. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, Division of Construction Management Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.

2. The pre-roofing conference is intended to clarify demolition and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved

shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

3. The following are to be accomplished during the conference:

    a. To review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.

    b. To establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.

    c. To establish roofing schedule and work methods that will prevent roof damage.

    d. Require that all roof penetrations and walls be in place prior to installing the roof.

    e. To establish those areas on the job site that will be designated as work and storage areas for roofing operations.

    f. To establish weather and working temperature conditions to which all parties must agree.

    g. To establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

4. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Owner, the Division of Construction Management, and the Division of Construction Management Inspector.

B. See Section 07411 – Metal Wall Panels.

3.1 INSULATION

A. See Section 07200 – Insulation.

1. Thermal Breaks:

    a. Provide thermal blocks/breaks at all roof to purlin connections points.

    b. 1/8 inch (3 mm) thick by 3 inch (76 mm) wide white, closed-cell polyethylene foam with pre-applied adhesive film and peel-off backing.

    c. Polystyrene Snap-R snap-on thermal blocks.

END OF SECTION

SECTION 13670 - EXTRUDED ALUMINUM WALKWAY COVER (FLAT CANOPY)

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 of this section.

1.2 SCOPE OF WORK

A. The work covered by this section shall include furnishings and installing Aluminum Canopy, decking, fascia. The canopy shall consist of structural aluminum panels bound by a framework of fascia which also acts as a water collecting gutter. All components shall be as required to support design loads in accordance with engineering prints and calculations provided by the manufacturer, sizes shown on the drawings are for diagrammatical purposes only.

1.3 DESCRIPTION OF WORK

A. The extent of aluminum walkway cover is shown on the drawings and as specified herein.

B. Definition: Type 1, Extruded Aluminum Walkway Cover shall consist entirely of extruded aluminum sections (roll-formed not acceptable). System shall consist of decking, fascia, accessory items and hardware to provide a complete system.

C. Water shall drain from deck into the existing beams and out at grade level of columns through weepholes.

1.4 SUBMITTALS

A. Shop Drawings: Submit detailed drawings, layout of walkway cover system, all mechanical joint locations with complete details, connections, jointing and accessories.

B. Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following except as otherwise indicated.

1. International Building Code, latest addition with amendments, if any.AWS (American Welding Society) standards for structural aluminum welding.

B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer, although several may be indicated as offering products complying with requirements.

C. Installer Qualification: Firm with not less than three (3) years experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.

D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.

E. Shop Assembly: Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system (sidewalks, curbs, building fascias, etc.).

1.6 PERFORMANCE REQUIREMENTS

A. System Performance: Provide aluminum covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:

B. The system shall be designed by a registered Engineer in the State of Alabama, certifying the system meets all wind, foundation and all other applicable loads and requirements set forth by local or state building requirements.

1. Live Load: 30 p.s.f. minimum
2. Structural design for wind forces: Comply with ANSI A58.1-1982
3. Design Wind Velocity: **120.p.h.**
4. Importance Factor: 1.1.
5. Stability Criteria: International Building Code 2015

C. Sizes shown on drawings are to be considered minimum.

D. Roof structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting a concentrated load such as being walked upon.

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. The following manufacturers products have been used to establish minimum requirements for materials, workmanship, and function:

1. Extruded Aluminum Walkway Cover System.

a. Tennessee Valley Metals, Inc. **(Basis of Design and Standard of Quality) |** 190 Industrial Park Road, Oneonta, Alabama 35121 | (205) 274-9500 | www.tvmetals.com.

b. Dittmer Architectural Aluminum | 1006 Shepherd Road | Winter Springs, Florida 32708| (800) 822-1755; (407) 699-1755 | www.dittdeck.com | info@dittdeck.com.

c. Superior Mason Products LLC. | 116 Citation Court, Birmingham, Alabama 35209| (877) 445-1200 | www.superiormetalproducts.com | canopysales@superior-mason.com.

d. Mitchell Metals | 1761 McCoba Dr. SE Suite B, Smyrna, Georgia 30080 | (770) 285-5875; | www.mitchellmetals.net | sales@mitchellmetals.net.

e. Gulf South Metals | 17869 Samantha Drive, Foley, Alabama 36535 | (251) 943-6443; | www.gulfsouthmetals.com | info@gulfsouthmetals.com.

B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. All aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.

B. Fasteners:

C. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.

D. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.

E. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.

F. Tek Screws: not permitted

2.3 FINISHES

A. Standard:

1. Factory baked enamel finish, AAMA 603.8.

a. Color to be selected by Architect after bid date from manufactures standards.

b. Standard Color Selection must include “White”.

2.4 WARRANTY

A. Manufacturer shall warrant the entire system against defects in labor and materials for a period of one (1) year commencing on the date of substantial completion as established in Division One of these specifications.

B. Intention of this warranty is the manufacturer will come onto the jobsite and do all necessary to effect corrections of any deficiencies.

C. Prima Facie Evidence of defects in labor and material may include but is not limited to, one or more of the following:

1. Moisture leaks
2. Metal failure including excessive deflection
3. Fastener failure
4. Finish failure

2.5 FABRICATION

A. Comply with indicated profiles, dimensioned requirements and structural requirements.

B. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.

C. All welding to be done by heli-arc process.

D. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.

E. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.

F. Roof Deck: Flush deck extruded aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'- 0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.

G. Expansion joints, design structure for thermal expansion and contraction. Provide expansion joints as required.

H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.

I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle covered walkway system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid excessive stresses.

3.2 EXAMINATION

A. Examine adjacent work for conditions that would prevent quality installation of system.

B. Do not proceed until defects are corrected.

3.3 FIELD DIMENSIONS

A. General contractor shall field confirm all existing locations, dimensions and elevations shown on shop drawings prior to fabrication.

3.4 INSTALLATION

A. Install roof deck sections, accessories and related flashing in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.

B. Assemble all components in a neat, workmanlike manner.

3.5 FLASHING

A. Flashings: Flashings required between covered walkway system and adjoining structures are not work of this section. Refer to "Flashing and Sheet Metals", Section 07600.

3.6 CLEANING AND PROTECTION

A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.

B. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

END OF SECTION

MECHANICAL
SPECIFICATIONS
15000

SECTION 15100 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

CONDITIONS AND REQUIREMENTS

The General Conditions, Supplementary Conditions, and Division-1, General Requirements apply to this section.

GENERAL PROVISIONS

The contract drawings indicate the extent and general arrangement of the work. The Contractor shall be responsible for installing the proposed systems as indicated, without violation of applicable codes, standards, or specification requirements. The Contractor is also responsible for coordinating the installation and operation of these systems with the other sections of this specification to provide a complete and operable system. Equipment, piping, and ductwork arrangements shall fit the space as indicated and shall allow adequate and approved clearance for entry, servicing and maintenance. Detailed drawings of any proposed departures due to actual field conditions shall be submitted to the Architect for approval. All work shall conform to the requirements of the referenced publications and as specified herein.

CONFORMANCE WITH AGENCY REQUIREMENTS

Where materials or equipment are specified to conform to requirements of the Underwriters' Laboratories, Inc., Factory Mutual Systems, Air Conditioning and Refrigeration Institute, Air Diffusion Council, American Society of Heating, Refrigerating and Air Conditioning Engineers, or the Air Moving and Conditioning Association, Inc., the Contractor shall submit proof of such conformance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, the Contractor may submit a written certificate from any approved, nationally recognized testing organization adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements, including methods of testing, of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code in every respect.

CAPACITIES

Capacities of all equipment and material shall be not less than those indicated, nor exceed maximum values shown on the drawings. Physical dimensions of equipment shall be verified against contract documents to insure manufacturer’s maintenance space is available.

EQUIPMENT INSTALLATION

Necessary supports shall be provided for equipment, appurtenances, pipe, and ductwork as required. Isolation vibration units shall be provided to minimize the intensity of vibration transmission to the building structure where required.

ELECTRICAL WORK

Electric-motor-driven equipment specified herein shall be provided complete with motors and controls. Electric equipment and wiring shall be in accordance with Division 16000, "Electrical Work". Electrical characteristics shall be as indicated. Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of motor when operating at proper electrical system voltage. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices, but not shown on the electrical plans, shall be provided under this section.

APPROVAL OF MATERIALS AND EQUIPMENT

After notice to proceed and before purchasing, the Contractor shall submit to the Architect for approval, five bound copies in 3-ring binders, a list of materials he proposes for the work. Items to be submitted include, but are not limited to, the items listed in each individual section. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's names, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

Shop Drawings: Drawings shall be a minimum of 8 1/2" x 11" in size, except as specified otherwise.

Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. All equipment selections shall be clearly marked with name designations as shown on drawings (i.e., AHU-1, HPU-2, etc.). Where manufacturer’s data includes equipment of differing sizes and/or capacities, the Contractor shall clearly indicate what specific model and/or size is to be used.

Delivery and Storage: Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Architect. Damaged or defective items, in the opinion of the Architect, shall be replaced.

Cataloged Products: Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least 2 years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer.

NAMEPLATES

Each major item of equipment shall have the manufacturer's name, address, serial and model numbers on a plate securely attached to the item.

VERIFICATION OF DIMENSIONS

The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.

DRAWINGS

Because of the scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that are required. The Contractor shall carefully investigate the structural and finish conditions affecting his work and he shall furnish fittings, offsets, transitions, unions, etc., as may be required to meet such conditions at no additional cost to the Owner.

CUTTING AND REPAIRING

The work shall be carefully laid out in advance and no excessive cutting of construction will be permitted. Damage to building, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved at no additional expense to the Owner.

SAFETY REQUIREMENTS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein. Items such as catwalks, ladders, and guard rails shall be provided where required for safe operation and maintenance of equipment.

MANUFACTURER'S RECOMMENDATIONS

Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

PAINTING

At the completion of all work, all equipment on this project shall be checked for damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal or especially covered areas that have been deformed shall be replaced with new material and repainted to match adjacent areas. Painting of new work shall be as specified herein.

FINAL CLEANUP

At the completion of all work, all equipment on the project shall be checked and thoroughly

cleaned, including coils, plenums, under equipment, and any and all other areas around or in equipment. Any filters used during construction shall be replaced with new filters during final cleanup.

OPERATING AND MAINTENANCE INSTRUCTIONS

Bound Instructions: Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Architect before the contract is completed. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: The words "Operating and Maintenance Instructions", the name and location of the building, the name of the Contractor and the contract number. Flysheet shall be placed before instructions covering each subject. The instruction sheet shall be approximately 8 1/2" x 11", with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:

Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

A control sequence describing start-up, operation and shutdown.

Operating and maintenance instructions for each piece of equipment, including lubrication instructions.

Manufacturer's bulletins, cuts and descriptive data.

Parts lists and recommended spare parts.

END OF SECTION 15100

SECTION 15200 - TESTING AND BALANCING AIR DISTRIBUTION SYSTEMS

PART 1 - GENERAL

GENERAL REQUIREMENTS

The General Conditions, Supplementary Conditions and Division 1, General Requirements, apply.

QUALITY ASSURANCE

Testing Agency:

Submit name, address, and qualifications of testing agency to Architect for approval prior to start of testing.

All system adjustments and test and balances are to be performed by a company regularly and exclusively engaged in this work. Agency shall be a member in good standing of the Associates Air Balance Council (AABC).

Procedures shall be as outlined in the AABC Publication 716-79 for total system balance.

SUBMITTALS

Test Reports: After completion, submit three (3) certified copies of test and balance report to the Architect for review and as a project record document.

JOB CONDITIONS

Commencement of Test: Do not begin balancing until the systems have been completed and are in full working order, or at the direction of the Architect, place any part thereof in operation for the purpose of balancing.

Plans and Data: Furnish the balance agency one (1) complete set of all approved up-to-date mechanical plans and shop drawings of all cooling, heating, air, and water distribution equipment.

FIELD QUALITY CONTROL

Performance Data: Record the following data and submit to the Architect.

Air Volumes and Velocities: Determine and tabulate at each grille, diffuser, louver, outside air intake, etc., and adjust dampers, control devices and fan drives to obtain the indicated air quantities. Adjust or modify each supply grille and diffuser distribution pattern as required to maintain air motion, noise level and temperature variations within acceptable limits throughout each space. Clearly and permanently mark all dampers at final setting for reported air balance.

System Component Capacity: Record and calculate all data necessary to demonstrate

capacity under actual operating conditions, and adjust dampers, and machine drives to obtain a suitable operating balance for each system. Record data for each item of equipment simultaneously with data from all associated equipment together with coincident outside air dry bulb temperatures to permit evaluation of total system performance. Data to include the following:

Supply, return and outside air quantities for each air conditioning and ventilation system.

Air volumes and velocities for each fan, cooling coil and air cleaning assembly.

Entering and leaving air dry bulb and wet bulb temperature for each cooling and heating coil.

Static pressures for all air handling units and major fans.

Actual voltage and current input for each motor.

Test and adjust each diffuser grille, and register within 10 percent of design requirements. Test and record temperature rise, voltage, and current across duct heaters.

In readings and test diffusers, grilles and registers include required fpm velocity and test fpm velocity, and required cfm and test cfm after adjustments.

TEMPERATURE CONTROLS

Set adjustments of all controllers to operate as indicated. Make four hour temperature traverse of each area or zone. Provide testing agency personnel with instruments to verify reports to Architect.

FINAL TEST

At conclusion of testing agency's work, demonstrate to the Architect that the equipment is mechanically sound, that the systems deliver the rated output without objectionable noise, distress or vibration, and that the temperature controls are functioning properly.

END OF SECTION 15200

SECTION 15400 - PLUMBING

PART 1 - GENERAL

SCOPE OF WORK

The work to be performed under this section of the Specification shall include all labor, materials, equipment, transportation, construction, facilities, and incidentals necessary for the proper execution and completion of all Plumbing work as shown and indicated on the Contract Drawings, and/or specified herein with the intent that the installation shall be complete in every respect and ready for use. The work required under this section of the specification shall include specifically, but is not limited to the following:

Cold water piping and connections to new fixtures as shown or indicated on the drawings.

Hot water supply piping, including connections to new fixtures, as shown or indicated on the drawings.

A system of sanitary soil, waste, and vent piping including connections to existing services, and new fixtures as shown or indicated on the drawings.

A system of thermal insulation for all new potable water piping.

All fixtures and equipment as hereinafter specified, completely installed and operational.

All necessary cutting and/or core drilling to install plumbing systems in this section.

RELATED DOCUMENTS

Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 specification sections apply to work specified in this section.

GUARANTEE

All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from the date of acceptance of the work by the Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the satisfaction of the architect.

CODES AND REGULATIONS

All work performed under this section shall conform with all local governing regulations, and in case of conflicting requirements, the most stringent shall apply. Minimum requirements shall be the International Building Code. All electrically operated equipment specified in this section shall comply with the National Electrical Code.

Should it be found that any part of the work shown or specified is not in accordance with local regulations, the Architect shall be so advised at the time of bidding and all work installed as required to meet the local codes.

The Contractor shall comply with the latest revisions of all county, district, municipal, or local building codes, interpretations, buildings permits to include but not be limited to:

2021 International Building Code
2021 International Fuel Gas Code
2021 International Fire Code
2021 International Mechanical Code
2021 International Plumbing Code
2010 ADA Standards for Accessible Design
NFPA-101 - Life Safety Code
Local Municipal Codes
National Electrical Code (NFPA 70)

FEES AND PERMITS

The Plumbing Subcontractor shall obtain and pay for all permits, fees for inspection, and other charges that may be necessary for fully completing the work. The Plumbing Subcontractor shall make all necessary tests required by City, County, or State authorities, legal regulations, and/or the Architect, and return to the Architect any certificates of approval issued in this district for plumbing work, etc. signed by the inspector in charge of each particular part of the work.

RECORD DRAWINGS

Contractor shall keep a set of reproducible drawings on site at all times and log all changes made during construction period. No deviations from the drawings and specifications shall be made without full knowledge and consent of the Architect. Record drawings shall show dimensions, locations, and depth of all buried and concealed piping, plugged outlets, and equipment, and shall keep up-to-date. No plumbing progress payments will be approved unless as-built drawings are up-to-date. Upon completion of work, sepias shall be turned over to the Architect.

COOPERATION

The Contractor shall lay out and proceed with his work so that this work will be executed in harmony with all other contractors and trades on the job.

VISITING THE PREMISES

The Contractor, before submitting his bid on the work, must visit the site and familiarize himself with all existing conditions. As a result of having visited the premises, the Contractor shall be responsible for the installation of the work as it relates to such existing conditions. The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

VERIFICATION OF CONTRACT DRAWINGS

The drawings and specifications are intended to cooperate. Any materials, equipment, or systems related to this section and exhibited on the architectural and plumbing drawings, but not mentioned in the specifications are to be executed to the intent and meaning thereof, as if it were both mentioned in the specification and set forth on the drawings. Where the Contractor finds the specification and/or drawings to be in conflict or where they are not clear, same shall be brought to the attention of the Architect prior to submitting a bid.

The plans indicate the general arrangement of the existing utilities. The locations of piping are approximate for clarity. Exact locations shall be determined in the field by the Contractor. In the event it should become necessary to change the locations of any work due to building construction, etc., the Contractor shall secure the approval of the Architect before making the changes. Any changes approved by the Architect shall be made without added cost to the Owner. Under no circumstances shall the sizes indicated on the drawings be changed without securing written approval of the Architect.

The drawings are diagrammatic and do not necessarily show or indicate all fittings, offsets, and accessories which may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work as well as the operational requirements of each system and shall arrange such work accordingly, furnishing such fittings, etc., as may be required for the proper and efficient functioning of each system. No unnecessary or unauthorized offsets will be permitted.

WORKMANSHIP

All workmanship performed under this section shall be executed in a first class manner in accordance with the best practices of the trade. The Architect reserves the right to accept or reject workmanship and determine when the Contractor has complied with the requirements herein specified. Only competent mechanics skilled in their respective trades shall be employed by the Contractor.

RESPONSIBILITY OF BIDDER

Each bidder shall visit the site of the proposed work and fully acquaint himself with conditions relating to the construction requirements so that he may fully understand the facilities, difficulties and restrictions contingent upon the execution of the work under this contract. The failure or omission of any bidder to receive or examine any form, instrument, addendum or other document shall in no way relieve any bidder from his obligations with respect to his bid or the contract. The submission of a bid shall be taken as prima fascie evidence of compliance with this paragraph and that he has included in his proposal every item of cost necessary for a complete installation of air conditioning, heating and ventilation operations strictly as planned, specified, and intended.

NOISE AND VIBRATION

This Contractor shall be held responsible for elimination of all noises or vibrations transmitted to occupied areas from equipment which he may install. This applies particularly to vibration and noises in piping. He shall furnish and install water hammer

arrestors, flexible connectors for piping, etc., as may be necessary.

SUBMITTAL DATA

Materials and equipment schedules shall be submitted as soon as practicable, but not later than 30 days after the date of award of contract, and before commencement of installation of any material or equipment. A complete schedule of the material and equipment proposed for installation shall be submitted in proper binders (3-ring or fastener type), properly marked for approval by the Architect. The schedule shall include catalogs, cuts, diagrams, drawings, specifications and such other descriptive data as may be required by the Architect. The schedule and supplementary data shall be submitted in six (6) copies, and approval obtained. All materials required to be submitted for approval under this section shall be submitted at one time.

Partial submittals will not be considered. Each item submitted shall be identified by its applicable drawing number.

Where equipment named as equivalent or approved equal are proposed for use by the Contractor, he shall be responsible to coordinate any changes with all trades affected.

The following equipment and material shall be submitted for approval:

Valves
Cleanouts
Access Panels
Piping and materials
Insulation
Pumps
Plumbing fixtures, including traps, supplies, and carriers
Grease Traps
Water Hammer Arrestors
Floor Drains
Trap Primers
Water Heaters

START-UP SERVICE

The Contractor shall put all items installed under this section into operation and shall instruct the Owner's maintenance personnel in all points requiring service and maintenance. Further, the Contractor shall make all adjustments and/or service requirements to said equipment during the first 60 days of actual occupancy.

PIPING

Provide pipe sleeves through masonry construction, and install escutcheon plates around exposed piping in all rooms.

Soil, waste and vent lines shall be Schedule 40 PVC-DWV in accordance with Commercial Standards CS272-65 or ASTM Standards D2665-68. Soil, waste, and vent lines penetrating a fire rated wall or floor shall be service weight cast iron at the point of

penetration only.

All plastic pipe shall bear the NSF Seal of Approval, and such other markings as required by the aforementioned standards.

Above slab cold water and hot water piping shall be Type "L" hard copper with sweated joints, using wrought fittings and non-corrosive flux. Below slab cold water piping shall be type "K" soft copper tubing.

Waste piping serving within the first thirty feet of areas where temperatures may be expected to exceed 140 degrees F shall be Spears® LabWasteTM CPVC piping or equal. Soil, waste, and vent systems penetrating a fire rated wall or floor shall be cast iron soil pipe. Below grade installation of thermoplastic pipe shall be installed in accordance to the ASTM D 2321* standard. * most current edition

Where pipes pass through firewalls, fire partitions, or fire rated floors, an approved UL Fire Seal shall be provided. System employed shall be assigned an approval number in accordance with 1990 Fire Resistance Directory published by Underwriters' Laboratories.

PIPE SUPPORT

Hangers: Support all suspended piping with clevis type hangers equal to Piping Technology and Products Fig. 83, 5'-0" o.c. When attached to open-web bar joists, the hanger shall be supported from both chords at the same time. The hanger is preferred to pass between the chords, not attached to the webbing member, and supported on top of the chords. This is a concentric application. Architect shall approve all methods of attachment of hangers to construction. Hangers in contact with copper piping shall be copper, or copper plated. Within the storm shelter area, hangers shall be installed at 2'-6" o.c and piping shall be appropriately braced.

Vertical Support: Steel bar base clamped to pipe or grip strut channel with offset clamps. Support members to be of same material as supported material where possible.

All anchorage shall be to studs or solid blocking built into the wall. No plumbing straps shall be used.

PIPING PLACEMENT

Place in most direct manner permitted by construction, free of unnecessary offsets, making changes in direction by means of standard fittings.

Grade 2" waste lines 1/4" per foot and 3" and 4" waste lines 1/8" per foot for positive flow. Secure all piping to structure.

Changes in direction of drainage pipe shall be made by means of suitable bends and branches of Y's and long sweeps. Short radius quarter bends are prohibited. Make no change in direction of flow greater than 90□. Where different sizes of drainage pipes or fittings are connected, use standard increasers and reducers of proper size. Do not

reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil waste or vent pipes, and use of saddle hubs and bands are prohibited.

Waste Arms
Type "K" copper or IPS brass pipe typical; Alloy steel or IPS brass pipe at urinals.

Test Fittings
Not shown on the drawings; provide where required for partial tests. Provide test tees at base of all stacks.

Hand holes with brass ferrules and brass trap screws for cleanouts shall be placed at ends of soil and waste pipe and where otherwise shown on plans or as required on job. Cleanouts to be brought flush with face of walls. All threaded plugs shall be full size of pipe on which placed up to 4".

Soil Pipe
Support to firm earth below floor slabs.

Changes in direction of drainage pipe shall be made by means of suitable bends and branches of Y's and long sweeps. Short radius quarter bends are prohibited.

Connections of vertical soil pipe to all connections in horizontal soil pipe to be made by "Y" fittings.

Vent Pipes
Main soil pipe stacks to be extended up through the building full size with increaser through roof per code.

Connect branch vents into main stacks with connections not less than 4 feet above the highest fixture.

All vent stacks shall be connected at the bottom to main drainage system and all horizontal runs shall be graded so as to discharge all water or condensation.

Water Piping
Place supply pipes as shown or as directed in neat arrangement and parallel or at right angles to walls, joists, etc.

Place shock absorbers at each fixture group as recommended by manufacturer. Shock absorbers shall be PDI certified.

Place valves on all water pipe risers and branch lines at point where risers and branch lines connect to main water lines.

PART 2 – PRODUCTS

WATER PIPING

All water piping, unless otherwise shown or specified shall be copper pipe Type L or K as specified having a wall thickness of not less than .035 inches. It shall be clean,

round, straight, and true to size, free from flaws and other defects.

All fittings on copper pipe shall be copper. The pipe and fittings shall be thoroughly cleaned before inserting into the joint and then soldered with lead free solder.

GAS PIPING

All piping above grade shall be Schedule 40 black steel ASTM 120. Fittings shall be 150 pound black malleable screw pattern for all sizes 2" and smaller.

Piping below slab shall be vented and encased in a sleeve of polyethylene, or other approved water resistant material. This can be accomplished using the pre-sleeved TracPipe PS-II system (or equal).

All piping shall be installed in accordance with NFPA recommendations and the National Fuel Gas Code complete with all necessary appurtenances.

Horizontal piping shall grade with a slope of 1" on 40 feet-0" to drip legs at all low points as required. Drips shall be provided at all low points and at bottom of risers. Drips shall be same size as the piping where installed and shall be a minimum of 12" long.

Use ground joint unions in all screw piping joints.

Piping shall be painted with yellow enamel and labelled with service and flow direction. Labels shall be secured to piping at spacings of no more than 15’-0”.

UNIONS

Unions shall be provided on inlet and outlet of all apparatus and equipment. Where valves are adjacent to equipment, unions shall be between valves and equipment.

Unions in copper pipe shall be cast bronze, WOG pattern, ground joint, 150 psi type.

Unions in steel pipe shall be malleable iron, WOG female pattern brass seat, ground joint, 150 psi type.

Unions connecting dissimilar metals shall be dielectric type.

TRAP PRIMER DISTRIBUTION UNIT

A trap primer distribution system shall be equal to Precision Plumbing Products DU-4 to serve no more than four fixtures off one primer distribution unit. Unit shall be installed per manufacturer's instructions.

VALVES AND COCKS

Valves and cocks shall be installed where shown on the drawings, and/or where found to be necessary for proper operation of the system. All branches from risers, all branches from mains, and all fixtures or equipment not having stops shall be provided with valves whether shown or not.

Angle or straightway chromium plated stops on the supplies to all fixtures accessible from the same room in which the fixtures are located.

All valves shall be the product of one manufacturer as cataloged by Milwaukee, Stockham, Crane, or Nibco.

For water piping, valves shall be equal to 125 psi SWP/200 psi WOG Nibco as follows:
Gate valves 1/2" to 3" = S-111.
Ball valves 1/2" to 2" = S-585.
Check valves 1/2" to 3" = S-413W.

WALL HYDRANTS

Interior wall hydrants shall be encased, anti-siphon, automatic draining, keyed with nickel bronze face plate. Mount flush with wall. Wall hydrant shall be equal to Zurn Z-1325. Coordinate wall thickness at installation location. Adjust location as necessary to enclose piping within the wall.

Exterior wall hydrants shall be encased, anti-siphon, automatic draining, non-freeze, with nickel bronze faceplate, keyed hinged cover. Wall hydrant shall be equal to Zurn Z-1322-EZ. Coordinate wall thickness at installation location. Adjust location as necessary to enclose piping within the wall.

THERMAL INSULATION WORK

All insulation work shall be performed by experienced insulation application mechanics thoroughly familiar with and experienced in the application of insulation materials. All insulation materials shall be applied in accordance with manufacturer's published recommended methods. Installation and finish of insulation materials shall meet with complete data for approval of materials and application methods as proposed for use. All piping shall be pressure tested and all surfaces shall be thoroughly cleaned before covering is applied. Insulation materials, including sealer, adhesive, finished, etc., shall meet NFPA Standards with regard to flame spread and support of combustion.

All domestic cold water piping and all hot domestic water piping less than 1-1/2” in diameter shall be covered with 1" thick heavy density fiberglass sectional pipe insulation equal to Owens Corning Fiberglass 25 ASJ/SSL, excluding piping below grade or chromium plated fixture connections. All hot domestic water piping 1-1/2” in diameter or larger shall be covered with 1-1/2" thick heavy density fiberglass sectional pipe insulation equal to Owens Corning Fiberglass 25 ASJ/SSL, excluding piping below grade or chromium plated fixture connections. All piping inside masonry walls shall be insulated; no exceptions. Armaflex type insulation shall be allowed only before building is dried-in in those locations which will be inaccessible for the installation of the aforementioned fiberglass insulation. All exposed hot and cold water piping shall be labelled as required by ASME A13.1.

Fittings for the above shall be insulated with premolded fitting insulation of the same material and thickness as the adjacent insulation and shall be covered with a premolded plastic (PVC) vapor barrier and sealed with vapor barrier lagging adhesive. Covering adjacent to unions and other points of termination shall be finished with the plastic

material neatly beveled.

It shall be the responsibility of the insulation subcontractor to coordinate hanger locations and prevent crushing or breaking finishes. Provide saddles with blocking as necessary.

Contractor shall insulate hot water supply assembly and P-Trap assembly with insulation kit equal to Brocar or Trubro on handicapped lavatories.

FLOOR, WALL, AND CEILING PLATES

Nickel plated floor, wall, and ceiling plates shall be provided on all pipes passing through floor, ceiling, or partition. Nickel or chromium plated escutcheons shall be provided on all fixture supplies.

PLUMBING FIXTURES AND EQUIPMENT

Provide roughing-in for and connect to supply lines, waste and vent lines, all equipment, fixtures, drains, etc., specified herein or in other sections of the specifications which require such connections.

Provide stops in hot and cold water upstream of connections to each fixture, equipment items, etc. Where not otherwise specified, stops shall be same as specified hereinbefore for ball valves. Provide deep escutcheon on all sinks and lavatories where waste pipe goes into wall. Anchor all supplies from wall securely within wall construction.

Provide stops for all fixtures. Traps for all fixtures shall be 17- gauge chromium plated brass.

Plumbing fixtures shall be equal to American Standard, Crane, Kohler, Just, Elkay or Eljer. Faucets and valves shall be equal to Sloan, Zurn, Delta, American Standard, Kohler, Just or T&S Brass. No others will be accepted.

Plumbing fixtures shall be as follows:

P-1 WATER CLOSET: Kohler K-4406 elongated bowl, floor mounted, floor outlet, flush valve type with Sloan Royal 111 flush valve. Provide Olsonite 10SSC white open front seat (less cover) and two bolt caps.

P-1A HANDICAP WATER CLOSET: Kohler K-4368, 17-1/2" high elongated bowl, floor mounted, floor outlet, flush valve type with Sloan Royal 111 flush valve. Provide Olsonite 10SSC white open front seat (less cover) and two bolt caps. Install per ADA requirements.

P-2 URINAL: Kohler K-4960-ET, wall hung, vitreous china with Sloan Royal 186 - 1.0 flush valve and Zurn Z1222 wall carrier.

P-2A HANDICAP URINAL: Kohler K-4960-ET, wall hung, vitreous china with Sloan Royal 186-1.0 flush valve and Zurn Z1222 wall carrier. Mount fixture in

compliance with ADA for handicap use.

P-3 LAVATORY: Kohler K-2005, 20" x 18" wall hung vitreous china with Delta 505 single lever faucet and grid waste. Bowl depth not to exceed 5-1/2". Provide 1-1/4", 17-gauge P-Trap, flexible supplies equal to Brasscraft, stops, Leonard model 170 thermostatic mixing valve, and Zurn Z1231 concealed arm carrier. Provide insulation kit on all exposed piping.

P-3A HANDICAP LAVATORY: Kohler K-2005, 20" x 18" wall hung vitreous china with Delta 505 single lever faucet and grid waste. Bowl depth not to exceed 5-1/2". Provide 1-1/4", 17-gauge P-Trap, flexible supplies equal to Brasscraft, stops, Leonard model 170 thermostatic mixing valve, and Zurn Z1231 concealed arm carrier. Install per ADA requirements. Provide insulation kit on all exposed piping.

P-4 WATER COOLER: Dual type, wall mounted, barrier free, Elkay LZSTL8WSSP with 17-gauge P-Trap and rough brass stop. Provide with Zurn Z-1225-BL floor-supported plate carrier and mount in compliance with ADA for handicap use. Unit to have bottle-filling station on lower side.

P-5 LAUNDRY SINK: Mustee 1RLN7 24" x 20" x 13" deep polypropylene utility sink. Provide with deck-mounted gooseneck faucet. wrist blades and basket strainer. Provide 1-1/2", 17-gauge P-Trap, continuous waste, and flexible supplies.

P-6 TRAINERS ROOM SINK: Elkay LRAD172265 Stainless steel, counter mounted, single-compartment, 6-1/2" deep. Provide T&S B-2866-04 gooseneck faucet (minimum 5" clearance from deck to spray) with wrist blade handles and cup strainer. Bowl depth to be 6-1/2". Provide 1-1/2", 17-gauge P-Trap, continuous waste, and flexible supplies with stops. Provide insulation kit and Leonard model 170 thermostatic mixing valve.

P-7 HANDICAP SHOWER: Aqua Bath C6530BF-FUS 3/4" shower with seat, "U" bar, and curtain rod. Provide with curtain, single handle, pressure balanced shower valve with hand held shower head and 24" vertical slide bar and 2" IPS drain with 5" diameter chrome plated strainer Zurn ZN-415.

P-8 FIXTURE NUMBER NOT USED

P-9 ICE MAKER BOX: Guy Gray BIM875 fully recessed, with 1/2" FIP inlet and 1/4"O.D. outlet compression valve.

P-10 WASHER BOX: Guy Gray B-200TS with 2" center set drain and top supply 1/2" angle valves.

P-11 MOP SINK: 24" x 24" x 12", terrazzo, Fiat TSBC-1610 with Fiat 830-AA wall mounted faucet with hose, 889CC bracket, vacuum breaker, stainless steel bumper guard, and stainless steel wall splash guards. Unit shall be provided with 3" drain.

P-12 COUNTER SINK: Elkay LRAD221965 Stainless steel, counter mounted, single-compartment, 19-1/2" x 22" x 6-1/2" deep. Provide T&S B-2866-04 gooseneck faucet (minimum 5" clearance from deck to spray) with wrist blade handles and cup strainer. Bowl depth to be 6-1/2". Provide 1-1/2", 17-gauge P-Trap, continuous waste, and flexible supplies. Provide insulation kit and Leonard model 170 thermostatic mixing valve.

P-13 WHIRLPOOL: Whitehall Manufacturing S-110-S (or equal) stationary 110-gallon whirlpool of 304 stainless steel seamless construction. . Plumbing contractor to provide necessary fittings to make all connections to provide a fully-functional installation.

Floor Drains (Typical locations) Zurn ZN-415S Series with polished nickel bronze, square heel-proof strainer and adjustable collar. Floor drains shall be provided with trap primer tap as indicated on plans. (for AHU drainage) Zurn ZN-415I Series with nickel bronze top and "Type I" polished nickel bronze strainer with raised flange. Floor drains shall be provided with trap guard device, (or equal), as indicated on plans. Floor drains shall be provided with trap primer tap or trap guard device where indicated on plans.

CLEANOUTS

Provide in cast iron sanitary piping at all changes in direction at ends of branches, at intervals not exceeding 40' on straight runs, and elsewhere as shown. Cleanouts shall be full opening type completely accessible. Size same as lines in which they occur, but not larger than 4". Tees and extensions shall be of same weight as pipe. Plugs shall be countersunk type. Catalog numbers from Josam or approved equal.

Outside cleanouts to grade shall be brought up flush with finished grade and installed in 18" x 18" x 6" concrete pad, cleanout plug shall be countersunk.

In Tile Floors: 56030-2, adjustable, cast iron body with ABS plug and satin finished square scoriated Nikaloy top; where soft tile occurs, provide 56030-12-2 recessed square Nikaloy cover.

In Concrete Floors: 58190, adjustable head, cast iron head and ferrule with ABS plug, round loose set scoriated tractor cover.

In Outside Line: 58190 cast iron head and ferrule with ABS plug. Terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In Finished Walls: 58790 cast iron cleanout tee with ABS plug and stainless steel wall plate cover. Where distance from plug to finish wall will exceed 4", provide 58710 extend cover from sanitary tee to bring plug within 4".

In Quarry Tile Floors: 56040-13-1, adjustable cast iron head and ferrule, ABS plug and round brass terrazzo cover and rim.

ELECTRIC TANK-TYPE WATER HEATERS

Provide electric water heater with high efficiency stainless steel sheathed elements

which comply with ASHRAE Standard 90-75. Water heaters shall have capacity as scheduled and shall be equal in all respects to Rheem. Provide with 3" diameter thermometer gauge on discharge line, auxiliary drain pan, T&P relief valve, expansion tank, and vacuum breaker.

Provide Watts 100XL temperature and pressure relief valve, Watts N36 vacuum relief valve, galvanized drain pan, and 5-year warranty on tank. See schedule for electrical characteristics.

If the water heater has a storage capacity over 120 gallons or a heating rate of 56kW or greater, a boiler installation permit must be obtained from the State of Alabama Department of Labor. The heater installation and piping must also be inspected and approved by the State of Alabama Department of Labor.

ELECTRIC TANKLESS WATER HEATERS

The water heater shall meet the minimum values as scheduled based on the design model indicated.

GAS TANKLESS WATER HEATERS

Each tankless water heater shall produce 56°F temperature increase. Each unit shall have a maximum gas consumption of 1,194,000 BTU/H, set discharge temperature for 125°F. Provide MC-601-BK controller and coordinate final location with architect/owner. Tankless water heater shall be equal to Rinnai CU199e. Install per specific manufacturer's recommendation.

Provide Watts's 100XL temperature and pressure relief valve, Watts N36 vacuum relief valve. See schedule for electrical characteristics.

HOT WATER CIRCULATION PUMPS

Shall be all bronze construction with one piece impeller, stainless steel shaft and 3/4" flanges. 120 volt single phase, control with strap-on aquastat set at 110°F. Unit shall be Rinnai Grundfos GTK15 or equal.

PART 3 - EXECUTION

COMPLETION OF WORK

This Contractor shall arrange for the installation of all equipment in order that it progresses along with the general construction of the building, and in no case shall be hold up other phases of the work due to the fact his equipment is not properly installed.

TESTING

General: Perform all tests in the presence of the Architect or his representative. Test shall conform to local code requirements. File copies of all test reports in duplicate to physical plant.

Soil, Waste, and Vent Systems: Plug all openings, fill entire system with water to point of overflow and hold for at least one hour before inspection. System must remain full during the test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested must have a 10' head. Provide test tees and plugs for all tests as required.

Drainage and Vent Systems final test. Fill all traps with water and then introduce into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a one-inch water column shall be held for a test period of not less than 15 minutes. The plumbing contractor shall provide all materials, equipment and labor to perform this testing.

Water Supply System: Test and secure acceptance of entire system before the piping or hot water heaters are otherwise concealed. Test as follows: Disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure. Fill the system with water; apply 150 psi hydrostatic pressure and hold until inspection is completed. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction where freezing conditions do not exist.

DISINFECTION

Disinfect all domestic water piping in accordance with local health department guidelines.

ATTACHMENTS

General: Contractor to execute originals of attached copies.

Copy of Permit Request to Install Boiler or Pressure Vessel, State of Alabama Department of Labor

Copy of Boiler and Pressure Vessel Inspection Report, State of Alabama Department of Labor

ATTACHMENTS:

JIM BENNETT
COMMISSIONER

Ralph Pate
Chief Inspector
Elevator/Boiler
Safety Division

STATE OF ALABAMA
DEPARTMENT OF LABOR
100 NORTH UNION STREET-SUITE 620
P.O. BOX 303500
MONTGOMERY, ALABAMA
ZIP 36130-3500
PHONE (334) 242-3460 **FAX (334) 240-3417**

Boiler and Pressure Vessel Inspection Report

DATE INSPECTED	**CERT. EXP DATE**	**CERT POSTED** YES [ ] NO [ ]	**INVOICE FOR INSP.** YES [ ] NO [ ]	**JURISDICTION #** AL	**Nat'l BD [ ] or Ser # [ ]**
OWNER NAME			**NATURE OF BUSINESS**		**TYPE INSP** PERMIT # INT [ ] EXT [ ]
OWNER STREET ADDRESS AND P.O.BOX		**OWNER CITY**		**OWNER STATE**	**OWNER ZIP**
LOCATION NAME			**SPECIFIC LOCATION**		**OBJECT LOCATION COUNTY**
LOCATION ADDRESS **LONGITUDE** **LATITUDE**			**LOC CITY**	**LOC STATE** ALABAMA	**LOC ZIP**
TYPE BOILER FT WT CI COIL ELECT BLR OTHER			**MAN HOLE** YES NO	**MANUFACTURER**	**FUEL** N/A
BOILER USE: Process Hws St Ht Hwh Other					**FIRING METHOD** N/A
TYPE PRESSURE VESSEL Air Nitrogen Water Autoclave Hot Water Oxygen Heat Exchanger Other					
PRESSURE VESSEL USE Process Storage Service Other (explain)					**CONTROLS TESTED** YES NO N/A
DIMENSIONS (length width height etc.) indicate in. and/or ft.		**BOILER CAPACITY** (indicate ht surface, lbs/h btu/h etc.)		**YEAR BUILT**	**ASME CODE SYMBOL**
MAWP	**NO. OF SAFETY-RELEIF VALVES**	**SAFETY-RELIEF VALVES SET AT**	**TOTAL SAFETY-RELIEF VALVE CAPACITY,** lbs/h btu/h cfm etc.)		**PRESSURE GAGE TESTED?** YES NO

Special Billing Instructions:

Send Invoice to: Owner [ ] Location [ ] Contact Name

Send Certificate to Owner [ ] Location [ ] phone number

Violations / required action / compliance date(s) **Fee Schedule:** **CERTIFICATE** **INSPECTION**

Signature of Inspector	**Inspector AL CoC #**	**Company Name**	**Contact and phone number**
I certify this is a true and correct report of my inspection.			

Neither this inspection nor any provision of this inspection shall be construed to place any liability on the state of Alabama, the Inspection Agency/Company or the Inspector with respect to any claim by any person, firm, or corporation relating in any way whatsoever to Boiler Inspections and injury or damage arising there from. Revised 112807

STATE OF ALABAMA
DEPARTMENT OF LABOR
100 NORTH UNION STREET-SUITE 620
P.O. BOX 303500
MONTGOMERY, ALABAMA
ZIP 36130-3500
PHONE (334) 242-3460 FAX (334) 240-3417

JIM BENNETT
COMMISSIONER

SAFETY DIVISION
CHIEF
RALPH PATE

Permit Request to Install Boiler or Pressure Vessel

(ONE OBJECT PER REQUEST WITH $ 50.00 FEE)

Type of Installation	New [ ] Used [ ]
Type of Object	Boiler [ ] Water Heater [ ] Pressure Vessel [ ] (storage tanks)

Installer _____
Address 1 _____
City / Zip _____
Contact Name _____
Phone Number _____

Loc of Installation _____
Address 1 _____
City / Zip _____
Contact Name _____
Phone Number _____

Purchased From (Co. Name, address, contact and ph#)	
Manufacturers Name	
National Board Registration # All objects must be NB registered by the Mfg, except cast Iron or cast aluminum sectional boilers)	
MAWP (max allowable working pressure indicated on Mfg Data Plate)	
Indicate the appropriate ASME Code Symbol Stamp as indicated on Mfg's Data Plate (all boilers and Pressure vessels must be ASME code constructed, and will have one of these stamps on nameplate attached to the shell.	**S** [ ] Power Boiler (over 15 psi steam) **HLW** [ ] Water Heaters (over 200,000btu and/or 120 gals) **H** [ ] Heating Boilers/Hot Water Supply Boilers **M** [ ] Miniature Boiler (not to exceed 100 psi steam) **U** [ ] Unfired pressure vessel/Storage Tank Note: Water Heaters are classified as a boiler.
Serial Number	

Signature of Applicant _____

OFFICIAL USE ONLY

Approved by: _____ **Check No.** _____

Permit Number _____ Date _____/_____/_____

This Permit expires one year from the date signed by the Department or when installation is complete.
Revised 11/28/2007

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END OF SECTION 15400

SECTION 15510 - FIRE PROTECTION SYSTEM

PART 1 – GENERAL

SCOPE OF WORK

The Contractor shall furnish all labor, materials, tools equipment, and perform all work and services necessary for or incidental to the design and installation, complete, of an approved fire protection system which shall be completely coordinated with the work of all other trades. All work shall be performed by an automatic sprinkler contractor licensed in the State of Alabama who shall certify the complete installation.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a complete and operable installation shall be furnished and installed as part of this work.

Shop drawings for the fire protection sprinkler system shall be submitted as signed and sealed documents by the contractor. Engineer of record shall be licensed in the State of Alabama.

The Contractor shall comply with all county, district, municipal, or local building codes, interpretations, buildings permits to include but not be limited to the latest editions of:

International Building Code – 2021
International Plumbing Code – 2021
International Mechanical Code – 2021
International Fire Protection Code – 2021
NFPA-13 - Installation of Sprinkler System
NFPA-90A - Installation of Air Conditioning and Ventilation Systems
NFPA-101 - Life Safety Code
Local Municipal Codes

DESCRIPTION OF WORK

Work included in this section of the specifications shall consist generally of, but is not limited to, the following major systems or categories of work:

The work includes the hydraulic design and installation of an automatic wet pipe fire extinguishing sprinkler system for light hazard occupancy for the entire building. Wet pipe protection shall be for all piping located in the occupied space. It is intended the wet piping protect area below the ceiling. The wet piping shall be located as close to ceiling as possible to allow for ceiling insulation to cover wet pipe system. The design, equipment, materials, installation and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 13, except as modified herein. System shall include all materials, accessories, and equipment necessary to provide an automatic system which is complete and ready to use. Design and install system to give full consideration to lighting blind spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage in accordance with prevailing code requirements.

FIRE PROTECTION SYSTEM CONTROLS

Devices and equipment for fire protection service shall be of an approved make and type listed by the Underwriter's Laboratories, Inc., or approved by the Factory Mutual System.

SPRINKLED CODES AND STANDARDS

Entire system shall be hydraulically designed and installed in accordance with the following codes and standards for the occupancy hazards as hereinbefore specified.

Standards of the National Fire Protection Association: Chapters No. 13 and No. 24.

A new fire service main including excavation and connection where indicated.

Requirements of the fire inspection bureau having jurisdiction.

International Building Code.

INSTALLATION

Furnish and install a complete fire protection system in accordance with this specification and as required by state and local governing codes.

System shall consist of connection to water service, valves, piping, all underground piping to sprinkler system. Provide sleeves at all floor and wall penetrations.

The Contractor shall conduct a flow test to insure available flow and pressure at point of connection. The system classification shall be for light/ ordinary hazard occupancy with risers to protect the facility. Should particular areas of the facility be classified other than as indicated coordinate with Engineer.

Flow test data shall be verified at the project site prior to beginning work.

Fire protection contractor shall coordinate installation of site utility piping with civil contractor to ensure a complete and operational system. A remote fire department connection shall be indicated on the backflow preventer as provided and installed by others.

Design and installation of the sprinkler system shall be such that it is entirely drainable.

SUBMITTALS

Submit a 1/8" = 1'-0" minimum scale reproducible shop drawing in accordance with NFPA #13 to the Architect. Verify all clearances, lighting fixtures, piping, etc., at job site or from contract documents.

Approval by Architect will be for general location only. Where there is conflict between authority's recommendations and these drawings and specifications, recommendations by the authority shall govern. All drawings shall be signed, sealed and submitted by a fire protection engineer registered in the State of Alabama.

Submit to Architect for approval actual photographs or samples of all items of equipment which will be visible with the finished work. Include such items as Siamese connections, valves, flow switches, sprinkler heads, etc.

PART 2 - PRODUCTS

MATERIALS SPECIFICATIONS

All material and equipment shall be furnished by an established and reputable manufacturer. All material and equipment shall be new, unused, and of first class construction designed and guaranteed to perform the services required and shall be approved by NFPA and UL.

Underground pipe shall be black steel. All joints under the slab and to 5 feet outside of the building shall be welded. Likewise this same piping shall be mil wrapped for corrosion protection.

Above grade, piping shall be black steel, Schedule 10 for sizes 2½" and larger; ASTM A135. Fittings shall be UL and FM approved mechanical couplings. Piping 2" and smaller shall be Schedule 40 black steel with 175 lb. screw pattern fittings.

Provide thrust restraints where steel piping is connected to cast iron.

All piping exposed to view shall be painted before final acceptance by Owner. Remove all rust, scale, dirt, etc., and prime and finish with red pipeline enamel.

PIPE HANGERS

Pipe hangers shall be spaced in accordance with requirements of NFPA or as specified in plumbing section, whichever is stricter. Hangers, hanger rods, inserts and clamps shall be constructed as approved by same. Hangers shall be same type as specified in plumbing section, however, shall be zinc coated for corrosion protection.

DRAINS

Install approved drains at low points of all piping and elsewhere as required to permit complete drainage of system without disconnection of any piping. Drain and test connections on end of sprinkler branches shall be piped to exterior of building.

Coordinate location of drains with Architect before installation. Submit locations on shop drawings. Install all drains in walls adjacent to exterior wall and provide lockable access panel for drain valve.

VALVES

Only approved OS&Y as required by Underwriters' Laboratories and NFPA shall be used. Check valves shall be approved by NFPA. Test and drain valves and hangers shall be approved and shall conform to requirements of NFPA. All OS&Y valves used in fire protection system shall have provisions for tamper switches. (Tamper switches shall be furnished and installed by the fire protection contractor and wired by the electrical

contractor).

BALL DRIP

Install ball drips at each location shown on plans or where required. Ball drips to be ½" size, Elkhart No. 701 or equal.

SIAMESE CONNECTIONS

Provide and install as shown on drawings two-way Siamese connection with a 4" x 2½" x 2½" cast brass angle body with chrome plated connections. On face of Siamese shall be written the works "Automatic Sprinkler". Automatic ball drip and check valve shall be UL and NFPA pamphlet No. 14 approved. Threads on each Siamese shall meet local fire department requirements. Siamese connections shall be provided remote from building as shown on civil drawings. Provide brass plugs and chain with entire assembly, chrome plated finish. Unit shall be Elkhart 156 with dependent drop clapper valves. Acceptable manufacturers: Potter-Roemer and Croker-Standard. Plastic dust covers on connections shall not be used.

Insure installation of this connection is within 100 feet of the nearest fire hydrant. Coordinate final location of fire hydrant with site utility contractor.

SPRINKLER HEADS

Install all sprinkler heads as required by NFPA No. 13. Heads shall be rated for various temperatures and flows as determined by National Fire Protection Association. In no case shall they be rated at less than 155°F.

Furnish spare sprinkler heads and wrench as required by NFPA and place in metal cabinet on job site where directed by Architect.

Furnish an emergency rubber ball shutoff with 36" long handle to be used for temporary closing of sprinkler heads.

Sprinkler heads shall be of type and operating temperature as required by specific location of installation. Sprinkler heads to be sidewall mounted shall be in accordance with governing codes.

All sprinkler heads in finished areas with lay-in acoustical ceilings shall be recessed type covered by white metal plates. Sprinkler heads in plaster or hard finished ceilings shall be semi recessed and have chromium plated finish. Sprinkler heads shall be equal to those manufactured by Grinnel, Automatic Sprinkler, or Viking.

Sprinkler heads located in corridor shall be located at the center of the corridors and at the center of the ceiling tile in which located.

SPACE LIMITATIONS

Route piping to avoid interferences with ducts, piping, lighting, etc. Necessary offsets, crossover or other routing shall be provided to permit all systems to be installed in available

space. Offsets, crossovers, etc., are not shown on drawings. Investigate mechanical, electrical, and architectural drawings to ascertain how work of other trades affect installation.

FLOW SWITCHES

Install UL approved flow switches and alarm devices where shown or required. Flow switches shall be Autocall, Notifier with electrical rating for pilot duty only. Switches shall be suitable for working pressures of 150 psi with adjusting screw to provide sensitivity. Wiring from flow switches to fire alarm system provided under another section. Switch shall have contacts required for interconnection to the fire alarm system.

PART 3 - EXECUTION

TESTS AND INSPECTION

Work included herein shall include all tests and inspections by State authority and/or Local Fire Marshall and all permits or inspection fees connected therewith. At completion of work and prior to acceptance by Owner, demonstrate complete operation of system including alarms.

DRAWINGS

Drawings are diagrammatic only. Field route all piping on job site. All piping in finished spaces shall be run concealed.

COORDINATION

Sprinkler contractor shall coordinate with utility the requirements of pressure and water supply for satisfactory operation of this system.

END OF SECTION 15510

SECTION 15800 - HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 - GENERAL

SCOPE OF WORK

The work consists of furnishing all labor, materials and incidentals necessary for a completely functional system. In general, the work shall include, but not necessarily be limited to the following major subdivisions.

Ductwork, grilles, and diffusers
Insulation
Split system direct expansion heat pump units
Ductless split system heat pump/air conditioning units
Packaged air conditioning units with hot gas reheat and gas fired heating furnace
Exhaust fans
Louvers
Electric unit heaters
Dampers
Air purification device (bi-polar ionization)

CODES, FEES, PERMITS

The Contractor shall comply with all county, district, municipal, or local building code, interpretations, building permits and assessments of fees for building permits, and ordinances.

The Contractor shall obtain and pay for all required permits, inspections, and certificates of inspection. Certificates of inspection shall be delivered to the Architect upon completion of the job.

The Contractor shall comply with the latest revisions of all county, district, municipal, or local building codes, interpretations, buildings permits to include but not be limited to:

ASHRAE, "HVAC Systems and Equipment" - Chapter 19, Duct Construction
SMACNA Standards for Duct Construction
International Building Code - 2021
International Mechanical Code - 2021
International Plumbing Code - 2021
ASHRAE 90.1
ASHRAE 62.1
NFPA-90A - Installation of Air Conditioning and Ventilation Systems
NFPA-101 - Life Safety Code
Local Municipal Codes

RESPONSIBILITY OF BIDDER

Each bidder shall visit the site of the proposed work and fully acquaint himself with conditions relating to the construction requirements so that he may fully understand the

facilities, difficulties, and restrictions contingent upon the execution of the work under this contract. The failure or omission of any bidder to receive or examine any form, instrument, addendum, or other document shall in no way relieve any bidder from his obligations with respect to his bid or the contract. The submission of a bid shall be taken as prima facia evidence of compliance with this paragraph and that he has included in his proposal every item of cost necessary for a complete installation of air conditioning, heating and ventilation operations strictly as planned, specified, and intended.

SUB-DIVISIONS OF WORK

Each sub-division of work includes furnishing and installing all materials to make that part of work complete, and shall comprise all auxiliaries, setting of equipment, sleeves through building construction where required and etc., all in complete coordination with General Contractor and in cooperation with other trades. It is contemplated that all sub-divisions of work when completed will form heating, air conditioning, and ventilation system for this project.

DRAWINGS

The drawings for the Heating, Ventilating and Air Conditioning for this job are diagrammatic. The Contractor shall make his own measurements at the site and in the building during construction and install the systems as the work progresses in such a manner that the equipment, piping, conduit, panels, and ductwork will fit into the finished space provided while maintaining headroom; and be neatly installed. All equipment and its interconnecting piping, ductwork, conduit, etc., shall be provided.

Due to differences between various manufacturers, it is not practicable to show exact dimensions of units, nor to show or specify all minor details of equipment. Contractor shall provide all valves, fittings and accessories as necessary for a complete installation, whether or not specifically mentioned or shown.

Equipment shall not be acceptable if operated in excess of the recommended and published ratings of the manufacturer.

FOUNDATIONS

The Contractor shall furnish all special foundations and supports for equipment, ductwork and piping which he installs and which are separate and distinct from building construction as shown by Architectural drawings.

SAFETY PROVISIONS

Contractor shall be required at all times to perform his work in strict accordance with the Williams-Steiger Occupational Health and Safety Act of 1970.

Equipment with any projecting or rotating parts shall be totally enclosed or properly guarded.

NOISE AND VIBRATION

This Contractor shall be held responsible for elimination of all noises or vibrations transmitted to occupied areas from equipment which he may install. This applies particularly to airborne noises in ductwork, vibration and noises in piping, and vibration from mechanical equipment transmitted through bases to building structure.

This Contractor shall furnish and install all flexible connectors for ductwork connected to motor driven equipment.

Contractor shall closely coordinate work for location of mechanical equipment and roof openings.

MOTORS AND STARTERS

This Contractor shall be responsible for the furnishing in place of all electric motors required for the operation of all heating, ventilating and air conditioning equipment. Electrical Contractor to provide all power wiring and conduit required for the operation of electrical motors as specified. Electric motors shall be selected in sizes as required to properly operate the equipment furnished but in no case smaller than those indicated on Equipment Schedules. Verify all electrical characteristics from electrical drawings before releasing motors for shipment. Electric motors shall have a service factor of 1.15 and power factor in accordance with ASHRAE 90-75.

This Contractor shall furnish all magnetic motor starters required to operate heating, ventilating, and air conditioning equipment and turn over to the Electrical Contractor for installation. All motor starters shall be provided with:

1 thermal overload per phase leg.

A 110 volt coil and a hand-off-automatic switch, if motors are subject to electrical interlock unless otherwise specified.

If equipment is provided with R.L.A. in excess of design conditions the Mechanical Contractor shall stand the expense of associated electrical changes.

It is the responsibility of the Mechanical Contractor to provide thermal overloads of the proper size as required by the actual motor nameplate amps. Motor starters shall comply with the requirements of the latest edition of the National Electrical Code and the local utility service company.

PAINTING

All equipment furnished without factory paint or galvanized finish shall be thoroughly cleaned and given a prime coat, then a finish coat of paint in a color as selected by Architect/Engineer. Any equipment finish that is damaged or chipped, shall be spot painted to match existing surface. Any miscellaneous metals used by this Contractor that are not galvanized shall be given two coats of paint in color specified by Architect. Any rusty or corroded finishes shall be thoroughly cleaned and painted two coats of paint - one prime and one finish coat.

TESTS AND GUARANTEES

After completion of his work, and when the building is ready for occupancy, this Contractor shall operate the air conditioning or heating system for a period of two days. During the tests, the Contractor shall adjust controls, outlets, etc.

The Contractor shall repeat operational sequence during heating and/or cooling season, whichever had not been subject to prior test period.

SHOP DRAWINGS

Materials and equipment schedules shall be submitted as soon as practicable but not later than thirty (30) days after the date of award of contract, and before commencement of installation of any material or equipment. A complete schedule of the material and equipment proposed for installation shall be submitted for approval. The schedule shall include catalogs, cuts, diagrams, drawings, specifications and such other descriptive data as may be required by the Engineer. All materials required to be submitted for approval under this section shall be submitted at one time. Partial submittals will not be considered. They will be returned as "not approved".

Shop drawings shall be submitted for approval on the following items of equipment: Subject drawings shall include all data pertinent to the performance and installation of all equipment.

Air distribution devices - grilles, diffusers, registers
Temperature controls
Insulation materials
Split system direct expansion heat pump units
Ductless split system heat pump/air conditioning units
Packaged air conditioning units with hot gas reheat and gas fired heating furnace
Electric heaters
Exhaust fans
Louvers
Dampers
Air purification device (bi-polar ionization)

QUALITY OF MATERIALS AND EQUIPMENT

It is not the intent of these specifications to limit material and/or equipment selections to one manufacturer; however, the Engineer reserves the right to be the final and sole judge with regard to equals.

Approvals of equipment are based on capacities, equality of workmanship and components, or general and special construction features. Approval of equipment does not relieve the Contractor of coordination responsibility with other trades. Equipment shall fit within the physical space of equipment shown and have same general connection as that shown on drawings. Proper clearances shall be maintained for servicing and maintaining equipment. Where equipment submitted varies from the general arrangement of that specified, Contractor shall submit detailed sheet-metal and equipment brochures. Shop drawings

shall indicate any and all sheet-metal, electrical, piping and structural changes required to facilitate change. Any and all additional costs incurred by changes will be borne by this Contractor.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver distribution devices in individual wrappings to prevent damage to finish surface of device.

Store in a dry, protected area until installed. After installation of devices, clean soiled surfaces.

PART 2 - PRODUCTS

REFRIGERANT PIPING

Piping shall be type "K" hard drawn copper, ASTM Spec. B280, and shall be mill cleaned, dried, and capped.

Fittings shall be extra heavy wrought copper in accordance with ANSI B9.1 with joints soldered using a high content silver alloy solder.

Installation shall be in accordance with unit manufacturer's requirements with all piping secured to walls and ceilings with approved galvanized hangers and clamps. Entire installation shall be in accordance with ANSI Standard B31.5 for refrigerant piping.

Insulate refrigerant suction line with 3/4" wall foamed plastic insulation slipped over tubing and all joints thoroughly sealed. Paint insulation with two coats of acrylic protective paint where insulation is exposed to weather. The first coat shall be white; the second coat shall be dark gray. Protect insulation with metal saddles and shields at all hanger points.

All refrigerant piping routed up along building exterior shall have a lineset cover system equal to Line-Hide. Cover system shall be of high-quality PVC construction with UV inhibitors for outdoor service. Cover shall be paint-able; coordinate color with Architect. Lineset cover shall have a -4 °F to 140 °F temperature range. Cover system shall have molded in mounting screw locations and include stainless steel assembly screws. All covers, couplings, elbows, joints, and caps shall be provided for refrigerant piping routing as shown. Cover system shall be suitable in size to completely cover the insulated refrigerant piping.

Suspend piping as required with approved pipe hangers at 4'-0" on center.

If field piping is used, piping diagrams shall be submitted by unit manufacturer showing pipe sizes, traps, service valves, etc., required for proper operation of equipment. Pre-charged tubing may be used at Contractor's option.

Test refrigerant system at 300 psi before charging system where units are to be field charged. System is to be thoroughly purged and evacuated before charging with refrigerant in accordance with manufacturer's recommendations. If factory pre-charged tubing is used, unit shall be checked and monitored for proper charge and efficient

operation.

HEAT PUMP UNIT (OUTDOOR SECTION) (5 tons and below)

Units shall be completely factory assembled, wired, and statically tested. Units shall be ARI certified and rated in accordance with the latest ARI Standard for Heat Pump Units.

Construction shall be heavy gage galvanized steel with a weather resistant powder finish. Unit shall have a corrosion and weatherproof base.

Condenser coil shall be copper tube type with aluminum fins mechanically bonded to the tubes. If all aluminum coils are provided, manufacturer shall provide five-year warranty for the coil. Condenser coil shall be protected on all four sides by louvered panels.

Condenser fan shall be propeller type, vertical discharge with vinyl coated fan guard. Fan shall be electronically balanced to eliminate vibration and noise. Fan motor shall be direct drive, inherently protected with sealed ball bearings.

Compressors shall be designed for split system direct expansion use.

Compressors shall be sealed hermetic type with external vibration isolating mounts. Compressors shall have crankcase heaters to prevent oil dilution. Compressor section to contain filter drier and accumulator. Compressors shall have factory-mounted suction and discharge line service valves. Manufacturer shall provide five-year warranty on compressors and file warranty with Architect.

Controls shall be factory mounted and wired in an accessible enclosure within the compressor compartment. System controls shall have a fully automatic defrost cycle for heating operation. Safety controls shall consist of high-low pressure cut-out and compressor overload protection. Cabinet shall be set standard of quality in appearance and construction. Cabinet shall be of zinc coated sheet steel and finished with epoxy paint. Compressor section shall have a large access panel for ease of service.

Unit shall be provided with the following options:

Anti-short cycle timer
Evaporator defrost control
Indoor fan delay
Seacoast kit
Low ambient kit
Rubber isolators

Unit shall have capacities as per schedule on drawings and shall be Trane, Carrier, Lennox, York, or equal. EER (or SEER) and COP shall meet minimum requirements of heat pump unit schedule on the drawings.

AIR HANDLING UNIT (INDOOR SECTION)

Unit shall be completely factory assembled with direct expansion coil, insulated drain pan, fan and filter section complete with disposable 1” thick filters. Units shall be designed for

vertical or horizontal mounting as shown on the plans.

Evaporator coil shall be direct expansion, R-410A, copper tube with aluminum fins mechanically bonded. Thermal expansion valves shall have bypass line and check valve installed for heat pump use. Minimum tube size shall be 1/2" o.d

Evaporator fan shall be forward curved double inlet mounted on a common shaft with permanently lubricated ball bearings. Fan shall be statically and dynamically balanced for smooth operation. Evaporator fans shall have V-belt drives with adjustable pitch pulley or direct driven fans with multiple speed taps for adjustment.

Cabinet shall be constructed of hot dip galvanized sheet steel a minimum thickness of 18-gauge. Interior panels and top shall be covered with insulation to prevent heat gain and noise transmission. Drain pan shall be coated to prevent condensation and corrosion.

Filter shall be of standard size throwaway and not less than 1" thick. Filter section shall be accessible from front of unit. Filters shall be a minimum of MERV 7 per ASHRAE 52.2.

Units shall have capacity as per schedule on drawings and shall be Trane, Carrier, Lennox, York, or equal.

Electric heaters shall be UL listed and factory installed as an integral part of the air handler with timed defrost control. See section Electric Heaters hereinafter specified.

ELECTRIC HEATERS

Electric heaters shall be factory installed and shall be furnished complete with air limiting and safety devices as required by National Electrical Code. Units shall bear UL approval for use in indoor unit. Sizes are to be as scheduled on drawings.

PACKAGED AIR CONDITIONING UNITS WITH GAS FIRED HEATING FURNACE

General
Equipment installation shall include but not limited to:

Package frame supported unit.
Heat exchanger.
Refrigeration components.
Unit operating controls.
Electrical power connections.
Operation and maintenance service.

References
ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
AHRI 360 - Unitary Air-Conditioning Equipment.
ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

Handling
Comply with manufacturer's installation instructions for rigging, unloading, and transporting

units.

Protect units from physical damage. Leave factory shipping covers in place until installation.

Warranty
Provide a full parts, labor, and refrigerant warranty for 60 months from start-up or 66 months from shipment, whichever occurs first.

Summary
The contractor shall furnish and install package pad mounted air conditioning unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

General Unit Description
Unit(s) furnished and installed shall be packaged pad mounted as scheduled on contract documents and these specifications. Cooling performance shall be based on AHRI testing procedures. Wiring internal to the unit shall be numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance with cULus for Central Cooling Air Conditioners. Unit(s) shall be factory assembled, internally wired, fully charged and consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or exhaust motors and drives, unit controls and heat as scheduled.

Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

Unit Casing
Cabinet: Galvanized steel, phosphatized, and finished with a pre-applied baked polyurethane enamel. Cabinet surface shall be tested 672 hours in salt spray in compliance with ASTM B117. Fully gasketed removable access panels with hinges. Structural members shall be heavy gauge with access doors and removable panels of heavy gauge. Provide 1/2 inch thick foil faced fiberglass insulation on all exterior panels and roof in contact with the return and conditioned air stream. Cabinet top cover shall be one piece construction or where seams exits, it shall be double hemmed and gasket sealed.

Electrical Power Connections
Factory-made penetrations shall be provided for connection of all electrical wiring. These wiring provisions shall be through the side of the cabinet. Field penetrations of the unit base pan shall not be acceptable.

Unit shall include a phase monitor as standard that protects equipment from phase loss, phase reversal, and low voltage. Any fault condition shall produce a Failure Indicator LED, and send the unit into an emergency stop condition. The entire unit with this option shall be cULus approved. If not, a field UL inspection is required.

Provide factory installed disconnect and powered GFCI outlet. The unit must have factory furnished and installed transformer for the GFCI outlet. If a field wired outlet is supplied, then the installing contractor will be responsible for the additional cost of the electrical runs.

Air Filters

Air Filters: Filters shall mount integrally within unit and be accessible through hinged access panels. Filters shall be minimum of 4” thick and MERV8.

Fans - Supply

Provide forward-curved fan mounted with fixed pitch sheave drive assembly. Complete fans assemblies shall be statically and dynamically balanced.

Fan shaft shall be mounted on grease lubricated ball bearings. All motors shall be circuit breaker protected. Fans shall be controlled as Single Zone Variable Air Volume with a full VFD with bypass. No two speed or four speed fan options will be accepted as alternatives.

Gas Fired Heating Section

Completely assembled and factory-installed heating system shall be integral to unit, cULus approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping connection through side of unit. The Module must be capable of 2.5:1 turndown rate at a minimum.

Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Upon a failure to ignite, three attempts of ignition will occur before lockout of the ignition system.
Combustion blower shall be centrifugal type fan with built-in thermal overload protection on fan motor.

Heat Exchanger: Provide drum and tube heat exchanger of free floating design manufactured from 14-gauge 304 stainless steel drum and 16-gauge 304 stainless steel tubes. Factory pressure and leak tested.

Limit controls: High temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow or loss of indoor airflow.

Evaporator Coil

Provide heavy duty aluminum fins mechanically bonded to internally enhanced, copper tubes.

Provide a thermostatic expansion valve for each refrigeration circuit. All coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil is pressure tested to 450 psig.

Unit shall include a Condensate Overflow Switch to shut the unit down in the event that a clogged condensate drain line prevents proper condensate removal from the unit.

Unit shall include Sloped Stainless Steel evaporator coil drain pans that are durable, long-lasting and highly corrosion resistant.

Condenser Section

Provide all Aluminum Microchannel epoxy coated condenser coils. All condenser coils shall be leak tested at the factory to ensure pressure integrity and pressure tested to 650 psig.

Condenser Coating must be Factory applied to withstand ASTM B117 Salt Spray test for 6000 hours and ASTM G85 A2 Cyclic Acidified Salt Fog test for 2400 hours. To provide optimal protection in more corrosive environments, coating shall cover all tubes, headers and fin edges.

Provide integral subcooling circuit(s) to prevent premature refrigerant flashing and to insure maximum operating efficiency.

Provide horizontal discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection in a weathertight casing.

Provide tool-less factory installed corrosion resistant louvered hail/vandalism guards to protect condenser coils from hail or physical damage. Wire mesh coil guards shall not be acceptable.

Refrigeration System
R410A refrigerant

Provide with thermostatic temperature motor winding control for protection against excessive temperatures caused by over-/under voltage operation or loss of charge. Also provide high and low pressure cutouts.

Provide a minimum of 5 stages of cooling or variable speed compressor control.

Refrigeration system shall include a reheat condenser factory installed downstream of the unit evaporator coil. Modulating valves shall control the flow of refrigerant between the indoor reheat and outdoor condensers in response to the unit discharge air temperature in order to dehumidify the space during low load conditions.

Outdoor Air Section
Provide a fully integrated factory installed 100% modulating outside air economizer with unit return and barometric relief air dampers. Economizer operation shall be through microprocessor based primary temperature controls that automatically modulate dampers to maintain space temperature conditions.

Provide economizer with differential enthalpy controls factory installed.

Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

Provide integrated CO2 based demand control ventilation utilizing space/duct CO2 sensors (as shown on plans) with sensor and control boards provided by RTU manufacturer.
The unit shall include a room humidity sensor to monitor and control to maintain a space humidity of 50% RH at the scheduled setpoint.

Unit Controls
General: Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in

response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.

Variable Air Volume Controls: Provide all necessary controls to operate a Single zone VAV rooftop from supply air temperature including supply air microprocessor controller, and supply air sensor. The microprocessor shall coordinate the economizer control and stages of cooling with supply air temperature reset capability based upon return temperature.

The following setpoints shall be accessible in the unit control panel: supply air cooling setpoint, morning warmup setpoint, reset setpoint, reset amount.

Compensated Outside Air Control - shall be provided to control outside air damper positioning, maintaining minimum outside air requirements, during operation of variable air volume (VAV) systems.

Clogged filter indication: Provide factory installed differential pressure switch to indicate filter replacement status. Differential pressure switch shall cause a contact closure to display a service indication and unit will continue to operate normally.

Building Management System

Control Functions: Include unit scheduling, occupied/unoccupied mode, start-up and coast-down modes, nighttime free-cool purge mode, demand limiting, night setback, discharge air set point adjustment, timed override and alarm shutdown.

Remote Monitoring: BAS system shall include modem to provide remote dial in and dial out capabilities.

Diagnostic Functions shall include: Unit operating mode, Unit failure status, cooling failure, emergency service stop indication, supply fan proving, timed override activation, high temperature thermostat status, Zone temperature, Supply air temperature, Cooling status (all stages), Stage activated or not, Stage locked out by UCP, HPC status for that stage, Compressor disable inputs, Number of stages activated, High temperature limit status, Economizer status, Enthalpy favorability status, Requested minimum position, Damper position, Dry bulb/enthalpy input status, Outside air temperature, Outside relative humidity,

Sensor Failure: Humidity sensor, OAT sensor, SAT sensor, RAT sensor, Zone temperature sensor, Mode input, Cooling setpoints from sensors (CV only), Static pressure transducer, Unit mounted potentiometer, SAT from potentiometer (VAV only), Air reset setpoint from potentiometer (VAV only), Unit Configuration data, Gas or electric heat, Economizer present, High temp input status, Local setpoint, Local mode, Inlet Guide Vane position/VFD %.

Unit operating mode
Unit failure status
Cooling failure
Emergency service stop indication
Supply fan proving

Timed override activation
High temperature thermostat status
Zone temperature
Supply air temperature
Cooling status (all stages)
Stage activated or not
Stage locked out by UCP
HPC status for that stage
Compressor disable inputs
Number of stages activated
High temperature limit status
Economizer status
Enthalpy favorability status
Damper position
Outside air temperature
OAT sensor (Fail/Normal)
SAT sensor (Fail/Normal)
RAT sensor (Fail/Normal)
Zone temperature sensor (Fail/Normal)
Mode input (Fail/Normal)
Cooling/heating setpoints from sensors (CV only) (Fail/Normal)
Static pressure transducer (Fail/Normal)
Unit mounted potentiometer (Fail/Normal)
SAT from potentiometer (VAV only) (Fail/Normal)
Air reset setpoint from potentiometer (VAV only) (Fail/Normal)
Unit Configuration data
Gas or electric heat
Economizer present
High temp input status
Local setpoint
Local mode

Provide capabilities for Boolean Processing and trend logs as well as "templated" reports and logs.

Installation
Install in accordance with manufacturer's instructions.

Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork. Install roof mounting curb level.

Manufacturer's Field Services
Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s). Package rooftop unitary manufacturers shall maintain service capabilities no more than 50 miles from the jobsite.

The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

EXHAUST FANS & GRAVITY VENTILATORS

All exhaust fans shall bear the AMCA Seal of Approval and shall be currently listed in the current AMCA Directory.

Motors shall have a 1 year manufacturer's warranty.

BATHROOM EXHAUST FANS

Exhaust fans shall be ceiling mounted type fans with 1/2" thick acoustical lined steel housing, direct drive centrifugal fan, back draft damper and integral aluminum ceiling grille. Fans shall have integral disconnect switch and speed controller. Fan control shall be as indicated on schedules. Fans shall be equal to Greenheck SP Series, Loren Cook GC Series, Twin City, or approved equal.

CONTROL OPERATIONS

General space temperature shall be controlled by wall mounted direct digital control (DDC) temperature sensors (as provided by Siemens) located within the spaces as indicated on drawings. Refer to specification Section 15900 & 15950 for additional information. Equipment operation shall be as per Sequence of Operations indicated on drawings. Provide a clear, lockable plastic enclosure for each wall mounted controller.

Wiring: All control wiring external to the equipment shall be installed by the Controls sub-contractor under the direct supervision of the HVAC subcontractor. Control wiring shall be installed in conduit (see below) and shall be color coded to match system wiring diagrams and shall be installed in accordance with the electrical section of the project specifications.

Note: All power wiring required for equipment operations shall be by the Electrical contractor. This contractor shall also provide all conduits as required for control wiring.

Test all units for two (2) 8-hour days under the supervision of manufacturer's representative, who shall make all necessary adjustments and instruct designated operating personnel in operation and maintenance of equipment and controls.

CONTROLS

Controls sub-contractor shall furnish and install all relays, transformers, contacts, etc., as required to control automatically the heating and air conditioning equipment. Submit control drawings for approval. Control drawings shall be complete and shall indicate complete control sequence of operation.

All control wiring shall be installed in conduit and shall be sized as recommended by unit manufacturer. All wiring shall be color coded to match system wiring diagrams and shall be installed in accordance with the electrical section of this specification.

The units shall be started and stopped by wall mounted DDC temperature sensors as provided by Siemens. Space temperature shall be controlled by wall mounted temperature sensors. Provide clear locking plastic guard. Provide all interlocks as indicated on drawings. Temperature sensors shall have manual override capability.

DUCTWORK

The sizes, runs, and connections of ducts shall be as indicated. Adhere to drawings as closely as possible. The right is reserved, however, if required to meet structural or other interferences, to vary run and shape of ducts and offsets during progress of work, at no extra cost to the Owner. Ductwork specified herein shall have rectangular cross section, unless otherwise indicated.

Materials - Methods of Construction: Details of construction and materials not specified herein shall be in accordance with SMACNA Low Velocity and ASHRAE "Guide" recommendations. Fabricate ductwork in workmanlike manner with airtight joints presenting smooth surface on inside, neatly finished on outside. Seal all duct joints airtight with approved tape or mastic before insulation is applied. Construct ductwork air extractors, spin-in taps with air scoops, turning vanes, splitter dampers, etc., to ease air flow and balancing of air. The joint between the trunk duct and any air extractor or spin-in tap shall be sealed with approved tape or mastic. Unless otherwise indicated, where square elbows have to be used, provide fixed deflectors. Construct, brace and support ducts in manner that they will not sag or vibrate to any perceptible extent when fans are operating at maximum speed and capacity. Ductwork shall be galvanized sheet steel unless otherwise specified. Distance between joints of any size duct shall not exceed 8'.

Flexible ductwork shall be the acoustical insulated type with mechanical lock helix. Flex duct shall have factory wrapped, fiberglass insulation and fire retardant, reinforced metalized aluminum vapor barrier. Helix shall be corrosion resistant galvanized steel, formed and mechanically locked to fabric. Flexible duct shall have a CPE inner film liner. Ductwork shall be in accordance with UL 181. Flexible duct shall have a working pressure of up to 6" w.g. positive pressure (thru 16" diameter). Operating temperature shall be from -20 °F to 200 °F. Flame spread shall be less than 25 and smoke developed rating shall be less than 50. Ductwork shall have a minimum insulating value of R=6.0. Maximum length shall be limited to 8'-0". Extend round snap-lock duct as required. Flexible duct shall be Flexmaster Type 9M or equal.

Sheet metal gauges for rectangular duct construction shall be:

Steel U.S. Std. Gauge	Maximum Size Inches	Type of Transverse Joint Conn.	Bracing
26	Up to 12	S-Drive, pocket or bar clips, on7'-10" centers with tape or mastic	None
24	13 to 24	S-Drive, pocket or bar clips, on 7'-10" centers with tape or mastic	None
24	25 to 30	S-Drive, pocket or bar clips, on 7'-10" centers with tape or mastic	1x1x1/8" angle 4' from joint

Duct Support: Support horizontal ducts with hangers spaced not more than 8' apart, place hangers at changes in directions. Use strap hangers for ducts up to 30" wide, angle hangers for ducts over 30" wide. Make strap hangers 1" by 16-gauge minimum, extended down both sides of duct and turn under bottom 2" minimum, fasten sides and bottom with

sheet metal screws.

Provide flexible duct connections between ducts and air handler. Connectors shall be constructed of 29 ounce, fire resistant, neoprene-coated fiberglass approximately 6" wide, bordered by crimping to sheet metal and fastened to ducts with screws not more than 2" on centers. Connection shall meet pressure classification of duct system used. Acceptable manufacturers shall be Ductmate, DuroDyne, or FanAir.

Spin-in fittings for connection run-outs to trunk duct shall be Air-Trac, Flexmaster, Ductmate, or approved equal. Fitting shall have a balancing butterfly damper and air extractor. Provide minimum 22-gage spin-in and scoop with a 20-gage damper. Perimeter clearance of damper in spin-in shall not exceed 1/8".

EXPOSED DUCTWORK

All exposed ductwork shall be constructed of double-wall spiral duct. The exterior surface of the duct shall be a clean, paintable surface. The interior surface shall be a perforated liner with minimum R-value of 6.

Round Ducts: Round ducts and fittings shall be spiral pipe and fittings. The duct shall be double wall with a perforated inner wall. Use couplings at connection of flexible tubing. Assembly and installation shall be in accordance with SMACNA HVAC Duct Assembly Standards, 4" static pressure rating, Class A seal, Chapter No. 3, and manufacturer's installation data shipped with material. Reinforcement of flat oval ducts shall be for 6 inches W.G.
Fittings: All 90° tees shall be conical; unless otherwise noted, all elbows and offsets shall be 1.5 radius die formed type for 8" and smaller sizes, 5 gore for larger sizes. All fittings shall be factory fabricated by spiral duct manufacturer. Provide relief type access panels (RAP) downstream of all fire dampers and smoke dampers and where indicated on drawings.
Test: Duct shall be pressure tested in accordance with SMACNA HVAC Air Duct Leakage Test Manual, as a whole or in part prior to installation of flexible duct and connection to equipment. Ducts shall be tested at 4" W.C. and shall provide Class A leakage.

Joints: Seal all joints with high-pressure duct sealant. On exposed duct, apply sealant to female fittings; sealant shall not be visible.

Layout Basis: United McGill Corporation. Fittings shall have performance and arrangement of United McGill Corporation products.

Manufacturers: Semco, Inc., U.S. Air Duct, United Sheet Metal Company, West-Sprio Co., Monroe Metals, Air Distributing Systems, Dixies Sheet Metal Products, Norlock.

EXPOSED FABRIC DUCTWORK

Description of Work
Extent of non-metal ductwork is indicated on drawings and by requirements of this section.

Types of non-metal ductwork required for this project include the following: Fabric Air Dispersion Projects.

Quality Assurance
Building Codes and Standards.

Product must be classified by Underwriter's Laboratories in accordance with the 25/50 flame spread / smoke developed requirements of NFPA 90-A.

All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.

Product must have an acceptable evaluation report (ER-5801) from ICBO-ES.

Design & Quality Control
Manufacturer must have documented design support information including duct sizing, vent and orifice location, vent and orifice sizing, length, and suspension. Parameters for design, including maximum air temperature, velocity, pressure and fabric permeability, shall be considered and documented.

Submittals
Product Data: Submit manufacturer's specifications on materials and manufactured products used for work of this section.

Building Code Data
Submit UL file number under which project is Classified by Underwriter's Laboratories.

Warranty
Manufacturer must provide a 10 year warranty program for products supplied for the fabric portion of this system.

Delivery, Storage and Handling
Protect fabric air dispersion systems from damage during shipping, storage and handling.

Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

Manufacturer: Subject to compliance with requirements, provide products manufactured in the United States by DuctSox or an approved equal

Fabric Air Dispersion System
Sedona Fabric: Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:
Fabric Construction: 100% Flame Retardant

Weight: 6.75 oz./yd^2 per ASTM D3776

Color: to be selected by Architect

Air Permeability: 2 (+2/-1)cfm/ft^2 per ASTM D737, Frazier

Temperature Range: 0 degrees F to 180 degrees F

Fire Retardancy
Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements of NFPA 90-A.

Systems Fabrication Requirements
Air dispersion accomplished by linear vent and permeable fabric, linear vent to consist of many 3/16" diameter open orifices rather than a mesh style vent to reduce maintenance requirements (common to mesh style).

Size of and location of linear vents to be specified and approved by manufacturer.

Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener – supplied by contractor.

Inlet connection includes zipper for easy removal / maintenance.

Lengths to include required zippers as specified by manufacturer.

System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.

End cap includes zipper for easy maintenance.

Fabric system shall include connectors to accommodate suspension system listed below.
Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows are 5 gores and the radius of the elbow is 1.5 times the diameter of the DuctSox.

Design Parameters
Fabric air diffusers shall be designed from 0.25" water gage minimum to 3.0" maximum, with 0.5" as the standard.

Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).

Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.

Do not use fabric diffusers in concealed locations.

Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.

Suspension Hardware
The duct suspension shall be with a 3 x 1 suspension system. The duct shall clip to the suspension cable at 12:00. the duct shall clip to the aluminum hanger at 2:00 and 10:00.

Reference the suspension detail on the drawings.

DAMPERS

Provide splitter and deflecting vanes for control of air volume and direction, and for balancing system where indicated, specified, directed or required.

Dampers shall be of same materials as duct, at least one gauge heavier than duct, reinforced where directed, and shall have an accessible location indicating quadrant, locking device for adjusting and locking dampers in position.

Stiffen duct at damper location, install damper in manner to prevent rattling.

Vertical fire dampers shall be curtain type with fusible link. Curtain shall be mounted out of airstream. Dampers shall be furnished and installed at locations shown on plans. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1-1/2 hour fire protection rating, 165°F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Fire dampers shall be equipped for installation as required by the location shown. Fire dampers shall be installed in openings utilizing steel sleeves, angles, other materials, and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the fire damper manufacturer's instructions. Fire dampers shall be Ruskin type IBD2 or approved equal. Verify required rating in field prior to installation.

Manual volume dampers shall be of the opposed blade type. They shall be furnished in sizes shown on plans. Frame and blades shall be 16-gauge galvanized steel with mill galvanized finish. Frames shall be structurally equivalent to 13-gage U-channel. Blades shall have horizontal orientation. Provide with 2" hand quadrant standoff bracket for insulated ductwork. Manual volume dampers shall be suitable for application in HVAC systems with velocities up to 1500 fpm. Dampers shall be tested in accordance with AMCA 500. Equal to Ruskin Model MD35.

Automatic (motorized) dampers shall be of the parallel blade type. They shall be furnished in sizes shown on plans. Frame and blades shall be 14-gage galvanized steel with mill galvanized finish. Blades shall have horizontal orientation and be airfoil type for low pressure drop and low noise generation. Linkage and hardware shall be zinc plated steel. Dampers shall be provided with solid stops for tight closing with sales on the blade edges and the sides of the damper frame which will stand a temperature of up to 200°F. These stops shall be so assembled that they may be easily replaced if they become damaged. Damper gasket shall be continuous 3/16" x 1/2" closed cell neoprene type. Bearings shall be corrosion resistant oil tight stainless steel sleeve type. Dampers shall be tight closing and shall be capable of less than 3.5% leakage based on an approach velocity of 1500 feet per minute when closed against a pressure of 4" w.g. Submit leakage and flow characteristic data. Motorized dampers shall be suitable for application in HVAC systems with velocities up to 2000 fpm. Motorized dampers shall be equal to Ruskin No. CD60.

Fire dampers shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper and its components. The access shall not affect the integrity of the fire-resistance rated assemblies. The access opening shall not

reduce the fire-resistance rating of the assembly. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5" in height reading: FIRE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

Manufacturers: Dampers may also be manufactured by Air Balance, Arrow United Industries, Greenheck, Industrial Louvers, Louvers and Dampers, or Nailor-Hart.

GRILLES, REGISTERS, AND DIFFUSERS

Location of ceiling mounted and sidewall air devices shall be as shown on plans. Install and fasten air distribution devices per manufacturer's detailed drawings. Use gaskets to make air-tight joints with adjoining construction. Supply, return, exhaust, and transfer air grilles and diffusers shall be sized not to exceed a N.C. level of (25).

All air devices installed in rated ceiling assembly shall be of steel construction. Reference Architectural Life Safety plans.

Ceiling diffuser shall be equal to Titus series TDC-AA- adjustable type with 24" x 24" lay-in panel supply diffuser with opposed blade balancing damper of size and capacity as indicated on drawings. Provide with directional throws as indicated on the plans. Provide with square to round duct connection. Round duct connection and face size shall be as shown on plans. Delete panel for ceiling diffusers installed in rigid ceilings. Finish shall be off-white color.

Ceiling mounted return and transfer air grilles shall be equal to Titus Series 50F. Grilles shall be of aluminum construction with a 1/2"x1/2"x1/2" aluminum grid. Grille shall have a 90% free area (minimum). Provide with opposed blade damper (except for transfer/pressure relief). Border shall have countersunk screw holes for a neat appearance. Sizes shall be as indicated on plans. Finish shall be off-white color.

Sidewall supply grilles shall be equal to Titus 300FS. Blades shall be double deflection type with the blades parallel to the short dimension. Blades shall be spaced at 3/4" on center. Grilles shall be of aluminum construction. Border shall have countersunk screw holes for a neat appearance.

Sidewall return and transfer grilles shall be equal to Titus 350ZFL. Blades shall be fixed deflection type with blades parallel to the long dimension. Blades shall be at a 0° deflection angle. Grilles shall be of aluminum construction. Border shall have countersunk screw holes for a neat appearance.

Location of ceiling mounted air distribution devices shall be as shown on the reflected ceiling plan. Install and fasten ceiling diffuser and return air grilles as per manufacturer's detailed drawings, use gaskets to make airtight joints with adjoining construction, join neatly with adjoining finished surface.

Acceptable manufacturers are Carnes, Nailor, Greenheck, Metal-aire, Titus, Price, or equal.

INSULATION

General: All insulation work shall be done by workmen thoroughly competent in this trade and employed by a full-time insulation contractor. Failure to finish work neatly, failure to vapor proof joints, ragged edges, failure to cover all fittings, valves, dents on surface, etc., shall be proper cause to reject this work. This Contractor shall call same to the attention of the Architect before such work has progressed beyond the point of economical correction.

All material used shall be new and of first line quality and shall be as recommended by the manufacturer for the service intended. All insulation materials, including sealer material, adhesive, finishes, etc., shall be non-combustible. Complete installation shall be in accordance with manufacturer's requirements.

This Contractor shall be responsible for the removal from the site of all excess materials, cartons, scrap, etc. He shall protect equipment installed by others, cleaning such equipment should mortar, plaster, adhesive, etc., fall on same.

The following service shall be insulated with the listed thickness of materials:

SERVICE	INSULATION MATERIAL	THICKNESS	FINISH
Condensate Drain Piping & Refrigerant Piping	Armaflex Type ER	3/8"	Paint with acrylic protective paint where exposed to sun
Rectangular Supply, Return, Exhaust, and Outside Air Ductwork	1 lb. density blanket type fiberglass duct wrap (minimum R=6.0)	2”	Reinforced aluminum foil

All Armaflex insulation shall be slipped over piping with all joints sealed with an approved mastic.

All insulation shall be installed as per material manufacturer's printed instructions.

Where piping insulation for condensate drain lines and/or refrigerant piping is exposed to the sun, the Contractor shall paint the insulation with two (2) coats of acrylic protective paint for UV protection. The first coat shall be white and the second coat shall be gray.

Insulation subcontractor shall submit complete product data brochures on insulation materials, jackets, finishes, mastics, cements, etc., for approval along with complete installation brochures for all materials used on this project. Installation methods shall be in accordance with printed instructions from material manufacturers.

It shall be the responsibility of the insulating subcontractor to coordinate hanger locations and prevent crushing or breaking of finishes.

All insulation materials, jackets, adhesives, coatings, etc., shall meet the Underwriters' Laboratories fire hazard classification (UL 723), for flame spread rating of 25, smoke developed rating of 50, and fuel contributed rating of 50.

Exterior duct insulation shall be applied outside of all heating and air conditioning ductwork in accordance with SMACNA Standards. Insulation shall be constructed of glass fiber and

shall be 1.0 pound density, 2" thick and comply with NFPA Bulletins 90A and 90B (minimum R value = 6). Insulation shall be wrapped and shall be secured with duct bands. All joints in insulation shall be butted together and brushed with adhesive. Insulation shall be by Owens Corning, Knauf, Pittsburg Corning, or equal.

Exterior ductwork shall be equal to Thermaduct.

AUTOMATIC SHUT-DOWN

Air conditioning equipment (over 2,000 cfm and/or as indicated on the plans) shall have smoke detectors installed in supply air and return air positions. Mechanical contractor shall install smoke detectors provided by electrical contractor under Division 16000. Mechanical contractor shall install smoke detectors in return air duct prior to mixing with any outdoor air. Smoke detectors shall be for automatic shut down of unit. Duct detector installation shall be in strict accordance with the manufacturer's instructions. Smoke detectors shall be connected to the building Fire Alarm System by the Electrical Contractor.

All duct mounted smoke detectors, low voltage wiring, relays, contactors, etc., necessary for interlocking air handling units for complete unit shut down upon smoke detection shall be furnished by the electrical contractor. Rigid conduit for low voltage wiring shall be furnished and installed by the electrical contractor. Smoke detectors shall be photoelectric 24 volt duct mountable or plenum mountable type as indicated on the drawings and shall be equal to System Sensor (Photoelectric).

At contractor’s option, a line voltage smoke detector may be installed, however, installation must be accomplished by a certified fire alarm systems installer and the contractor shall be responsible for obtaining all components and services necessary for the installation of a complete tested and operational system.

AIR CONDITIONING FILTRATION

Air Conditioning Systems Filtration Notes: It is the mechanical contractors responsibility to ensure the inside of each air handling unit with associated air distribution system is kept cleaned and not allow construction dust to infiltrate the system. Should the system become contaminated as determined by Architect, Engineer or Owner, the mechanical contractor shall be responsible for cleaning. The mechanical contractor shall take any precautions necessary to prevent construction dust from entering the system which shall include as a minimum:

Prior to activating the air conditioning system for building finish work, all filters shall be installed in each air handling unit.

The mechanical contractor shall maintain clean filters at all times. Regular filter replacement is recommended.

Prior to the Owner taking possession of the building, all filters in each air handling unit shall be replaced new. One complete set of replacement filters for each air handling unit shall be turned over to Owner for future installation.

At no time are any air handling units to be operated without air filters. Return grilles are to

be covered with filter media during construction when units are in operation.

ACCESS DOORS

Air duct access doors shall be steel of the double wall insulated type complete with hinges and camlock latches. Insulation shall be 1" thick fiberglass with "K" factor of 0.26 at 75°F mean temperature. Provide access doors at all fire dampers and where indicated. Doors smaller than 8" shall have plexiglass window. Coordinate with specification section 08345 (this contractor to furnish).

Duct Diameter	Access Opening
8" thru 10"	7" dia.
11" thru 13"	10" dia.
14" thru 19"	13" dia.
20" and over	18" dia.

For flat oval and rectangular ducts, the nominal size of the access opening shall be:

When mounted on minor axis:

Minor Axis	Access Opening
8" thru 11"	8"x12"
12" thru 13"	12"x12"
14" and over	14"x20"

When mounted on major axis:

Major Axis	Access Opening
8" thru 16"	8"x12"
17" thru 24"	12"x12"
25" and over	14"x20"

When used with insulated ducts, the access sections shall have glazed covers to prevent condensation.

Duct Access Doors (Low Pressure) – Duct access doors shall be suitable for installation in duct indicated on plan. Access doors shall be rated for systems with up to 2" external w.c. Install per manufacturer's recommendations. Access doors shall be sized and located to provide convenient access for inspection and resetting of fire dampers. Access doors shall be Ruskin ADH22 in all respects or equal by Greenheck, NCA, or Nailor.

DRAIN CONNECTIONS

Provide drain connection with P- trap with appropriate depth for system pressure for all cooling coils at air handling units. Drain piping shall be Type 'L' copper or Schedule 40 PVC pipe with drainage pattern fittings and cement mastic joints insulated with 3/8" wall closed cell elastomeric insulation slipped over piping. Drain piping passing through a fire rated barrier or return air plenum shall be metal and fire rated (i.e. steel, copper, etc.). Slope piping at 1/4" per foot to nearest floor drain, hub drain, or as indicated on plans. Refer to plumbing plans for location of floor and/or hub drains.

FILTERS

Filters shall be pleated type, 2" thick, and of the sizes as indicated on the plans, or sized to be below maximum allowable pressure drop at design airflow.

The 100% synthetic gradient filter media shall be continuously bonded to the support grid with an effective open area of 96%. Media shall be resistant to a wide range of chemicals, shall not absorb moisture, and shall not support microbial growth. Filter support grid shall be 30 gage galvanized expanded metal grid.

Pleat spacing shall maximize the surface area and dust holding capacity. Filter shall have 16 pleats per linear foot.

The filter frame shall prevent pleat collapse and filter bowing. Frame shall be moisture resistant double wall.

Maximum temperature rating shall be 180 °F for continuous service. Filter shall be resistant for humidity levels up to 100% RH.

Filters shall have a minimum MERV rating of 7 in accordance with ASHRAE 52.2.

Filters shall be equal to Flanders.

LOUVERS

Louvers shall be wind-driven, rain resistant type and AMCA 550 and 540 rated equal to Ruskin EME3625MD. Furnish and install louvers as hereinafter specified where shown on plans. Louvers shall have a drain gutter in each blade and downspouts in jambs and mullions. Stationary double drainable horizontal blades shall be contained within a single 5" deep frame.
Louver components (heads, jambs, sills, blades, and mullions) shall be factory assembled by the louver section to provide overall sizes required.

Construction shall be of extruded aluminum allow as follows:

Frame:	0.081" wall thickness
Blades:	0.081" wall thickness; 2" on center; sight-proof (44% free area based on 48"x48" test size); horizontally mounted
Screen:	5/8" x 0.040" expanded, flattened aluminum in removable frame

Pressure drop shall not exceed 0.10" w.g. at design airflow.

Provide with bird-screen by louver manufacturer. Screen mesh opening size shall be in accordance with 2015 IMC.

Submittals - Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of louver assembly.

Finish - High Performance Organic Finish (Baked Enamel): Provide factory applied, baked-on 3 coat fluoropolymer finish complying with AAMA 2604-05 and containing not less than 50% PVDF resin by weight in both color and clear top-coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions. Color and gloss to be selected by Architect from manufacturer's full color range.

Published louver performance data bearing the AMCA Certified Ratings Seal for Air Performance & Water Penetration shall be submitted for approval.

Acceptable louver manufacturers shall be: Ruskin, Greenheck, American Warming, Pottorff, Nailor-Hart, Arrow United Industries.

DUCTLESS SPLIT SYSTEM HEAT PUMP

The heat pump system shall be mini-split type. The system shall consist of a slim silhouette, compact, wall mounted indoor fan coil section and a slim silhouette horizontal discharge outdoor unit which shall be of an inverter driven heat pump design.

Units shall be tested by a Nationally Recognized Testing Laboratory and shall bear the ETL label. All wiring shall be in accordance with the NEC. Units shall be rated in accordance with AHRI 210 and bear the AHRI Certification label. The units shall be manufactured in an ISO 9001 and 14001 facility.

A dry holding charge shall be provided from the factory for the indoor section before shipment. Unit shall be stored and handled according to the manufacturer’s recommendations.

The unit shall have a manufacturer’s parts and defects warranty for a period of five (5) years from date of installation. The compressor shall have a seven (7) year warranty from the same date of installation. Warranty does not include labor.
System performance shall meet the scheduled capacities and efficiencies.

The indoor unit shall be factory assembled, wired, and run tested and include all factory wiring, piping, control circuit board, fan, and fan motor. The unit shall have a self diagnostic function, 3-minute time delay, and an auto restart function after a power interruption. Indoor unit cabinet shall have a smooth front and white finish with multi-directional and refrigerant piping connections. The indoor unit shall have a separate metal installation plate to secure to the wall. Indoor unit fan shall be direct driven via a single motor. Fan shall be statically and dynamically balanced and have permanently lubricated bearings. Airflow direction shall be adjusted with manually adjustable guide vanes. Fan shall have multiple speed settings. Indoor unit sound level shall not exceed 36 dBA at Low airflow setting. The airflow shall be filtered with an easily removable, washable, pleated type filter. The coil shall be of non-ferrous construction with smooth plate fins on copper tubing. Tubing shall have inner grooves for heat exchange. All tube joints shall be brazed with phoscopper or silver alloy. Coils shall be pressure tested at the factory. Provide with a sloped, corrosion resistant drain pan under the coil. Indoor unit shall have a drain pan level switch to shut unit down prior to condensate overflow. Electrical power shall be for 208-230V, single phase and be directly powered from the outdoor unit. Indoor unit shall be controlled by a wall mounted thermostat.

The outdoor unit shall be specifically designed to work with the indoor unit(s). Outdoor unit shall have a thermally fused powder coat finish and be completely factory assembled, piped, and wired. Unit shall be run tested at the factory. Outdoor unit cabinet shall be of galvanized steel construction, bonderized, and finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance. Unit shall have two steel mounting feet with four(4) slotted mounting holes. Assembly shall withstand lateral wind loads up to 155 MPH. The outdoor fan shall be direct driven, propeller type. Fan shall have permanently lubricated bearings and be mounted for quiet operation. Unit shall have a raised guard to prevent contact with moving fan parts. Outdoor unit shall have horizontal discharge airflow. Unit shall not exceed 54 dBA in cooling mode. Outdoor coil shall be of non-ferrous construction with either lanced or corrugated plate fins on copper tubing. Refrigerant from outdoor unit shall be regulated with an electronically controlled expansion valve. Refrigerant type shall be R-410A. Unit shall be pre-charged for 25 feet of piping. All refrigerant lines shall be of annealed copper tubing, individually insulated with closed cell insulation. Refrigerant connections between indoor and outdoor units shall be flare type. The compressor shall be hermetic type, inverter driven, variable speed type. Compressor motor shall be direct current type equipped with a factory supplied and installed inverter drive package. Unit shall be equipped with an accumulator. Compressor shall have thermal overload protection and be mounted so as to avoid vibration transmission. Electrical power shall be for 208-230V, single phase.

Acceptable manufacturers shall be Mitsubishi, Daikin, LG, or approved equal.

AIR PURIFICATION DEVICE (Bi-polar Ionization)

Quality Assurance
The air purification system shall be a product of an established manufacturer in the USA.

A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system(s) to ensure installation in accordance with the manufacturer's recommendation.

Technologies that do not address gas disassociation such as UV lights, powered particulate filters, and/or polarized media filters shall not be allowed. Uni-polar ion generators or plasma particulate filters shall not be allowed.

This project is designed in accordance with ASHRAE Standard 62 IAQ Procedure and shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted.
The air purification system shall be tested by UL or ETL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieve UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers shall submit independent UL 867 test data with ozone results to the engineer during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.
The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be

0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.0042 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

Submittals
Submit manufacturer's technical product data for ion generators including:

Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.

Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.

Performance data for each type of plasma device furnished.

Indoor Air Quality calculations using the formulas within ASHRAE 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled.

Product drawings detailing all physical, electrical, and control requirements.

Copy of UL 867 independent ozone test.

Delivery, Storage, & Handling
Deliver in factory shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending. Store in original cartons and protect from weather and construction work traffic. Store indoors and in accordance with the manufacturer's recommendation for storage.

Warranty
Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of 2 years after shipment. Labor to replace equipment under warranty shall be provided by the installing contractor.

General
The air purification system(s) shall be of the size, type, arrangement, and capacity indicated and required by the unit furnished and shall be of the manufacturer (or listed equal) specified.

All other suppliers of comparable products requesting prior approval shall submit for prior approval in accordance with the requirements of Section 15100. In addition, supplier shall provide 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 must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third party validation study performed on a previous installation of the same application shall also be included. Provide independent test data from ETL or UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

Design & Performance Criteria

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 as described herein.

The bi-polar ionization system shall be capable of:

Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
Capable of reducing static space charges.
Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm^3 measured 5 feet from the floor.

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.

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 the requirements of the air purification system.

The air purification device shall not have maximum velocity profile.

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 capable of wash down duty.

Equipment Requirements: Electrode specifications

Each Plasma generator with bi-polar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Unit shall be capable of treating 6,000 cfm. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be allowed due to replacement requirement, maintenance, performance reduction over time, ozone production and corrosion.

Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time.

Electrode pair shall provide a minimum of 140 million ions per cubic centimeter, both positive and negative ions in equal quantities. Devices providing less than the rated ion densities shall not be acceptable.

Air Handler Mounted Units

Where so indicated on the plans and/or schedules, plasma generators shall be provided and installed. The mechanical contractor shall mount the plasma generator and wire it to the AHU control power (24 VAC) as instructed by the air purification manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with in integral illuminated LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy

chained in series such that only one dry contact per AHU is required to interface to the BAS or the optional DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating are not acceptable.

Plenum/Duct Mounted Units

Where so indicated on the plans and/or schedules, plasma generators shall be provided and installed. The generator shall be installed through the duct wall and into the airstream with the external power head in a convenient location for visual indication of power, removal and servicing, by the mechanical contractor. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per duct is required to interface to the BAS or the optional DDC controller.

Ionization Requirements

Plasma generators with bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

The bi-polar ionization system shall consist of bi-polar plasma generator and power supply. The bi-polar system shall be installed where indicated on the plans or specified to be installed and powered by 24 VAC.

The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.

Ionization output from each electrode shall be a minimum of 140 million ions/cc when tested at 1" from the ionization generator.

All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

MRSA - >96% in 30 minutes or less
E.Coli - >99% in 15 minutes or less
TB - >69% in 60 minutes or less
C.diff - >86% in 30 minutes or less

Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufacturers requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated above. Products tested only on Petri dishes to prove kill rates shall not be acceptable.

The operation of the electrodes or bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

Electrical Requirements

Wiring, conduit, and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. The contractor shall coordinate electrical requirements with the air purification manufacturer during submittals.

Control Requirements
All plasma generators shall have internal short circuit protection, overload protection, and automatic fault reset.

Integral airflow sensing shall modulate the plasma output as the airflow varies or stops. A mechanical airflow switch shall not be acceptable as a means to activate the plasma device due to high failure rates and possible pressure reversal.

The installing contractor shall mount and wire the plasma device within the air handling unit specified or as shown on plans. The contractor shall follow all manufacturer IOM instructions during installation.

All plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the plasma device, but not directly sensing the power at the ion output shall not be acceptable.

Plasma systems that use multiple modules with ion output alarm wires wired to the same terminal such that all ion modules must fain to show an alarm status shall not be acceptable.

Execution
The Contractor shall be responsible for maintaining all air systems until the Owner accepts the building.

All equipment shall be assembled and installed in a workman like manner to the satisfaction of the Owner, Architect, and Engineer.
Any material damaged by handling, water, or moisture shall be replaced by the mechanical contractor at no cost to the Owner.

All equipment shall be protected from dust and damage on a daily basis throughout construction.

Provide the manufacturer's recommended electrical tests.

A manufacturer's authorized representative shall provide start-up supervision and training of Owner's personnel in the proper operation and maintenance of all equipment.

Acceptable manufacturers shall be Top Product Innovations, Global Plasma Solutions, or approved equal.

PART 3 - EXECUTION

TESTING AND BALANCING

The heating and ventilating subcontractor shall submit to the Owner a record of the capacities of each grille, register, diffuser, and equipment opening as determined by the test after final adjustments have been made with a notation for the final setting and average velocity through each outlet as determined by readings of a velometer taken at several points at the face of the register or opening. Air delivery through supply outlets shall be

considered equal to that quantity as published in the manufacturer's tables. Return air through return air grilles shall be considered as equal to the product of the velometer velocity and effective area of the register.

Thermostats for the heat pump equipment shall be provided as part of that equipment, connected up by the electrical subcontractor, and be tested by the HVAC subcontractor.

The following systems shall be tested at pressures indicated:

Drain piping	10 psi

All tests shall be verified by a test record maintained on the site and witnessed by the signature of inspector.

Any portion of system failing to pass test shall be retested until proven acceptable.

GUARANTEE

The Contractor shall guarantee, in writing, the entire system when completed to be free from any and all defects and shall guarantee the entire system, controls, and other equipment against defective materials and workmanship for a period of one (1) year from date of completion and acceptance.

Upon receipt of notice from the Owner of the failure or any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly repaired or replaced with new parts by and at the expense of the Contractor.

Under the guarantee clause, the Contractor shall include free routine maintenance for a period of one (1) year from the date of final acceptance. At the end of one year of operation, the mechanical contractor shall inspect and repair any problems which may exist. Contractor shall lubricate bearings, adjust or replace belts, replace filters, and provide all necessary preventative and corrective maintenance required. Contractor shall provide Engineer with a table identifying each air handler unit model and serial number, quantity and size of filters, filter manufacturer and efficiency, belt manufacturer and size, motor HP, frame, and power supply.

CLEANING VENTILATING SYSTEMS

All ducts shall be thoroughly cleaned and blown out to prevent any debris from damaging fan wheels or discharging through diffusers when systems are placed in operations. All temporary connections required for blowing out the system, cheesecloth for all duct openings, and any other equipment or labor for cleaning shall be provided by the heating and ventilating subcontractor. All filters shall be renewed after ventilating systems have been cleaned. The cost of renewal shall be borne by the General Contractor.

END OF SECTION 15800

SECTION 15900 - TEMPERATURE CONTROL SYSTEM

PART 1 – GENERAL

DESCRIPTION OF WORK

The automatic temperature controls (ATC) portion of this project will be provided under Section 15950. Subject to section 15950 specifications, the controls shall be as manufactured by Siemens ONLY for tie-in to the existing Siemens system previously installed throughout Baldwin County schools. Controls shall be provided and installed under the supervision of the ATCS contractor responsible for warranty and servicing of the system.

The automatic temperature controls (ATC) portion of this project as specified under Section 15950 shall be bid to and included in the base bid direct to the General Contractor.

COORDINATION

It shall be the Division 15000 contractor's responsibility to include all costs in his bid, associated with the controls work. These shall include but not be limited to the following:

Providing and installation of all dampers and blank offs as required.
Installation of sensor wells for ATC sensors or meters.
Installation of Air Flow Measuring stations and dampers
Starters with control transformers and HOA switches as specified in the mechanical sections.
Mounting of DDC box controllers

END OF SECTION 15900

SECTION 15950 – EMCS & DDC

PART 1 – GENERAL

WORK INCLUDED

General: Building Management System (BMS) Contractor shall provide and install:

Complete temperature control system to be DDC with electric actuation as specified herein.
All wiring, conduit, panels, and accessories for a complete operational system.
BMS Contractor shall be responsible for all electrical work associated with the BMS.
Perform all wiring in accordance with all local and national codes.
Install all line voltage wiring, concealed or exposed, in conduit in accordance with the Division 16 specifications, NEC and local building code.
Provide extension of 120 volt, 20 amp circuits and circuit breakers from Emergency power panels for all BMS equipment power. Provide and install local UPS Power supply for all BMS system panels and equipment.

Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator's workstations.

All low voltage electrical control wiring throughout the building whether in exposed areas shall be run in conduit in accordance with the Division 16 specifications, local building code and the NEC.

Provide system graphics for each controlled device and/or integrated systems as required by the owner. Origin of information shall be transparent to the operator and shall be controlled, displayed, trended, etc. as if the points were hardwired to the BMS.

GENERAL PRODUCT DESCRIPTION

The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing, that the shop drawings have been prepared by the equipment manufacturer and that the equipment manufacturer has supervised their installation. In addition, the equipment manufacturer shall certify, in writing, that the shop drawings were prepared by their company and that all temperature control equipment was installed under their direct supervision.

All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this project. All systems and components shall have been thoroughly tested and proven in actual use for at least two years.

The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator

devices.

System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm to multiple operator workstations without dependence upon a central or intermediate processing device.

DDC Controllers shall be able to assign password access and control priorities to each point individually. The log-on password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust or control only the points that the operator is authorized for. All other points shall not be displayed at the PC workstation or portable terminal. (e.g., all base building and all tenant points shall be accessible to any base building operators, but only certain base building and tenant points shall be accessible to tenant building operators). Passwords and priority levels for every point shall be fully programmable and adjustable.

RELATED SECTIONS

The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.

The following sections constitute related work:

Section 15100 – General Requirements
Section 15200 – Testing, Adjusting, and Balancing for HVAC
Section 15400 – Plumbing
Section 15800 – HVAC
Section 15995 – Commissioning of HVAC Systems
Section 16100 -- Electrical
Section 16720 – Fire Detection and Alarm Systems

APPROVED CONTROL SYSTEM CONTRACTORS & MANAGERS

The following are the only acceptable Control System Products:

Siemens APOGEE Automation System
Siemens TALON Automation System

The following are the approved Control System Contractors:

Engineered Cooling Services – Product Line: Siemens TALON
Control Vendor Contact: Alessa Smith (850) 512-2321
Bobby Marcus, P.E. (850) 393-3300

Siemens Industry, Inc. – Product Line: Siemens APOGEE

Approved Equal; Must obtain approval prior to submitting bid

The new BAS system installed shall communicate to the Existing Baldwin County Board of Education Tridium N4 Supervisor Graphical Workstation

The new BAS system shall include a Tridium N4 Jace with required device licenses and a Three (3) year Service Maintenance Agreement (SMA).
The new BAS system shall include an additional Jace Niagara connection for the existing Supervisor.
All graphics for new BAS system shall be developed for the Tridium N4 Jace. Graphics should include individual graphics for each piece of equipment, floorplans, and any integrated equipment.

QUALITY ASSURANCE

The BAS system shall be designed and installed, commissioned and serviced by factory trained personnel. BAS contractor shall be Siemens Value Added Partner or Siemens Branch. BMS contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment. The BMS contractor shall provide full time, on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the BMS. The Bidder shall be regularly engaged in the installation and maintenance of BMS systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the installation and maintenance of BMS systems similar in size and complexity to this project.

The BMS contractor shall have a minimum of Three (3) Tridium N4 Certified technicians and Three (3) Siemens Certified technicians.

The BMS contractor shall maintain a service organization consisting of factory trained service personnel and provide a list of ten (10) projects, similar in size and scope to this project, completed within the last five years.

Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

All BAS peer-to-peer network controllers, central system controllers, and local user displays shall be UL Listed under Standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under Standard UL 864, categories UUKL, UDTZ, and QVAX and be so listed at the time of bid. All field level controllers shall comply with UL Standard UL 864 category UUKL; Standard UL 864, categories UDTZ, and QVAX and be so listed at the time of Bid.

The BAS peer-to-peer network controllers and local user display shall also comply with the European Electromagnetic Compatibility (EMC) Framework, and bear the C-Tic Mark to show compliance. The purpose of the regulation is to minimize electromagnetic interference between electronic products, which may diminish the performance of electrical products or disrupt essential communications.

DDC peer-to-peer controllers shall be compliant with the European EMC Directive, Standards EN 50081-2 and EN 50082-2, at the Industrial Levels. Additionally the equipment shall be compliant with the European LVD Directive and bear the CE mark in order to show compliance to both directives.

All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

CODES & STANDARDS

Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

National Electric Code (NEC)
International Building Code (IBC) - 2021
International Mechanical Code (IMC) - 2021
[Local] Building Code

SUBMITTALS

Product Submittal Requirements. Meet requirements of Section 15100 on Shop Drawings, Product Data, and Samples. Provide six copies of shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Begin no work until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD compatible files in electronic format (file format: .dwg, .dxf, .vsd, or comparable) or hard copies on 11 x 17 prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work.

Provide submittals within 4 weeks of contract award.

Submittal data shall consist of the following:

Direct Digital Control System Hardware
Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
Manufacturer's description and technical data, such as product specification sheets, installation and maintenance instructions for items listed below and for relevant items not listed below:

Direct Digital Controllers (controller panels)
Transducers and Transmitters
Sensors (including accuracy data)
Valves
Dampers
Relays and Switches
Control Panels
Power Supplies
Operator Interface Equipment

Wiring diagrams and layouts for each control panel. Show all termination numbers.

Controlled Systems
Riser diagrams showing control network layout, communication protocol, and wire types.

Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.

Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic use the same name.

Instrumentation list for each controlled system. List control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.

Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system.

Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.

Description of process, report formats and checklists to be used in the *Control System Demonstration and Acceptance* section in *PART 3 – EXECUTION* of this specification.

Contractor shall submit documentation in the following phased delivery schedule:

Valve and damper schedules
Point Naming Convention
Sample Graphics

System Schematics, including:

System Riser Diagrams
Sequence of Operations
Mechanical Control Schematics
Electrical Wiring Diagrams
Control Panel Layouts
Product Specification Sheets
As-Built drawings

Project Record Documents
Submit three (3) copies of record (as-built) documents upon completion of installation. Submittal shall consist of:

Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD compatible files in electronic format and as 11 x 17 inch prints.
Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements in the *Control System Demonstration and Acceptance* section in *PART 3 – EXECUTION* of this specification.
Certification of pressure test required in the *Control Air Tubing* section in *PART 3 – EXECUTION* of this specification.
Operation and Maintenance (O & M) Manual.
As-built versions of the submittal product data.
Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.
Operator's Manual with procedures for operating control systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
Documentation of all programs created using custom programming language, including setpoints, tuning parameters, and object database.
Graphic files, programs, and database on electronic media..
List of recommended spare parts with part numbers and suppliers.
Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
Complete original original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
Licenses, guarantees, and warranty documents for equipment and systems.

WARRANTY

Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Failures on control systems that include all computer

equipment, transmission equipment and all sensors and control devices during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with the above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

Exception
Contractor shall not be required to warrant reused devices, except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

Contractor shall not be required to warrant systems, equipment and devices or software if the damages and/or failures were caused by lack of training, unauthorized use, negligence or deliberate action of other parties, or job site conditions.

OWNERSHIP & PROPRIETARY MATERIAL

Project specific software and documentation shall become Owner's property. This includes, but not limited to:

Graphics
Record drawings
Database
Application programming code
Project Specific Documentation shall become Owner's property.

General
Submit four (4) copies of owner's manuals upon completion of project.

Submit two (2) electronic copies of complete as-built documentation. All drawings shall be in standard AutoCad format, other documentation shall be in standard MS Office format.

Update manuals with modifications made to system during guarantee period. Provide replacement pages or supplements in quantity stated above for "as-built" manuals.

Operating manual to serve as training and reference manual for all aspects of day-to day operation of the system. As a minimum include the following:

Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.

Description of manual override operation of all control points in system.
BMS system manufacturers complete operating manuals.

Provide maintenance manual to serve as training and reference manual for all aspects of day-to-day maintenance and major system repairs. As a minimum include the following:

Complete as-built installation drawings for each building system.

Overall system electrical power supply schematic indicating source of electrical power for each system component. Indicate all battery backup provisions.

Photographs and/or drawings showing installation details and locations of equipment.

Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.

Parts list with manufacturer's catalog numbers and ordering information.

Lists of ordinary and special tools, operating materials supplies and test equipment recommended for operation and servicing.

Manufacturer's operation, set-up, maintenance and catalog literature for each piece of equipment.

Maintenance and repair instructions.

Recommended spare parts.

Provide Programming Manual to serve as training and reference manual for all aspects of system programming. As a minimum include the following:

Complete programming manuals, and reference guides.

Details of any custom software packages and compilers supplied with system.

Information and access required for independent programming of system.

PART 2 – PRODUCTS

MATERIALS

All products used in this project installation shall be new and currently manufactured and shall have been applied in similar installations. Do not use this installation as a

product test site unless explicitly approved in writing by Owner or Owner's representative. Spare parts shall be available for at least five years after completion of this contract.

COMMUNICATION

The design of the BMS shall support networking of operator workstations and Building Controllers. The network architecture shall consist of two levels, an Ethernet based primary network for all operator workstations, servers, and primary DDC controllers along with secondary Floor Level Networks (FLN) for terminal equipment application specific controllers.

Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.

Primary Network - Panel to Panel Communication
All Building Controllers shall directly reside on the primary Ethernet network so that communications may be executed directly between Building Controllers, directly between server and Building Controllers on a peer-to-peer basis.

Systems that operate via polled response or other types of protocols that rely on a central processor, file server, or similar device to manage panel-to-panel or device-to-device communications shall not be acceptable.

All operator interfaces shall have the ability to access all point status and application report data or execute control functions for any and all other devices. Access to data shall be based upon logical identification of building equipment. No hardware or software limits shall be imposed on the number of devices with global access to the network data.

The primary network shall use TCP/IP over Ethernet. All devices must:

Auto-sense 10/100 Mbps networks.
Receive an IP Address from a Dynamic Host Configuration Protocol (DHCP) Server or be configured with a Fixed IP Address.
Resolve Name to IP Addresses for devices using a Domain Name Service (DNS) Server on the Ethernet network.
Allow MMI access to an individual Primary Network Controller using industry standard Telnet software to view and edit entire Primary Network.

The primary network shall provide the following minimum performance:

Provide high-speed data transfer rates for alarm reporting, report generation from multiple controllers and upload/download efficiency between network devices. System performance shall insure that an alarm occurring at any Building Controller is displayed at any PC workstations, all Building Controllers, and other alarm printers within 15 seconds.
Message and alarm buffering to prevent information from being lost.
Error detection, correction, and re-transmission to guarantee data integrity.

Synchronization of real-time clocks between Building Controllers, including automatic daylight savings time corrections.

The primary network shall allow the Building Controllers to access any data from, or send control commands and alarm reports directly to, any other Building Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. Building Controllers shall send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device. The network shall also allow any Building Controller to access, edit, modify, add, delete, back up, restore all system point database and all programs.
The primary network shall allow the Building Controllers to assign password access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the PC workstation or portable terminal. (e.g., all base building and all tenant points shall be accessible to any base building operators, but only certain base building and tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.

Devices containing custom programming must reside on the Primary Network.

Secondary Network – Application Specific Controller Communication
Communication over the secondary network shall be BACnet MS/TP protocol.

This level communication shall support a family of application specific controllers for terminal equipment.

The Application Specific Controllers shall communicate bi-directionally with the primary network through Building Controllers for transmission of global data.

A maximum of 50 terminal equipment controllers may be configured on individual secondary networks to ensure adequate global data and alarm response times.

BUILDING CONTROLLER SOFTWARE

Furnish the following applications software to form a complete operating system for building and energy management as described in this specification.

The software programs specified in this Section shall be provided as an integral part of Building Controllers and shall not be dependent upon any higher level computer or another controller for execution.

All points, panels and programs shall be identified by a 30-character name. All points shall also be identified by a 16-character point descriptor. The same names shall be displayed at both Building Controller and the Operator Interface.

All digital points shall have a user defined two-state status indication with 8 characters minimum (e.g., Summer, Enabled, Disabled, Abnormal).

Building Controllers shall have the ability to perform energy management routines

including but not limited to time of day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating/cooling interlock, supply temperature reset, priority load shedding, and power failure restart.

The Building Controllers shall have the ability to perform the following pre tested control algorithms:

Two position control
Proportional control
Proportional plus integral control
Proportional, integral, plus derivative control
Automatic tuning of control loops
Model-Free Adaptive Control

Each controller shall be provided with an interactive HELP function to assist operators using POTs and remote connected operators.

SYSTEM SECURITY

User access shall be secured using individual security passwords and user names.

Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.

User Log On/Log Off attempts shall be recorded.

The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.

Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the field panel.

USER DEFINED CONTROL APPLICATIONS

Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

It shall be possible to use any system measured point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.

Any process shall be able to issue commands to points in any and all other controllers in the system.

Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.

Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.

Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task oriented information from the user manual.

ALARM MANAGEMENT

Alarm management shall be provided to monitor and direct alarm information to operator devices. Each Building Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

Conditional alarming shall allow generation of alarms based upon user defined multiple criteria.

An Alarm “shelving” feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).

Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.

Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.

All alarm or point change reports shall include the point's user defined language description and the time and date of occurrence.

The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, Building Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each Building Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.

In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200-character alarm message to more fully describe the alarm condition or direct operator response.

Each Building Controller shall be capable of storing a library of at least 50 alarm

messages. Each message may be assigned to any number of points in the Controller.

Operator-selected alarms shall be capable of initiating a call to a remote operator device.

SCHEDULING

Provide a comprehensive menu driven program to automatically start and stop designated object or group of objects in the system according to a stored time.
Schedules shall reside in the building controller and shall not rely on external processing or network.

It shall be possible to define a group of objects as a custom event (i.e., meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.

For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.

The operator shall be able to define the following information:

Time, day
Commands such as on, off, auto, etc.
Time delays between successive commands.

There shall be provisions for manual overriding of each schedule by an authorized operator.

It shall be possible to schedule calendar-based events up to one year in advance based on the following:

Weekly Schedule: Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, and stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.
Exception Schedules: Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.
Holiday Schedules: Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.
Night setback control: The system shall provide the ability to automatically adjust setpoints for night control.
Loop Control: A Model-Free Adaptive Control algorithm or alternatively a PID (proportional-integral-derivative) closed-loop control algorithm with direct or reverse action and anti-windup shall be supplied. The algorithm shall calculate a time-varying

analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and weighting parameters shall be user-selectable.

Sequencing
Provide application software based upon the sequences of operation specified to properly sequence equipment.

Staggered Start
This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable.

Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

Totalization
Run-Time Totalization: Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.

Consumption totalization: Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for all analog and digital pulse input type points.

Event totalization: Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.

Data Collection
A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.

Building Controllers shall store point history data for selected analog and digital inputs and outputs.

Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.

Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in third-party personal computer applications.

Loop Tuning: Building Controllers shall also provide high resolution sampling capability for verification of DDC control loop performance. Documented evidence of tuned control loop performance shall be provided on a <monthly, seasonal, quarterly, annual> period.

For Model-Free Adaptive Control loops, evidence of tuned control loop performance shall be provided via graphical plots or trended data logs. Graphical plots shall minimally include depictions of setpoint, process variable (output), and control variable (e.g., temperature). Other parameters that may influence loop control shall also be included in the plot (e.g., fan on/off, mixed-air temperature).

For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops. In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.

Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

BUILDING CONTROLLERS

Building Controllers shall be 32-bit, multi-tasking, multi-user, real-time 100 MHz digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and the attached point list.

Each Building Controller shall have sufficient memory, a minimum of 24 megabyte, to support its own operating system and databases, including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, and dial-up communications.

Provide Universal I/O capability, including software configurable universal inputs and universal outputs.

Each Building Controller shall support a minimum of one directly connected Secondary Network.

Building Controller shall have an integral real-time clock.

Each Building Controller shall support firmware upgrades without the need to change hardware.

Each Building Controller shall support:

Monitoring of industry standard analog and digital inputs, without the addition of equipment outside the Building Controller cabinet.
Monitoring of industry standard analog and digital outputs, without the addition of equipment outside the Building Controller cabinet.

Spare Point Capacity
Each Building Controller shall have a minimum of 10 percent spare point capacity.

The type of spares shall be in the same proportion as the implemented I/O functions of the panel, but in no case shall there be less than one spare of each implemented I/O type.

Provide all processors, power supplies, and communication controllers so that the implementation of adding a point to the spare point location only requires the addition of the appropriate:

Expansion modules
Sensor/actuator
Field wiring/tubing

Serial Communication
Building Controllers shall provide at least two EIA-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, and portable laptop operator's terminals. Building Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected printers or terminals.

I/O Status and Indication
Building Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LEDs or analog indication of value shall also be provided for each analog output. All wiring connections shall be made to field-removable terminals.

Shall provide I/O modules with LCD’s capable of displaying information faults including but not limited to open circuit, short circuit, unreliable input signal, signal under range, and signal over range via informative symbols.

Self Diagnostics. Each Building Controller shall continuously perform self diagnostics, communication diagnosis, and diagnosis of all panel components. The Building Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication for any system.

Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days..

Environment
Controller hardware shall be suitable for the anticipated ambient conditions.

Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

Immunity to power and noise.

Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.

Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:

RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3V

Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact

Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power

Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)

Isolation shall be provided at all Building Controller's AC input terminals to suppress induced voltage transients consistent with:

IEEE Standard 587 1980

UL 864 Supply Line Transients

Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

Local Controller Interface

A local user interface to the controller shall be provided. The interface may be mounted on any building controller and automatically read and initiate commands of local database points without further set-up or configuration. The Controller Interface shall be provided for interrogating and editing data, commanding point values at user defined priorities, viewing and acknowledging alarms, and viewing point monitoring reports. An optional system security password shall be available to prevent unauthorized use of the local controller interface and display.

Minimum Approved Building Controllers.

BMS Contractors shall furnish Building Controllers as listed below. Providing an approved controller does not release the contractor from meeting all performance, software and hardware specifications for Building Controllers and system operations.

Siemens – PXC / TC Compact Controllers, PXC / TC Modular Controllers.

APPLICATION SPECIFIC CONTROLLERS (ASC)

Provide for control of each piece of equipment, including, but not limited to the following:

Heat Pumps

Each Building Controller shall be able to communicate with application specific controllers (ASCs) over the Secondary Network to control terminal equipment only.

Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

Each ASC shall include all point inputs and outputs necessary to perform the specified control sequences. The ASC shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control output signals shall not be acceptable. Outputs utilized either for two-state, modulating floating, or proportional control, allowing for additional system flexibility.

Space Combination Temperature / Relative Humidity / CO2 Sensors. Each controller performing space temperature control shall be provided with a matching room sensor.

Wired temperature sensor specifications. The sensing element for the space temperature sensor must be IC-based and provide the following.

Digitally communicating with the Application Specific Controller.

Auxiliary Communication Port
Each room temperature sensor shall include a terminal jack integral to the sensor assembly. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit.

Setpoint Adjustment Dial
The setpoint adjustment function dial shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator.

Override Switch
An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator.

Communication
Each controller shall perform its primary control function independent of other Secondary Network communication, or if Secondary Network communication is interrupted. Reversion to a fail-safe mode of operation during Secondary Network interruption is not acceptable.

Control Algorithms

The controller shall receive its real-time data from the Building Controller time clock to ensure Secondary Network continuity. Each controller shall include algorithms incorporating proportional, integral and derivative (PID) gains for all applications. All PID gains and biases shall be field-adjustable by the user via room sensor LCD. Controllers that incorporate proportional and integral (PI) control algorithms only shall not be acceptable.

Control Applications

Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.

Programmability

Application Specific Controllers shall be programmable, using software provided by the BMS manufacturer. Software shall be field-installable on any standard laptop. Program language shall be text-based and allow up to 200 lines of code for programming. Programming shall allow for changing sequence of operation, commanding and releasing points, additional monitoring, and command priority management within the Application Specific Controller.

Calibration

Each controller shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and ensuring against drift over time.

Manual calibration may be accomplished by either commanding the actuator to 0% via the POT or by depressing the room sensor override switch. Calibration of the transducer at the controller location shall not be necessary.

Calibration shall be accomplished by stroking the terminal unit damper actuator to a 0% position so that a 0 cfm air volume reading is sensed. The controller shall automatically accomplish this whenever the system mode switches from occupied to unoccupied or vice versa.

Calibration shall be accomplished by zeroing out the pressure sensor and holding damper at last known position until calibration is complete. The controller shall automatically accomplish this whenever the system mode switches from occupied to unoccupied or vice versa.

Memory

Provide each ASC with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or minimum of 72-hour battery backup shall be provided. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

Upon replacement, new ASCs shall recover control function and site specific defaults automatically and resume normal operation.

Power Supply

The ASCs shall be powered from a 24 Vac source and shall function normally under an operating range of 18 to 28 Vac, allowing for power source fluctuations and voltage drops. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type. The BMS contractor shall provide 24 Vac power to the terminal units by utilizing:

The existing line voltage power trunk and installing separate isolation transformers for each controller.

Dedicated line voltage power source and isolation transformers at a central location and installing 24 Vac power trunk to supply multiple ASCs in the area.

Environment

The controllers shall function normally under ambient conditions of 32 to 122°F (0 to 50°C) and 10% to 95% rh (non-condensing). Provide each controller with a suitable cover or enclosure to protect the circuit board assembly.

Immunity to noise. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

Controllers for Heat Pump terminals

All Heat Pump terminal control applications shall be field selectable such that a single controller may be used in conjunction with any of the above types of terminal units to perform the specified sequences of control. ASCs that require factory application changes are not acceptable. The Heat Pump terminal ASC shall support the following types of pressure independent terminal boxes as a minimum:

Single-stage heat pump control
Multiple-stage compressor with reversing valve and mixed air
Heating and cooling compressors and mixed air

INPUT/OUTPUT INTERFACE

Hardwired inputs and outputs may tie into the system through building or application specific controllers.

Modular, “hot-swappable” I/O so that the electronics of a small portion of the I/O can be replaced without effecting the power or communication for the other points.

All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to ten (10) pulses per second for pulse accumulation.

Analog inputs shall allow the monitoring of low-voltage (0 to 10 Vdc), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with—and field configurable to—commonly available sensing devices.

24 Vdc shall be available next to the point signal for powering the output device.

Binary outputs shall provide for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.
Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 Vdc or 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on building or custom application controllers shall have status lights and manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

Tri-State Outputs: Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

Point name labels: It shall be possible to print customized name labels for each I/O point and install on an existing holder on the I/O device.

System Object Capacity: The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

POWER SUPPLIES & LINE FILTERING

Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.

Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC

Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

Line voltage units shall be UL recognized and CSA approved.

Power line filtering.

Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:

Dielectric strength of 1000 volts minimum
Response time of 10 nanoseconds or less
Transverse mode noise attenuation of 65 dB or greater
Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz.

AUXILIARY CONTROL DEVICES

Specified in this section are the following hard wired input/output devices connected to the Building Controller or ASC:

Electric Damper Actuators
Binary Temperature Devices
Temperature Sensors
Dew Point/Humidity Sensors
Indoor Air Quality (CO2/TEMP/RH) Space Sensors
Current Switches
Local Control panels

Specified in this section are the following devices connected to the BMS using secondary network communication.

Indoor Air Quality (CO2) Space Sensors
Power Monitors
Electric Damper Actuators

General
All actuators shall be manufactured; brand labeled, or distributed by Siemens or Belimo.

All damper actuators having more then 100 lb-in torque output shall have a self-centering damper shaft clamp. V-bolt type damper shaft clamp is not acceptable.

The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing. Alternatively, an uninterruptible power supply (UPS) may be provided. On terminal unit valves actuators and 2-second timing damper actuators capacitor driven fail action is permitted.

Modulating actuator shall accept a 0-10 Vdc control signal and provide a 0-10 Vdc

operating range.

All 24 Vac/Vdc actuators shall operate on Class 2 wiring.

All actuators over 20 lb-in torque capacity shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered and spring-return actuators shall have a manual crank for this purpose.

Upon start up and after power loss, the actuator must immediately respond to control signals. Actuators requiring calibration to determine end stops are not acceptable.

Electric actuators for emergency generator damper control shall be rated for 350°F. maximum operating temperature and capable to drive fully open and close within 15 seconds.

All actuators that provide a factory mounted electrical appliance or plenum rated cabling must be marked with numbers on the wires as well as color coded.

Provide built-in dual end switches as required for the sequence of operation.

Control damper actuators shall be RoHS Part A complaint.

Binary temperature devicesID: 319]

Line-voltage space thermostat

Line-voltage thermostats shall be bimetal-actuated, snap acting SPDT contact, enclosed, UL Listed for electrical rating. The thermostat cover shall provide exposed setpoint adjustment knob. The thermostat shall operate within the 55°F to 85°F setpoint range, with 2°F maximum differential.

Temperature sensors

Provide the following instrumentation as required by the monitoring, control and optimization functions. All temperature sensors shall use platinum RTD elements only, except for those connected to application specific controllers via RJ-11 connector.

Room Temperature:

Temperature monitoring range	+40/+90°F (+40/120°F for high temp alarms)
Installation adjustments	none required
Calibration adjustments	none required
Factory calibration point	32°F
Accuracy at calibration point	+/- 0.7°F

Duct (Single Point) Temperature

Temperature monitoring range	+20/+120°F or +30/+250°F
Installation adjustments	none required
Calibration adjustments	none required
Factory calibration point	70°F
Accuracy at calibration point	+/- 0.54°F

Duct (Averaging) Temperature

Temperature monitoring range	+20/+120°F
Installation adjustments	none required
Calibration adjustments	none required
Factory calibration point	32°F
Accuracy at calibration point	+/- 0.54°F

Outside Air Temperature

Temperature monitoring range	-58/+122°F
Installation adjustments	none required
Calibration adjustments	none required
Factory calibration point	70°F
Accuracy at calibration point	+0.5°F

Dew point/humidity sensors
Outside Air Dew Point Temperature

Dew point monitoring range	-40/+115°F DP, 12% to 99% rh
Output signal	4-20 mA
Calibration adjustments	zero and span
Factory calibration point	70°F
Accuracy at calibration point	+2.0°F DP

Room/duct Relative Humidity

Sensor Humidity range	0 to 100%
Operating temperature	15°F to +170°F
Accuracy	+2% rh
Sensing element	Capacitive sensor
Output signal	4-20 mA DC
Installation adjustments	none required
Operating temperature	15°F to +170°F
Voltage requirement	12-36 Vdc

Indoor air quality (CO2/TEMP/RH) sensors
Provide indoor air quality sensors to monitor Carbon Dioxide (CO2), and Temperature and Humidity.

Duct and Wall mounted sensors with Temperature shall have an option for active or passive temperature outputs (based on part number)

The sensor shall meet the following requirements:

Operating voltage:	24 Vac +/- 20%, or 15 to 35Vdc
Frequency:	50/60 Hz
Power consumption:	max. 6 VA
CO2 measuring range:	0 – 2000 ppm
Tolerance:	+/- 50 ppm

Output: 0 - 10 Vdc or 0 - 5 Vdc Field configurable
Output (passive T, selectable) pt100, pt1000, Ni1000, NTC 10K
Calibration: none required
Permissible air velocity in duct: <26.2 ft/s.

Current switches
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.

Local control panels
All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable sub panels. A single key shall be common to all field panels and sub panels.

Interconnections between internal and face mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

COMMUNICATION & WIRING CONTROL

Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16 unless otherwise noted herein.

All insulated wire to be copper conductors, UL labeled for 90°C minimum service.

Wire Sizing and Insulation

Wiring shall comply with minimum wire size and insulation based on services listed below:

Service	**Minimum Gage/Type**	**Insulation Class**
AC 24V Power	12 Ga Solid	600 Volt
DC 24V Power	10 Ga Solid	600 Volt
Class 1	14 Ga Stranded	600 Volt
Class 2	18 Ga Stranded	300 Volt
Class 3	18 Ga Stranded	300 Volt

Provide plenum-rated cable when open cable is permitted in supply or return air plenum where allowed per execution specifications defined in *Paragraph 3.07 – Wiring* of this specification.

Power Wiring
115V power circuit wiring above 100 feet distance shall use minimum 10 gage.

24V control power wiring above 200 feet distance shall use minimum 12 gage.

Control Wiring
Digital Input/Output wiring shall use Class 2 twisted pair, insulated.

Analog inputs shall use Class 2 twisted shielded pair, insulated and jacketed and require a grounded shield.

Actuators with tri-state control shall use 3 conductor with same characteristics

Communication Wiring
Ethernet Cable shall be minimum CAT5.

Secondary level network shall be 24 gage, TSP, low capacitance cable.

Approved Cable Manufacturers
Wiring from the following manufacturers which meet the above criteria shall be acceptable:

Anixter
Belden

PART 3 – EXECUTION

EXAMINATION

The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others.

PROTECTION

The contractor shall protect all work and material from damage by its employees and/or subcontractors and shall be liable for all damage thus caused.

The contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted.

COORDINATION

Site

The project coordination between trades is the responsibility of the prime contractor who is the one tier higher contractual partner such as mechanical contractor, general contractor, construction manager, owner or owner's representative as applicable.

The controls contractor shall follow prime contractor's job schedule and coordinate all project related activities through the prime contactor except otherwise agreed or in minor job site issues. Reasonable judgment shall be applied.

Where the work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment.

If the contractor deviates form the job schedule and installs work without coordinating with other trades, so as to cause interference with work of other trades, the contractor shall make the necessary changes to correct the condition without extra charge.

Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

Submittals

Refer to the *Submittals* section in *PART 1-GENERAL* of this specification for requirements.

Test and Balance

The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.

In addition, the contractor shall provide a qualified technician for duration of 8 hours to assist in the test and balance process.

The tools used during the test and balance process shall be returned at the completion of the testing and balancing.

Life Safety

Duct smoke detectors required for air handler shutdown are supplied under Division 16 of this specification. The contractor shall interlock smoke detectors to air handlers for shutdown.

Coordination with controls specified in other sections or divisions.

Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

All communication media and equipment shall be provided as specified in the *Communication* section in *PART 2 – PRODUCTS* of this specification.

Each supplier of controls product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this section.

The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.

The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

GENERAL WORKMANSHIP

Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

Install all equipment in readily accessible locations as defined by *Chapter 1, Article 100, Part A* of the *National Electrical Code (NEC).*

Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

FIELD QUALITY CONTROL

All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in *PART 1 – GENERAL* of this specification.

Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

Contractor shall have work inspected by local and/or state authorities having jurisdiction over the work.

EXISTING EQUIPMENT

Unless otherwise directed, the contractor is not responsible for the repairs or

replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.

WIRING

All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ from those in Division 16, the requirements of this section shall take precedence.

All NEC Class 1 (line voltage) wiring shall be UL Listed in approved conduit according to NEC and Division 16 requirements.

All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)

Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in conduit may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.

All wiring in mechanical, electrical, or service rooms—or where subject to mechanical damage— shall be installed in conduit.

Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

Do not install wiring in conduit containing tubing.

Where plenum rated cable is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.

Where plenum rated cable is used without conduit, it shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical conduits, piping, or ceiling suspension systems.

All wire-to-device connections shall be made at a terminal block or wire nut. All wire-to-wire connections shall be at a terminal strip or wire nut.

All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the contractor shall provide step-down transformers or interposing relays.

All plenum rated wiring shall be installed as continuous lengths, with no splices permitted between termination points

All wiring in conduit shall be installed as continuous lengths, with no splices permitted

between termination points or junction boxes.

Maintain fire rating at all penetrations. Install plenum wiring in sleeves where it passes through walls and floors.

Size and type of conduit and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.

Include one pull string in each conduit 3/4 in. or larger.

Control and status relays are to be located in designated enclosures only. These enclosures can include packaged equipment control panel enclosures unless they also contain Class 1 starters.

Conceal all conduit, except within mechanical, electrical, or service rooms. Install conduit to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).

Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements. Conduit and pull boxes may not be hung on flexible duct strap or tie rods. Conduits may not be run on or attached to ductwork.

Adhere to this specification's Division 16 requirements where conduit crosses building expansion joints.

The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal conduit less than 1/2 inch electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

Conduit must be adequately supported, properly reamed at both ends, and left clean and free of obstructions. Conduit sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

COMMUNICATION WIRING

The contractor shall adhere to the items listed in the *Wiring* section in *PART 3 – EXECUTION* of the specification.

All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

All runs of communication wiring shall be unspliced length when that length is commercially available.

All communication wiring shall be labeled to indicate origination and destination data.

Grounding of coaxial cable shall be in accordance with NEC regulations article on *Communications Circuits, Cable, and Protector Grounding*.

INSTALLATION OF SENSORS

Install sensors in accordance with the manufacturer's recommendations.

Mount sensors rigidly and adequately for the environment within which the sensor operates.

Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

Sensors used in mixing plenums and hot and cold decks shall be of the averaging type.

Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the full face of the coil.

All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

Room Instrument Mounting

Room instruments, including but not limited to wall mounted thermostats and sensors located in occupied spaces shall be mounted 53 inches above the finished floor unless otherwise shown.

Instrumentation Installed in Piping Systems

Thermometers and temperature sensing elements installed in liquid systems shall be installed in thermowells.

Gauges in piping systems subject to pulsation shall have snubbers.

Gauges for steam service shall have pigtail fittings with isolation valve.

Duct Smoke Detectors
Duct smoke detectors will be provided by the Electrical Contractor in supply and return air ducts in accordance with Division 16.

Contractor shall connect the DDC System to the auxiliary contacts provided on the Smoke Detector as required for system safeties and to provide alarms to the DDC system.

Averaging Temperature Sensing Elements
Sensing elements shall be installed in a serpentine pattern.

Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

ACTUATORS

Mount and link control damper actuators according to manufacturer's instructions.

To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

Provide all mounting hardware and linkages for actuator installation.

Electric/Electronic

Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.

PROGRAMMING

Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free within the primary controller for future use.

Point Naming
System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Point Naming standard shall be agreed upon between owner and BAS contractor. Refer to the *Submittals* section in *PART 1 – GENERAL* of this specification.

Software Programming

Provide programming for the system and adhere to the sequences of operation provided. The contractor also shall provide all other system programming necessary for the operation of the system, but not specified in this document. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation and be of different font and color in text editor. Use the appropriate technique based on one of the following programming types:

Text-based

Must provide actions for all possible situations.
Must be modular and structured.
Must be commented.
Must provide line–by–line programming and compilation wizard to allow for ease of editing.

Graphic-based

Must provide actions for all possible situations.
Must provide programming and compilation wizard to allow for ease of editing.
Must be documented.

Operator Interface

Standard graphics—Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints.

Show terminal equipment information on a “graphic” summary table. Provide dynamic information for each point shown.

The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

Contractor shall provide necessary programming to create all reports referred to in the *Operator Interface Software* section in *PART 2–PRODUCTS* of this specification.

CONTROL SYSTEM DEMONSTRATION & ACCEPTANCE

Demonstration

Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.

The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary of the installation, start-up, and debugging process

and as specified in the *Control System Checkout and Testing* section in *PART 3–EXECUTION* of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.

The demonstration process shall follow that approved in the *Submittals* section in *PART 1–GENERAL* of this specification. The approved checklists and forms shall be completed for all systems as part of the demonstration.

The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.

As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.

Demonstrate compliance with the *System Performance* section in *PART 1–GENERAL* of this specification.

Demonstrate compliance with sequences of operation through all modes of operation.

Demonstrate complete operation of operator interface.

Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

Acceptance

All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.

The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in the *Submittals* section in *PART 1–GENERAL* of this specification.

CLEANING

The contractor shall clean up all debris resulting from their activities daily. Contractor shall remove all cartons, containers, crates, etc., under their control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

TRAINING

The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed. Factory employed/certified instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays.

SEQUENCE OF OPERATION

Refer to Sequence on plans.

END OF SECTION 15950

SECTION 15995 - COMMISSIONING OF HVAC SYSTEMS

PART 1 – GENERAL

GENERAL

General provisions and mechanical are specified in division 15.

This division covers the commissioning of the mechanical and their controls systems.

The commissioning authority shall be the Baldwin County School Board facilities department.

Qualifications and experience for the HVAC commissioning team.

At a minimum, the proponent company's qualifications and experience shall include the following:

Membership in AABC Commissioning Group (ACG) and commissioning certification from that organization.
At least 10 years of experience with the types of building HVAC and control systems included in this project.
Knowledge of operations and maintenance requirements.
A thorough knowledge of testing, adjusting and balancing (TAB) procedures and methods.
Knowledge and experience with applicable life safety codes, regulations, and procedures.
Successful experience working with multi-disciplinary teams.
Excellent oral and written communication skills.

SUBMITTALS

Approval is required for submittals. The following shall be submitted in accordance with submittal procedures:

Product Data:

Commissioning Team:

List of team members who will represent the contractor to the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Proposed revision to the list, prior to the start of the impacted work. Two commissioning teams shall be required.

Test Schedule: Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

Test Reports: Completed pre-commissioning checklists and functional performance test

checklists organized by system and by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

SEQUENCE AND SCHEDULING

The work described in this section shall being only after all work required in related Sections, including Section 15200: Testing and Balancing Air and Water Distribution Systems and Section 15900 for Automatic Temperature Control Systems and 15950 for EMCS & DDC has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved.

All team members shall be required to be on the project site for the commissioning procedures.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

COMMISSIONING TEAM AND CHECKLISTS

The Contractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified herein. In addition, the Owner shall be represented by a representative of the Construction Office and the Architect Design Team Representative. The team members shall be as follows:

Designation Function:

M Contractor's Mechanical Representative
E Contractor's Electrical Representative
T Contractor's Testing, Adjusting, and Balancing Representative
C Contractor's Controls Representative
D Design Agent's Representative
O Owner's Representative

Each checklist shown in appendices A and B shall be completed by the commissioning team. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date unless an "X" is shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.

TESTS

The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the

information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are dependent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. The Contractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating commissioning team member of which participation is specified is not present for the test. The Contractor shall reimburse the Owner for all costs associated with effort lost due to tests that are aborted.

Pre-commissioning Checks

Pre-commissioning checks shall be performed for the items indicated on the checklists in Appendix A. Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable contractor requirements.

Functional Performance Tests

Functional performance tests shall be performed for the items indicated on the checklists in Appendix B. Functional tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

Pre-Commissioning checklist – Piping

Condensate Drain Piping – All units

Checklist Item	M	E	T	C	D	O
Installation						
a. Piping complete.	___	X	___	X	___	___
b. Cleanout caps installed as required.	___	X	___	X	___	___
c. Piping insulated as required.	___	X	___	X	___	___
d. Piping secured and installed as specified.	___	X	X	X	___	___
Testing, Adjusting, and Balancing (TAB)						
a. Hydrostatic test complete.	___	X	___	___	X	___

Pre-Commissioning Checklist – Ductwork

For Air Handling Unit: AHU#

Checklist Item	M	E	T	C	D	O
Installation						
a. Ductwork complete.	___	X	___	X	___	___
b. As-built shop drawings submitted.	___	X	___	X	___	___
c. Ductwork leak test complete.	___	X	___	X	___	___
d. Fire dampers, and access doors installed as required.	N/A	X	N/A	X	N/A	N/A
e. Ductwork insulated as required.	___	X	___	X	___	___
f. Thermometers and gauges installed as required.	___	___	___	___	___	___
g. Verify open/closed status of dampers.	___	X	___	X	___	___
h. Flexible connectors installed as specified.	___	X	___	X	___	___
Testing, Adjusting, and Balancing (TAB)						
a. TAB operation complete.	___	X	___	X	___	___

Pre-Commissioning Checklist – DX Split System Air Handling Unit

For Air Handling Unit: AHU/HPU#

Checklist Item	M	E	T	C	D	O
Installation						
a. Vibration isolation devices installed.	___	X	X	X	___	___
b. Inspection and access doors are operable and sealed.	___	X	___	X	___	___
c. Casing undamaged.	___	X	X	X	___	___
d. Insulation damaged.	___	X	X	X	___	___
e. Condensate drainage is unobstructed. (Visually verify drainage by pouring a cup of water into drain pan.)	___	X	X	X	___	___
f. Fan belt adjusted (if applicable).	___	X	___	X	___	___
g. Manufacturer's required maintenance clearance provided.	___	X	X	X	___	___
Electrical						
a. Power available to unit disconnect.	___	___	X	X	___	___
b. Power available to electric heater.	___	___	X	___	___	___
c. Proper motor rotation verified.	___	___	___	X	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	X	___	___	___
Coils						
a. Refrigerant piping properly connected.	___	X	X	X	___	___
Checklist Item						
a. Any damage to coil fins has been repaired.	___	X	___	X	___	___
Controls						
a. Air handler controls system operational.	___	X	___	___	___	___

Testing, Adjusting, and Balancing (TAB)

a.	Construction filters removed and replaced.	___	X	___	___	___	___
b.	TAB report submitted.	___	X	___	X	___	___
c.	TAB results within +10%/-0% of cfm shown on drawings.	___	X	___	X	___	___
d.	TAB results for outside air intake within +10%/-0% of both the minimum and Maximum cfms shown on drawings.	___	X	___	X	___	___

Pre-Commissioning Checklist – Fans

For Exhaust and Supply Fans: EF#

Checklist Item	M	E	T	C	D	O
Installation						
a. Fan belt adjusted.	N/A	X	N/A	X	N/A	N/A
b. Speed controller installed.	___	X	___	X	___	___
Electrical						
a. Power available to fan disconnect.	___	___	X	___	___	___
b. Proper motor rotation verified.	___	___	___	X	___	___
c. Verify that power disconnect is located Within sight of the unit it controls.	___	___	X	___	___	___
Controls						
a. Control interlocks properly installed.	___	___	X	___	___	___
b. Control interlocks operable.	___	___	X	___	___	___
c. Dampers/actuators properly installed.	___	X	___	___	___	___
d. Dampers/actuators operable.	___	X	___	___	___	___
e. Verify proper locations and installation of thermostat.	N/A	X	N/A	N/A	N/A	N/A
Testing, Adjusting, and Balancing (TAB)						
a. TAB results –10%/-0% to cfm shown on drawings.	___	X	___	X	___	___
b. TAB Report submitted.	___	X	___	X	___	___

Pre-Commissioning Checklist – HVAC System Controls

For HVAC System: All

Checklist Item		M	E	T	C	D	O
Installation							
a.	As-built shop drawings submitted.	___	X	X	___	___	___
b.	Layout of control panel matches drawings.	___	X	X	___	___	___
c.	Framed instructions mounted in or near control panel.	___	X	X	___	___	___
d.	Components properly labeled (on inside and outside of panel).	___	X	X	___	___	___
e.	Control components piped and/or wired to each labeled terminal strip.	___	X	X	___	___	___
f.	EMCS connection made to each labeled terminal strip as shown.	___	X	X	___	___	___
g.	Control wiring and tubing labeled at all terminations, splices, and junctions.	___	X	X	___	___	___
h.	Shielded wiring used on electronic sensors.	___	X	X	___	___	___
Main Power and Control Air							
a.	110 volt AC power available to panel.	___	___	X	___	___	___
Testing, Commissioning, and Balancing							
a.	Testing, Commissioning, and Balancing Report submitted.	___	X	___	___	___	___

Pre-Commissioning Checklist – Electric Unit Heater

For Electric Unit Heater: EUH#

Checklist Item	M	E	T	C	D	O
Installation						
a. Unit properly installed and secured in wall.	___	X	X	X	___	___
b. Grille undamaged.	___	X	X	X	___	___
c. Heating element fins undamaged.	___	X	X	X	___	___
Electrical						
d. Power available to fan disconnect.	___	___	X	___	___	___
e. Proper motor rotation verified.	___	___	___	X	___	___
f. Verify that power disconnect is located Within sight of the unit it controls.	___	___	X	___	___	___
Controls						
f. Thermostat controls heater operation.	___	___	X	___	___	___
g. Fan delay is functional.	___	___	X	___	___	___

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

Functional Performance Test Checklist – Split System DX Heat Pump Unit

For Heat Pump Unit: AH/HP#

1. Functional Performance Test: Contractor shall verify operation of air handling unit as per specification including the following:

   Occupied Mode:

   - Verify that supply fan energizes with building occupancy schedule:

   - Verify that compressor section cycles on/off with thermostat temperature setpoint:

   - As compressor is “off”, override relative humidity sensor to initiate dehumidification sequence. Verify that compressor energizes and hot gas reheat is functional (verify air handler LAT):

     Cooling mode EAT/LAT =
     Dehumdification mode EAT/LAT =
     Heat Pump Heating mode EAT/LAT =

   - Verify electric resistance heater is operable for heating operation. Override space temperature to energize electric heater sequence.

     Electric heater mode EAT/LAT =

   - Verify that all dampers area in normal position:
     Motorized OA damper opens to preset position:

   - Verify system safeties allow start if safety conditions are met:

   - Verify unit shuts down on building fire alarm (area smoke detector and/or pull station):

   - Verify unit shuts down on duct smoke detector alarm:

   Unoccupied mode:

   - Verify that supply fan de-energizes with building occupancy schedule:

   - Verify that compressor section cycles on /off with thermostat setback temperatures:

   - As compressor is “off”, override relative humidity sensor to initiate “unoccupied”

dehumidification sequence. Verify that compressor energizes and hot gas reheat is functional (verify air handler LAT) (OA damper should remain closed):

Cooling mode EAT/LAT =
Dehumidifcation mode EAT/LAT =
Heat Pump Heating mode EAT/LAT =

- Verify that all dampers are in normal position:
  Motorized OA damper closes:

2. Certification: We the undersigned have witnessed the above functional performance
tests and certify that the item tested has met the performance requirement in this section of the specifications.

	Signature and Date
Contractor's Mechanical Representative	_____
Contractor's Electrical Representative	_____
Contractor's Testing, Adjusting, and Balancing Representative	_____
Contractor's Controls Representative	_____
Owner's Representative	_____

Functional Performance Test Checklist – Fans

For Exhaust Fan: EF#

1. Functional Performance Test: Contractor shall verify operation of fan as per specification including the following:

   Occupied Mode:

   - Verify exhaust fan energizes with building occupancy schedule:
   - Verify fan operates without excessive noise and/or vibration:
   - Verify system safeties allow start if safety conditions are met:

   Unoccupied Mode:

   - Verify exhaust fan de-energizes with building occupancy schedule.

2. Certification: We the undersigned have witnessed the above functional performance test and certify that the item tested has met the performance requirements in this section of the specification.

	Signature and Date
Contractor's Mechanical Representative	_____
Contractor's Electrical Representative	_____
Contractor's Testing, Adjusting, and Balancing Representative	_____
Contractor's Controls Representative	_____
Owner's Representative	_____

For Exhaust Fan: EF#

1. Functional Performance Test: Contractor shall verify operation of fan as per specification including the following:

   Occupied Mode:

   - Verify exhaust fan energizes with building occupancy schedule:
   - Verify fan operates without excessive noise and/or vibration:
   - Verify system safeties allow start if safety conditions are met:

   Unoccupied Mode:

   - Verify exhaust fan de-energizes with building occupancy schedule.

2. Certification: We the undersigned have witnessed the above functional performance test and certify that the item tested has met the performance requirements in this section of the specification.

	Signature and Date
Contractor's Mechanical Representative	_____
Contractor's Electrical Representative	_____
Contractor's Testing, Adjusting, and Balancing Representative	_____
Contractor's Controls Representative	_____
Owner's Representative	_____

Functional Performance Test Checklist – Electric Unit Heater

For Wall Heater: EUH#1

1. Functional Performance Test: Contractor shall verify operation of heater as per specification including the following:

   - Verify that supply fan energizes prior to heating element:

   - Verify that supply fan remains operational when heater de-energizes for fan delay:

   - Verify that built-in thermostat activates/de-activates heating mode:

   - Verify leaving air temperature during heating mode:

     Electric heater LAT =

2. Certification: We the undersigned have witnessed the above functional performance
   tests and certify that the item tested has met the performance requirement in this section of the specifications.

	Signature and Date
Contractor's Mechanical Representative	_____
Contractor's Electrical Representative	_____
Contractor's Testing, Adjusting, and Balancing Representative	_____
Contractor's Controls Representative	_____
Owner's Representative	_____

ELECTRICAL SPECIFICATIONS 16000

SECTION 16100 - ELECTRICAL

PART 1 - GENERAL

RELATED DOCUMENTS

The General and/or Special Conditions Sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to this work. Section 16 is sub-divided for convenience only.

SCOPE

Furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete electrical systems as shown on the drawings and specified herein. Work shall include but is not necessarily limited to the following items:

Service Entrance
Grounding
Lighting and controls
Demolition
Telecommunications
Exterior Distribution/Branch Circuits
Interior Distribution/Branch Circuits
Equipment Connections
Fire alarm
Intercom/Sound
Outdoor Lighting

JOB CONDITIONS

Site Inspections: Before submitting proposals, each bidder should visit the site and fully familiarize himself with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities, as to requirements of materials to be furnished, or as to the extent of demolition required.

Existing Conditions: All utilities, existing systems, and conditions shown on the plans as existing are approximate, and the Contractor shall verify all details of the project before any work is started.

Scheduled Interruptions: Planned interruptions of utilities service, to any facility affected by this contract, shall be carefully coordinated and approved by the Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until specific approval has been granted by the Architect. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and material required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.

Maintaining Service: Any existing service (or operating system) which must be interrupted for any length of time shall be supplied with a temporary service as necessary for continuation of the normal operation of this facility.

Removal of Existing Work: Where noted or indicated on the drawings, or specified herein, existing electrical materials and equipment shall be removed from the building. All materials designated to be removed by the Contractor, not to be salvaged and given to the Owner or required to be reinstalled, including scrap, shall become the property of the Contractor, and shall be promptly removed from the site. Existing items required to be removed temporarily in order to properly install new work shall be replaced in a satisfactory manner upon completion.

TEMPORARY POWER

Furnish and maintain temporary wiring system for light and power for use during construction by all trades. Use solidly grounded system. Limit over-current protection to 20 amperes on No. 12 conductors. Coordinate all requirements for temporary power with the serving utility and pay for all charges incurred while furnishing power for construction. Verify whether charges for electrical power consumption are specified in Division One; if so, payment of bills for power consumption are not included under this section.

Accidental Interruptions: All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If accidental utility interruption resulting from work performed by the Contractor occurs, service shall be immediately restored to its original condition without delay, by and at the expense of the Contractor, using skilled workmen of the trade required.

CODES, PERMITS AND INSPECTIONS

The installation shall comply with all local, state, and federal laws and ordinances applicable to electrical installation and with the regulations of the latest published edition of the National Electrical Code (N.E.C.) where such regulations do not conflict with those laws and ordinances. The Contractor shall obtain and pay for all permits and inspection fees, and after completion of the work, shall furnish the Architect a certificate of final inspection and approval from the applicable local inspection authorities. Any charges by a utility (Power, Telephone, Cable TV, etc.) for providing service as shown shall be included in the bid and paid by the Contractor. The installation shall comply with:

International building Code 2021
International Fire Code 2021
NFPA 70, National Electrical Code
NFPA 72, National Fire Alarm and Signaling Code
ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings

DRAWINGS AND SPECIFICATIONS

The drawings and these specifications are complimentary each to the other. What is called for by one shall be as binding as if called for by both. Where the drawings and/or specifications differ as to quantity or quality, the greater quantity or higher quality shall be provided. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

STANDARDS OF MATERIALS AND WORKMANSHIP

Materials: All materials shall be new and shall be listed and approved by the Underwriters' Laboratories, Inc., in every case where a standard has been established for a particular type of material in question. All work shall be executed in a workmanlike manner and shall present a neat appearance.

Prior Approvals: Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer. It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the Contractor's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Other named manufacturers, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the engineer shall reserve the right to reject it. Where use of such equipment requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit and any other equipment. The Contractor shall furnish said changes and additions and pay all costs for all changes to the work and the work of others affected by using such equipment.

For approval of products other than those specified, bidders shall submit to the Architect, a request in writing, at least ten (10) days prior to bid date. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data, model numbers, list of references or other information necessary to completely describe the item. Approval will be in the form of an Addendum to the specifications issued to all prospective Prime Contract Bidders on record. The Addendum will indicate the additional products which are approved for this project.

If a bidder proposes to use substitute materials or equipment for the following items, he shall obtain a minimum of ten (10) days before Bid "Prior Approval" or longer as described in "Instructions to Bidders" for the items indicated below:

Lighting controls.
Dry type transformers.
Panelboards.
Safety switches.
Lighting fixtures.
Emergency battery units.
Fire alarm system.
Intercom/Clock

Approval on other items shall be handled in the normal manner, as described in "Instructions to Bidders", under the heading "Approval of Materials", preferably before receipt of bids.

Substitutions: Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing samples if required.

Shop Drawings: The Contractor shall submit a list of items proposed for use. He shall also submit catalog data and shop drawings on proposed systems and their components, panelboards, safety switches, starters and contactors, transformers, lighting fixtures, and wiring devices. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Data shall be submitted within ten (10) calendar days after the contract is awarded. Provide six (6) copies of shop drawings unless a greater number of copies is required by the General Conditions. Each submittal data section shall be covered with an index sheet listing Contractor, Sub-Contractor, Project Name, and an index to the enclosed submittals.

Each major section of submittals such as power, equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:

General contractor with phone number and project manager.
Subcontractor with phone number and project manager.
Supplier of equipment with phone number and person responsible for this project.

Index of each item covered in submittal and model number as proposed in the attached.

Any deviation from contract documents shall be specifically noted on submittal cover index and boldly on specific submittal sheet.

TYPE OF PERMANENT ELECTRICAL SERVICE

Existing electrical service is 480 volts, 3-phase, 4-wire. Contractor shall verify all details of electrical service with the serving utility company prior to bid. Contractor shall include any and all costs associated with the service in his bid price and shall pay these costs to the serving utility company.

Operating and Maintenance Manuals: At completion of the work, furnish three (3) copies of written operation instructions which shall include manufacturer's descriptive bulletins, operating and maintenance manuals and parts lists of all equipment installed. Also include in such instructions, the specified size and capacity ratings of all equipment installed. Each set of instructions shall be assembled into a suitable loose-leaf type binder and presented to the Architect for delivery to the Owner.

Record Drawings: Maintain one extra set of black-line, white print drawings for use as Record drawings. Records shall be kept daily, using colored pencil. As the work is completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Architect.

Comply with the following for all work specified in Division Sixteen. As-built information shall be shown to scale, using standard symbols listed in the legend. As a minimum, show the following:

Location of stub-outs, dimensioned from permanent building lines.
Location and depth of under-slab and in-slab raceways.
All routing of raceways.
Corrected panelboard and equipment schedules.
Corrected circuit numbers as they appear on panelboard directories.
Corrected motor horsepower and full load amperages.
Number, size, type of insulation, and number of wires in each conduit or multi-conductor cable whether in conduit or exposed.
Location of junction boxes and splices.
Location of access panels.

INTERFACE WITH OTHER CONTRACTS

It shall be the responsibility of the Contractor to cooperate with all other crafts working on this project. All cutting, trenching, backfill, and structural removals to permit entry of the electrical system components shall be done by this Contractor. All patching and finishing shall be done by the General Contractor.

It shall be the responsibility of the Electrical Contractor to coordinate, provide, and install the overcurrent protection devices, wire, and conduit as required for the specific mechanical equipment installed.

It shall be the responsibility of the Contractor to cooperate with all other crafts working on this project to ensure there are not pipes, ductwork or other foreign systems as described in the latest version of the NEC within the working space or the dedicated space for the electrical equipment. All piping, ductwork or other foreign systems as described in the latest version of the NEC located above the dedicated space shall have

shields or other protection as approved by the NEC.

EQUIPMENT FURNISHED UNDER OTHER SECTIONS

This Contractor shall furnish and install complete electrical roughing-in and connection to all equipment furnished under other sections as indicated on drawings. All such equipment shall be set in place as work of other sections.

The Electrical Contractor is to provide and install all components, wire, conduit, boxes, etc. to interlock the exhaust fans with the HVAC equipment as required.

The Electrical Contractor is to provide and install the required device boxes for the HVAC controls. A raceway, 3/4” conduit minimum, is to be provided and installed from the device location to the accessible space above the ceiling or as appropriate for the application. Line voltage thermostats are to be installed by the Electrical Contractor. Exact requirements for control wiring, conduit, boxes, etc. shall be coordinated with the mechanical contractor and mechanical documents prior to bid.

EQUIPMENT CONNECTIONS

In general, provide electrical power and control systems connections to all equipment shown on drawings. Included are wiring raceways, disconnects, starters, and other devices shown. Excluded are devices furnished integrally with the manufacturer's package and work specified in other sections of these specifications.

GROUNDING

Provide grounding and bonding systems in strict accordance with the latest published edition of N.E.C., except where more stringent requirements are specified herein. Inter-connection of neutral and ground is not permitted except at service entrance equipment or as required for a separately derived system. Install grounding conductors to permit shortest and most direct path to ground. Inaccessible joints are not to be made in grounding conductors. Where grounding conductors are in raceway, bond conductor and raceway at both ends. Grounding and bonding fittings used shall be UL listed and be compatible with metals used in system. Sheet metal type straps are not acceptable.

Service entrance ground shall consist of driven electrodes, ground ring, building steel, water pipe electrodes, concrete encased electrode, rod and pipe electrodes, or plate electrodes as available. The driven electrodes, building steel, water pipe electrodes, and concrete encased electrodes are the minimum requirements. Unless otherwise shown on drawings, each driven electrode shall consist of one 3/4 inch diameter 10 ft. long copperweld steel rod. Rod made of wrought iron may be used in lieu of copperweld at option of contractor. Water pipe connection shall be made to a minimum one inch diameter metallic cold water pipe. Extend grounding conductor to main telephone equipment space. Interconnect conduits entering and leaving service entrance equipment using grounding bushing and copper conductor.

A green insulated ground conductor shall be run in all branch circuit and feeder conduit with phase and/or neutral conductors. Ground conductor shall be sized per NEC or as noted on drawings. Minimum size #12 AWG. Conduit box to device strap or yoke

screw connection is not sufficient. Provide an insulated grounding jumper for receptacle circuits.

The Electrical Contractor shall test and provide written certification of final ground system; including test method, equipment model and serial numbers, and final measurements at each point. The ground electrode system must be less than 25 ohms.

GUARANTEE AND SERVICE

Upon completion of all tests and acceptance, the Contractor shall furnish the Owner of a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 - PRODUCTS

GENERAL

All equipment and materials shall have ratings established by the recognized independent agency or laboratory. The Contractor shall apply the items used on the project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory. Use of equipment or materials in applications beyond that certified by the agency or beyond that recommended by the manufacturer shall be cause for removal and replacement of such misapplied items.

PANELBOARDS

General: Furnish and install circuit breaker lighting and appliance panelboards where shown on the drawings and as indicated in the panelboards schedule. Panelboards shall comply with the following industry standard:

NEMA Standard PB-1
UL Standards: Cabinets and Boxes -UL50; Panelboards - UL 67
National Electric Code

Panelboards shall be labeled as suitable for use as service equipment in accordance with Article 408 of the National Electrical Code.

Box: The panel box shall not be less than 20 inches wide and fabricated from galvanized or galvannealed steel. Box shall have adjustment screws to provide easy alignment for flush mounted applications. Removable end walls to be blank with no KO's. Panelboard box is to have separate UL label and minimum wire bending and gutter requirements to meet the NEC and UL standards. Wiring gutters shall be completely free of any part of trim clamp to prevent damaging wire insulation.

Interior Type S3: All interiors shall be completely factory assembled. The design of the interior should permit replacement of circuit breakers without disturbing adjacent units and without machine drilling or tapping. Bus bars and breaker branch bus shall be of

98% conductivity copper. Bus sequence shall start at the top left phase bus of the interior for both top and bottom fed panels. Panelboard bus structure and main breaker or main lugs shall have current ratings as shown on the plans or as indicated in panel schedule. Such ratings shall be established by heat rise test in accordance with Standard UL 67. Bus bars shall be supported by glass filled polyester type insulators. All bolts used to connect current carrying parts together shall be case hardened, thread-forming type and be accessible for tightening from the front of the panel. Provide an individual circuit number button with an embossed number next to each breaker or provision. Stick on numbers are unacceptable.

Dead front to be provided with flange for easy attachment of trim. Incoming cable lugs shall be grouped at one end to separate them from the load side cables. Neutral bussing shall have a lug for each outgoing branch requiring a neutral connection. For easy wiring and shortest cable run possible, load side neutral connection lugs to be split with each side taking 50% of load neutral connections. The interior shall be provided with wing nuts for securing to box without tools.

All computer isolation panels shall have 200% neutral bus.

Fas-Latch Trim: The panel trim shall be surface or flush as indicated on the drawings. It shall be fabricated from cold rolled steel, painted with an ANSI-61 light gray finish and equipped with concealed hinges, flush lock and a holder for circuit directory card. Trim shall have two separate supports designed to engage the box flange to stabilize and secure the trim during installation. Trim screws to be located behind the lockable door for tamper resistance. No external screws on trims will be allowed. Trims shall be hinged to box.

Description: The panelboards shall be Sentron type for use on systems as indicated on each panelboard schedule. The panelboard enclosures shall be NEMA Type 1 construction for top or bottom cable entrance and suitable for surface or flush mounting unless otherwise noted on panelboard schedules. Panels shall be interchanged from top or bottom feeds.

Short circuit rating shall be as indicated on panel schedule.

Provide main lug only or main circuit breaker panel boards as shown on panelboard schedules. Also provide branch and subfeed circuit breakers of the quantity, trip rating and number of poles as shown on schedules. All panels shall accept additional feed thru lugs or subfeed breaker without modification to bus.

Molded case circuit breakers shall be thermal magnetic, quick make, quick break, trip free. Multi-pole breakers shall be common trip. All breakers shall be equipped with antiturn solderless, pressure type connectors. All provisions shall be located at the bottom of the panelboard and be fully bussed complete with all necessary mounting hardware less the breaker. No plug in breakers will be allowed.

All panels shall be fully rated. No series rating of breakers is acceptable.

Provide subfeed lugs, feed through lugs, handle blocking devices, pad locking devices, shunt trips and ground bus bars as shown on schedules.

Panelboards shall be manufactured by Siemens, General Electric or Square D or prior approved.

NAMEPLATES

Each new panel shall have an external micarta engraved nameplate. Disconnect switches, starters or similar devices shall have a micarta engraved nameplate mechanically affixed (no glue) indicating the load served and the location, such as "A/C 2" or "A/C 3 above ceiling". Letters shall be 1/4" black on a white background. Panels shall be designated in this manner.

"Panel A
120/208 Volts
3 Phase, 4 Wire"

DIRECTORIES

For panelboards, install typewritten directories, listing each branch circuit, identifying space and equipment it controls. Label panels, disconnect switches, pushbuttons, motor starters, and time clocks with identification shown on plans using engraved nameplates, identify main and switches ahead of mains, noting equipment they serve.

DISCONNECT SWITCHES

Furnish heavy duty disconnect switches. Switches shall be a product of the same manufacturer as panelboards, using a quick-make, quick-break mechanism. Enclosure shall be Nema Type conforming to area in which it is installed. Shop drawings include manufacturer's catalog data and physical dimensions for each size switch.

FUSES

Furnish fuses for fusible equipment. Supply one (1) set of 3-spare fuses for each size used. Provide spare fuse cabinet. Fuses specified are coordinated and shall be manufactured by Bussman. Chase-Shawmut and Little Fuse will be approved provided shop drawing submittal demonstrates selective coordination.

RACEWAY AND FITTINGS

Rigid Metal Conduit - Shall have threaded fittings, galvanized steel or threadless compression galvanized steel or threadless compression cadmium plated malleable iron. Fittings shall be rain tight/concrete tight.

Electrical Metallic Tubing (EMT) - Material of steel or malleable iron is acceptable. Couplings and connectors shall be concrete and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 2” and smaller. Use set screw type couplings with four set screws each for conduit sizes over 2”. Use set screws of casehardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding. Indent type connectors or couplings are prohibited. Die-cast or pressure-cast zinc-alloy fittings or fittings made of “pot metal” are prohibited.

Rigid Non-Metallic Conduit - shall have polyvinyl chloride (PVC) fittings suited for the purpose and joined together by a method approved for the purpose. Schedule 80 conduit sections may be joined together with threaded fitting connectors.

Flexible Metal Conduit - fittings shall be zinc plated steel or cadmium plated malleable iron screw type with insulated throat and angular wedge fitting between convolutions of conduit.

Liquidtight Flexible Metal Conduit - fittings shall be cadmium plated, malleable iron or steel with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.

Conduits installed concealed in earth fill, concrete or, solid masonry structures shall be PVC 40. PVC shall not be installed in any exposed locations. All exposed exterior conduits shall be GRS. Any GRS installed below grade or in concrete shall have bitumastic applied prior to installation.

Conduits used for connection to recessed lighting fixtures shall be FLEX. Conduits for connection to motors or vibrating equipment shall be LQFLEX not less than 18" long and not over 60" long. All flexible conduits are to be secured at a minimum of every three feet using approved methods.

Conduits run concealed in the hollow space of non-masonry walls or, above suspended/hard ceilings shall be EMT. Exposed conduits shall be run at right angles to or parallel with building lines and exposed structure. In all cases, conduit runs shall be grouped together where possible and shall be supported from the building structure, not from any suspended ceiling support system.

PVC 80 shall be used only where specifically indicated on the drawings and shall be UL listed as sunlight resistant. Install conduits passing through building sidewalls or through beams below grade with expansion/deflection fittings. Install expansion fittings where conduit crosses an expansion joint. Where conduit penetrates damp-proofing membranes, cut the membrane carefully around the conduit and seal the joint with pressure sensitive tape.

All conduit bends are to be made with a device made for the application. All conduit runs are to be parallel or perpendicular to the building structure. Conduit offsets are to be utilized at junction boxes and device boxes and a strap placed on conduit at the point nearest the box for support.

Support raceways securely with pipe straps, wall brackets, conduit hangers or ceiling trapeze. Fastenings shall be by wood screws or screw type nails to wood, by toggle bolts to concrete block, expansion bolts on concrete or brick, and beam clamp types on steel or bar joists. Raceways shall not be fastened to suspended ceiling supports but must have independent support from the structure. Supporting devices shall be of materials having corrosion protection at least equal to the raceway. A support shall be provided as close as practical to, and not exceeding 18" from an unsupported box or from change of direction. In horizontal runs, this support may be omitted if the box is independently supported and the box connection is not made with chase nipple or threadless box connector. In vertical runs, load produced by weight of the raceway and

conductors shall not be carried by the raceway terminal, but must be carried entirely by conduit supports. Install conduit supports in strict accordance with the following table, except as required by support for boxes and changes in direction:

MAXIMUM SUPPORT

TRADE SIZE	LOCATION OF RUNS	SPACING
1/2, 3/4	Exposed, Horizontal	7 feet
1 and larger	Exposed, Horizontal	10 feet
All sizes	Concealed, Horizontal	10 feet
1/2, 3/4	Exposed, Vertical	7 feet
1, 1-1/4	Exposed, Vertical	8 feet
1-1/2 and larger	Exposed, Vertical	10 feet
All sizes	Concealed, Vertical	10 feet

For conduit runs that are not sized on drawings, the maximum conduit fill shall be computed using the requirements for Type THW conductors although the actual wiring is with Type THWN or other type of conductors having smaller cross-sections. This requirement is made to provide spare conduit capacity.

Install all required sleeves for conduits passing through concrete slabs. Fire proof space between conduit and sleeve after installation using of mineral wool as required. All fire wall penetrations are to be sealed with a U. L. approved method. Any penetrations of the roof membrane must be sealed by a certified roofing contractor using an approved method.

Expansion Joints:
Conduits 3” and larger, that are secured to the building structure on opposite sides of a building expansion joint, required expansion and deflection couplings. Install couplings in accordance with the manufacturer’s recommendations.

Provide conduits smaller than 3” with junction boxes on both sides of the expansions joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5” vertical drop midway between ends. Flexible conduit shall have a green copper ground-bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for three inches and larger conduits are acceptable.

Expansion fittings shall be provided for raceways to compensate for thermal expansion and contraction in conduit runs 200ft or greater and at building expansion joints. Bonding jumpers shall be provided for electrical continuity of the raceway system at the expansion fittings.

Conductors:
All conductors shall be installed in conduit. Conductors for building wiring shall have THHN/THWN, 600-volt insulation and shall be soft-drawn copper of standard American Wire Gauge (AWG) size. Minimum size shall be No. 12. 20-amp branch circuits more than 100 feet in length shall be upsized to No. 10. Provide individual neutral conductors for all single-pole branch circuits. Tied breaker handles are not acceptable. All wire No. 8 and larger shall be stranded. All branch circuits No. 10 and smaller shall be wired with color-coded wire with the same color used for a system throughout the building.

Power feeders and branch circuits larger than No. 10 shall either be fully color coded or shall have black insulation and be similarly color coded with tape or paint in all junction boxes and panels. Where tape or paint is used to identify conductors, apply at all terminations, junction boxes, pull boxes and wireways. Apply tape, butt lapped, or paint for a minimum distance of 2" and, where applied to ends of conductors, start at cut end of the conductor insulation. Tape shall not cover manufacturers conductors shall be color coded or labeled as necessary for clear identification. Color coding of all conductors shall be as follows:

Grounding	Bare or Green
120/208 volt Three Phase (wye)	
Phase Conductors:	A-Black, B-Red, C-Blue
Neutral:	White
277/480 volt Three Phase (wye)	
Phase Conductors:	A-Brown, B-Orange, C-Yellow
	Neutral: Natural Grey

All circuits are to be run with a neutral conductor: No shared neutral conductors are allowed.

Suitable bushings, shields or fittings having smooth rounded edges shall be provided where conductors pass between wire ways, through partitions, around bends, between wire ways and cabinets or junction boxes, and at other locations where necessary to prevent abrasion of the insulation of the conductors. As a clarification, this also applies to conduits stubbed into the ceiling.

JUNCTION AND PULL BOXES

Junction and pull boxes shall meet requirements of National Electrical Code. Standard manufactured boxes shall be listed by Underwriters' Laboratories, Inc. Where custom designed and fabricated boxes are needed, they shall meet the construction standards of Underwriters' Laboratories, Inc. and the N.E.C.

Junction and pull boxes shall be installed where required by National Electrical Code and where necessary to facilitate pulling of wire or cable. Considerations are sizes of wire and cable, number of bends in raceway, and conductor support requirements in vertical raceways. Maximum distance between terminations at junction or pull boxes, cabinets, or other points of termination shall not exceed 250 feet for straight horizontal runs. This length shall be decreased 50 feet for each 90 degree bend. All junction boxes shall be independently and rigidly supported from the building structure. Junction box type shall conform to the area in which it is installed (i.e. wet location areas shall be moisture resistant type junction boxes).

Junction boxes and associated conduit for Fire Alarm shall be painted red. Junction boxes for low voltage controls, communication, technology, etc. shall be permanently marked indicating use.

OUTLETS

Outlet boxes shall be one piece or projection welded, galvanized stamped steel for gang sizes required. Where several devices are located on drawings in the same general location, use multi-gang boxes. Sectional boxes are not acceptable. Boxes shall be sized in accordance with National Electrical Code. Boxes required for communications systems, mechanical control devices, etc., shall be installed under this section of the specifications. Verify outlet box locations and sizes required for systems other than electrical power from shop and manufacturer's drawings, and install outlets as per those requirements.

Boxes for wall and ceiling outlets shall finish flush and straight. Wall outlets in exposed concrete block, masonry, and tile walls shall be installed with extra deep square corner boxes or with standard boxes and square cornered tile wall covers so that conduit offsets are not required. Openings in concrete blocks or masonry walls shall be saw cut with an opening tolerance of 1/8" on all sides, the opening shall have bottom of box at nearest masonry joint to dimension indicated. For other wall finishes, boxes shall be installed with plaster or device type covers as required. No outlets shall be installed back-to-back. Where outlets occur in stud walls back to back on opposite sides, they shall be isolated by a solid stud between them or shall have a 24" separation. For boxes installed in a fire rated barrier, a U.L. approved putty pad shall be installed as required.

WIRING DEVICES

Colors: Wiring device and plate colors shall be selected by Architect.

Receptacles: Duplex receptacles shall be specification grade, 20 amps, 125 volts with grounding terminal. The receptacles are to be rigidly secured independent of device plate and such that the device plate secures to the device as the design specifies.

Switches: Standard flush tumbler switches shall be specification grade, 20 amps, 120/277 volts A-C only, single pole, three-way or four-way as shown, single throw with screw terminals arranged for side wiring. The switches are to be rigidly secured independent of device plate and such that the device plate secures to the device as the design specifies.

Device Plates: Shall be of the specification grade high impact resistant, stainless steel plates. The nominal thickness is to be .070”. Color to match device.

Ground Fault Receptacles: Furnish and install receptacles with ground fault circuit interrupters as indicated on plans. Receptacles shall be NEMA 5-20R configuration with 120V ac 20 amperes circuit rating. All receptacles shall be such depth as to permit mounting in outlet boxes 1-1/2" or greater in depth without the use of spacers. Units shall have line and load terminals such that connection to load terminals will provide ground fault protection for other receptacles. All receptacles shall accept standard duplex wall plates. All receptacles shall be noise suppressed and shall be UL listed. Any device located within 76” of a source of water is to be GFCI protected.

All devices are to be installed such that devices do not move when in normal use. The

device plate shall not be used to secure device in place.

LIGHTING FIXTURES

Provide wired, cleaned, and with lamps specified, all fixtures designated on drawings. Contractor shall verify the ceiling construction for correct trim and support arrangement of lighting fixtures; corrosion resistant plaster frames are required in plaster ceilings. Shop drawing submittals shall consist of properly identified copies of manufacturer's catalog pages showing all features and accessories specified.

Secure mounting and support of all lighting fixtures shall be accomplished under this section of these specifications. Lighting fixtures shall be installed plumb, square, and level with the ceiling, wall, and in alignment with adjacent lighting fixtures. Mounting heights indicated shall be to the bottom of the fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Lay-in troffer fixtures shall be supported with a minimum of 4 ceiling support wires per fixture and not more than 6 inches from each corner of the fixture. For fixtures smaller in size than the ceiling grid, provide a minimum of four wires per fixture. Do not support fixtures by ceiling acoustical panels. All concealed fixture mounting accessories shall be securely tied to structure. Flexible connections to fixtures shall not exceed 6 feet in length. Fixtures shall be solidly grounded to raceway system.

In areas where the reflected ceiling plan is shown, all work shall be in conformance with this plan. If the ceiling grid is installed other than shown on the electrical plan, it shall be the responsibility of the installer of the lighting fixtures to call this fact immediately to the attention of the Architect and Contractor, and work shall not proceed until Architect's decision in the matter is obtained.

Fluorescent ballasts shall be electronic type, class A noise rating, class P safety standards, high power factor greater than .98, programmed start, auto restart, 10% total harmonic distortion or less, 42 kHz – 54 kHz hertz ballast frequency, .85 or greater ballast factor, less than 1.7 lamp current crest factor, meeting the requirements of ANSI/IEE C62.41 & C82.11, FCC Part 18 (RFI & EMI), CBM, UL, Public Law No. 100-357, and NAECA. All ballasts shall include internal fusing. Ballast shall be compatible for use with energy saving lamps. For outdoor applications, ballast shall be rated for zero degrees Fahrenheit starting temperature.

High Intensity Discharge (HID) lamp ballasts shall be high power factor type greater than .98, protected by in-line fuse, UL 1029, UL class P, ANSI C82.4, 15% total harmonic distortion or less, 100 kHz – 200 kHz ballast frequency , end-of-life detection and shutdown. Ballasts in fixtures for interior spaces shall be encapsulated in a Class H potting compound to provide a Class A noise rating. Ballasts in fixtures installed outdoors shall be weatherproof. Provide 0 degrees Fahrenheit starting temperature for HID below 250W. Provide -20 degrees Fahrenheit starting for HID 250W and above.

LED drivers shall be highly efficient, class A noise rating, 0.9 or greater power factor, power supplies rated for the wattage requirements of the fixture. THD at full load shall be <10% at 120v and <20% at 277v. <3% line regulation, <1W stand-by power. LED power up time to be <1 sec. Load regulation <5%. Provide over voltage protection, non-latching output short circuit protection, current reduction LED load temperature

protection. Ambient operating temperature range -30 degrees Celsius to 50 degrees Celsius at 85% non-condensing relative humidity. Driver shall meet ANSI C62.41 Cat.A 2.5kv transient protection. Power supply shall be field programmable with 1mA resolution. Programmer shall not require the power supply to be powered up or connected to AC line voltage while programming. Provide integrated configurable LED thermal protection. Drivers shall be universal voltage input. Power supply shall be UL Class 2. LED dimming drivers shall provide continuous flicker-free dimming from 100%-1%.

All lamps shall be the product of one manufacturer and shall be as manufactured by General Electric Osram/Sylvania, or Phillips. HPS lamps shall comply with the current published ANSI standards.

TELEPHONE SYSTEM

The Contractor shall furnish and install PVC 40, EMT, boxes, etc. as appropriate, for telephone cables. All turns shall be made with no more than two (2) bends to a run. All telephone conduit is to have bushings provided at both terminated ends. The electrical contractor shall consult the local telephone company for complete rules and regulations and the telephone conduit shall be installed according to these rules.

PRODUCT DELIVERY, STORAGE AND HANDLING

Protections: Take necessary precautions to protect all material, equipment, apparatus, and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment, or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the Owner.

Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical, and mechanical injury. At the completion of the work, the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

PART 3 - EXECUTION

EXCAVATION, TRENCHING AND BACKFILLING

Trenches for all underground conduits shall be excavated to the required depth. The bottom of trenches shall be tamped hard. Before backfilling the excavation shall be cleaned of trash and debris. Backfill shall consist of excavation or borrow of sand, gravel, or other approved material free of trash, lumber, sawdust or other debris. Backfill shall be placed in 9" thick moistured and hand or machine tamped layers. Backfill shall be brought to suitable elevation above ground to provide for anticipated settlement and shrinkage. All paving broken up shall be repaired and returned to the original condition.

PAINTING

Contractor shall touch-up or refinish all items of electrical equipment furnished with a factory finish coat of paint and which may have been damaged regardless of cause.

TESTING AND BALANCING

Balance all single-phase loads connected to all panelboards to ensure an approximate equal division on these loads on main power supply serving building. All tests shall be made in accordance with the latest standards of the IEEE and the NEC. The installation shall be tested for performance, grounds and insulation resistance. "Megger" type instruments shall be used. Contractor shall perform circuit continuity and operational tests on all equipment furnished or connected by Contractor. The tests shall be made prior to final inspection. The Contractor shall provide all testing equipment and all costs shall be borne by him. Written reports shall be made of all tests. These reports shall be turned over to the Architect at time of final inspection. All faults shall be corrected immediately.

CLEANING UP

The Contractor shall remove all oil, grease, or other stains resulting from his work performed in the building or the exterior thereof.

WARRANTY AND MAINTENANCE

The Electrical Systems and associated materials shall be covered by the warranty for a period of one year. All materials, installation, and workmanship shall be warranted during the warranty period. That is, any item will be repaired at no charge for any defects for one year after the date of acceptance.

END OF SECTION 16100

SECTION 16110 - LIGHTING CONTROLS

PART 1 - GENERAL

INTRODUCTION

The work covered in this section is subject to the requirements in the General Conditions of the Specifications. Contractor shall coordinate the work in this section with the trades covered in other sections of the specification to provide a complete and operable system.

SYSTEM DESCRIPTION

Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is the intent of this section to provide an integrated, energy saving lighting control system including Lighting Control Panels, Occupancy Sensors, and Daylighting Controls from a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Comply with NEC, NEMA, and FCC Emission requirements for Class A applications.

UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Configured to order or custom relay panels shall be UL Listed under UL 508, Industrial Control Panels.

SUBMITTALS

Submit manufacturer's data on lighting control system and components including shop drawings, detailed point to point wiring diagrams, and floor plans showing occupancy and daylighting sensor locations. Provide typical mounting details for occupancy and daylighting sensors for this application.

MANUFACTURERS

This specification is based on products from Watt Stopper/Legrand, Santa Clara, CA. Any other system wishing to be considered must submit descriptive information 10 days prior to bid. Prior approval does not guarantee final approval by the electrical engineer. The contractor shall be completely responsible for providing a system meeting this specification in its entirety. All deviations from this specification must be listed and individually signed off by the consultant.

PART 2 - PRODUCTS

OCCUPANCY SENSORS AND POWER PACKS

Occupancy Sensors:

All products listed are Watt Stopper product numbers and will integrate fully with the Lighting Control system listed in the project specifications.

Ceiling sensors: DT-200, DT-300.

Wall sensors: DW-100:

Dual technology sensors shall:

Use passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall may be considered.

Ultrasonic sensors shall:

Utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and airflow throughout controlled space.

Have an ultrasonic operating frequency that is crystal controlled at 25 kHz within □ 0.005% tolerance, 32 kHz within □ 0.002% tolerance, or 40 kHz □ 0.002% tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.

All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit).

All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

Circuit Control Hardware – (POWER PACKS)

Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control unit shall provide power to a minimum of two (2) sensors.

Relay Contacts shall have ratings of:

13A - 120 VAC Tungsten
20A - 120 VAC Ballast
20A - 277 VAC Ballast
20A – 347 VAC Ballast

Control wiring between sensors and control units shall be Class II, 18-20 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable:

1. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

EXTERIOR PHOTOCELLS

Each photocell shall be mounted in the appropriate location for measuring the available daylight. Each photocell will have a separate control/calibration module mounted separately and in an accessible location.

PART 3 - EXECUTION

SUPPORT SERVICES

Service Description:

System Startup:
Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all system components. The startup requirement is intended to verify:

That all occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory.

The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.

The sensors interact as a complete and operational system to meet the design intent.

Manufacturer to provide a written statement verifying that the system meets the above requirements.

Training:
Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system.

Documentation:
Manufacturer shall provide system documentation including:

System one-line showing number and type of switches and sensors, dataline. Typical wiring diagrams for each component.

The manufacturer will certify that the products will meet the product specifications and local energy codes. If any additional equipment is required to meet the coverage patterns or local energy codes, the manufacturer will provide the additional equipment at no cost to the owner.

Programming:
Manufacturer shall provide system programming including:

Wiring documentation.
Switch operation.
Operating schedules.

END OF SECTION 16110

SECTION 16200 – SURGE SUPPRESSION DEVICE

PART 1 – GENERAL

RELATED DOCUMENTS
Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions, Mechanical and Electrical Supplementary Requirements 15000/16000, and Division 1 Specification sections, apply to work specified in this section.

DEFINITIONS

LED: Light Emitting Diode
SCR: Silicon Controlled Rectifier
SPD: Transient Voltage Surge Suppressor

SUBMITTALS

Provide submittals for all required testing and pertinent manufacturer information described herein. Submittals for products by manufacturers not listed as “acceptable” below, must submit proper documentation showing detailed (line-by-line) compliance with this specification not less than fifteen (15) business days prior to bid date, to allow ample engineering time for review of submitted products. Prior approvals not received by the deadline date defined above will not be considered. Along with the line-by-line comparison from manufacturers not listed herein, surge suppression submittals shall include, but shall not be limited to the following items:

Dimensioned drawing of each suppressor type indicating mounting arrangement.
Manufacturer shall include its UL 1449 Second Edition file number(s).
Manufacturer shall include its UL 1283 file number(s).
Letter from manufacturer verifying SPD incorporates “directly-connected-protection - elements” between all possible modes in every given service rating (i.e. line-to-neutral, line-to-line, line-to-ground, neutral-to-ground).
Certified test data documenting IEEE C62.41.2 performance (as defined herein), and the ability of the device to meet or exceed all requirements of this specification.
Warranties: As specified in this Section.

QUALITY ASSURANCE

Manufacturer Qualifications: At least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
Operates a Quality System Certified manufacturing facility as ISO 9001:2000 Compliant.

CODES AND REFERENCED STANDARDS

UL 1449 2nd Edition listed, UL 1283 listed, CUL, ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002, NEMA LS-1, 1992 2.2.7, IEEE Std. 1100-1999 Section 8.6.1
ANSI C84.1, American National Standard for Electric Power Systems and Equipment –

Voltage Ratings.
National Electrical Code (NEC) Article 285

SUPPRESSOR LOCATIONS

Provide surge suppressor at each building service entrance switchboard and at other panelboard locations as indicated on the Contract Drawings. SPD Devices are to be mounted integrally to the panels.

MANUFACTURERS

The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein. Subject to compliance with requirements, provide products by the following manufacturer(s) or approved equal as described above:

Commonality: All SPD devices at the service entrance, distribution panels and sub-panels shall be provided by same SPD manufacturer.
Approved equals will be accepted (see submittal procedures per section 16100).

GENERAL REQUIREMENTS

SPD devices shall be rated for the class of service necessary for the application.
SPD devices shall be designed for AC power systems with a minimum of AC follow current after operation.

The SPD shall have sine-wave tracking capability.
Manufacturer shall provide permanently-connected devices mounted parallel to the service, distribution and sub panels and series connected devices as required for individual equipment protection as indicated on Contract Drawings. SPD device drawings shall be made available upon request.

SPD circuitry shall include only solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that “crowbar” (e.g. spark gaps, gas tubes, SCR’s, etc...) shall not be accepted. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound and be of a parallel design.

Electrical performance characteristics:
Service ratings:

120/208V 277/480V	Three-phase	4-Wire + Gnd	Wye

Other voltages (as indicated on the drawings)

SPD ratings: SPD devices supplied shall meet or exceed (as a minimum) the capabilities listed below:

TABLE ON NEXT PAGE

Modes Of Protection Required (10) TEN independent, dedicated, discrete modes of protection required)	[b] Max. ANSI/IEEE Let-Through Voltage **Category C (Main Service)** **208/480 3PH**	[b] Max. ANSI/IEEE Let-Through Voltage **Category B (Distribution)** **208/480 3PH**	[c] Max. ANSI/IEEE Let-Through Voltage **Category A (Branch)** **208/480 3PH**	Peak Surge Current [a] "kA" (Per Phase)		
				**Service Entrance	**Dist. Panels	**Branch Panels
L-N	940/1250	410/580	40/70	360kA	240kA	180kA
L-L	1200/1450	600/800	40/145	360kA	240kA	180kA
L-G	835/1150	410/600	60/100	360kA	240kA	180kA
N-G	880/1450	675/1100	60/70	360kA	240kA	180kA

****** For clarification purposes, higher (and lower) peak surge current (PSC) ratings are required for specific panels. Please verify the Peak Surge Currents per the amperages of the equipment that is being protected, are in accordance with the recommendations below:

4000 Amps and Higher = 600kA "per phase"

800 Amps – 1600 Amps = 240kA "per phase"

3000 Amps – 4000 Amps = 480kA "per phase"

225 Amps – 800 Amps = 180kA "per phase"

2000 Amps – 3000 Amps = 360kA "per phase"

100 Amps – 225 Amps = 120kA "per phase"

[a] kA "per phase" value is determined by the following:
[kA "per mode" (x) # of modes available, subtract N-G value, divide the remaining kA by phase(s). The sum will be your kA "per phase"]

[b] Measured at IEEE C62.41.2-2002 Category C High; 20kV 1.2x50 µS/10 kA 8 x 20µS waveform & Category C Low/B High; 6kV, 1.2x50 µS/3 kA 8 x 20µS waveform. Transient shall be applied at the 90° phase angle unless otherwise indicated above.

[c] Measured at IEEE C62.41.2-2002 Category A-Ringwave at 2kV 0.5 µS/67A 100kHz. Transient shall be applied at the 270° phase angle, positive polarity unless otherwise indicated above.

Measured Limiting Voltage Test Environment: All voltages shall be peak (±10%) Positive Polarity, Time base = 20µS, Sampling Rate = 250ms/s to ensure maximum transient capture. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (un-powered), except for the 120V circuits which are Dynamic (powered). All tests shall be performed in accordance with UL 1449 Second Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted.

Modes: The SPD system shall provide dedicated, independent, distinct protection circuitry for every mode found in the electrical distribution system at the point of SPD application. For example, a 400/230V, 3-phase Wye, 4-wire plus ground system has TEN (10) distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). For 6 mode Delta systems, SIX (6) dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G).
Fusing:

The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. Surge protective devices shall contain short circuit current safety fusing within each device where no circuit breaker is specified, for over-current requirements of the NEC.

The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under UL 1449 2nd Edition.

The Transient Voltage Surge Suppressor (SPD) shall be of a parallel design using fast-acting transient energy protection that will divert and dissipate the surge energy.
The SPD shall be self-restoring and fully automatic with a total response time approximately 1 nanosecond.

The maximum continuous operating voltage shall be capable of sustaining 115% of nominal RMS voltage continuously without degrading.

The SPD shall be UL listed at or above the available fault current level at the point of SPD application, per UL 1449 2nd Edition, as amended. The SPD shall be marked with the short circuit current rating. The SPD short circuit rating shall be, as a minimum, the same rating as the power distribution equipment to which it is connected.
Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, totally encapsulated, custom parallel and solid state.

Features: Surge protective devices shall provide on-board visual status of their operational readiness by LED indicator lights.

Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive- maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device

(SPD) status are not acceptable. SPD devices shall require no routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon expiration.

Warranty: The manufacturer shall provide unlimited free replacement of the entire SPD (not just modules, components or sub-assemblies) for all inoperable SPD during the warranty period. Minimum warranty period shall be 10 (TEN) years.

Enclosures: Unless otherwise noted, NEMA 4 (or better) enclosures for indoor installations where fire suppression systems are utilized and NEMA 4X or better enclosures for outdoor/wet locations shall be utilized.

PART 3 – EXECUTION

Provide surge suppressor to be installed at each building service entrance gear, transfer switch, or other location (service entrance), that the service encounters as it enters the facility and/or as indicated on Contract Drawings. Also, provide SPD devices at all distribution and panel-board locations as indicated on Contract Drawings. The SPD shall be located immediately adjacent to the switchboard or panel-board being protected (close-nipple). (The SPD may not be located integral within the switchboard or panel-board(s) unless the switchgear manufacturer providing such products expressly meets or exceeds all parameters of this specification for the SPD.) Any SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable. The surge protection devices shall be connected on the load side of the over-current protective device to which it is connected as per UL 1449 and NEC Art. 285, of the electrical service it is protecting. Unless otherwise specified, provide a 30A breaker for each SPD device.

NOTE SPD marked L1, L2, L3, N, and GND (as applicable) must be connected, respectively, to phase(s), neutral, and ground.

Surge protective devices shall be installed neatly. Bind the phase, neutral, and ground conductors tightly, over the entire run, from the suppressor to the service panel, and always use the shortest length of connecting cable possible.

Connect surge protector to the grounding system.
The electrical contractor (installer) shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall assure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor shall further ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

All labor, materials, equipment, and services necessary for, and incidental to, the installation of the SPD system components as specified herein shall be provided by the electrical contractor (installer).

END OF SECTION 16200

SECTION 16300 - LOW VOLTAGE DRY TRANSFORMERS

PART 1 - GENERAL

GENERAL

Self-cooled, dry type two winding power transformer for general power and lighting application. Listed by Underwriters' Laboratories, Inc., and labeled with appropriate listing mark. Single or three phase as indicated with KVA rating as indicated. Separate coil for each phase of three phase units. Unless otherwise indicated, designed for 480 volt primary. Three phase transformers connected delta-wye with 120/208 volt wye secondary unless otherwise indicated. Single-phase units with 120/240 volt secondary unless otherwise indicated. Enclosure for indoor application. Ventilation openings, corrosion treatment, cable space, ground pad, wiring compartment temperature, and wiring terminations in accordance with UL 506.

Primary Taps: 25 KVA and smaller; four 2-1/2% taps, two above and two below normal. Larger than 25 KVA; six 2½% taps, two above and four below normal.

Temperature Classification: 25 KVA and smaller; 185°C insulation system temperature classification, 115°C winding temperature rise. Larger than 25 KVA; 220°C insulation system temperature classification, 115°C winding temperature rise.

Load Rating: Capable of operating continuously at full nameplate rating in 40°C ambient. Capable of withstanding daily overload requirements of ANSI-C57.12 with no loss in normal life expectancy.

Sound Rating: In accordance with ANSI-C89 and NEMA standard sound ratings.

Impedance: 75 KVA and smaller; 3.0% impedance, minimum. Larger that 75 KVA; 4.5% impedance, minimum.

15KVA and Smaller: May be wall mounted with suitable frame supports providing wall is of sufficient strength to adequately support imposed load, and providing such method is acceptable to Architect, unless otherwise indicated on the drawings.

Larger than 15 KVA: Floor mount.
For non linear loads use a minimum of K-13 or ASF shown on drawing.
Transformers are to have copper windings and be NEMA-TP1 rated.

Acceptable: General Electric; Siemens; Westinghouse; Sorgel; Schneider.

END OF SECTION 16300

SECTION 16720 - FIRE DETECTION AND ALARM SYSTEMS

PART 1 - GENERAL

SUMMARY

Includes But Not Limited To

Furnish and install a fire alarm and detection system as described in Contract Documents.

Furnish and install raceway, conductors, boxes, and miscellaneous items necessary for complete system.

Related Sections

Division 16 - Quality and installation standards for wiring, raceway, conduit, and boxes.

SYSTEM DESCRIPTION

An automatic fire alarm system consisting of control panel, power supplies, alarm initiating devices, and notification appliances.

Class B (Style B) initiating device circuits and Class B (Style W) notification appliance circuits including end-of-line devices.

Performance Requirements

Operation of manual station or automatic activation of any smoke detector, shall:

Cause system notification appliances to operate.
Indicate device in alarm at control pane LCD display.
Indicate device in alarm on remote annunciator LCD display
Initiate off-site alarm notification system.

System shall return to normal when operated device is returned to normal and control panel is manually reset, except alarms may be silenced as specified below.

Alarm may be silenced by switch in control panel.

Ring Back Feature - When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.

When alarms are silenced, indicating red LEDs on control panel and remote annunciator shall remain on until operated device is returned to normal and control panel is manually reset.

Green pilot LED shall normally be on indicating that system is receiving normal power.

Failure of normal power shall cause this LED to extinguish.

Amber trouble LED and trouble alarm, operating together, shall signal trouble condition.

Following conditions shall signal trouble condition:

Failure of normal power.
Opens or short circuits on indicating circuits.
Disarrangements in system wiring.
Control panel circuit board removal.
Ground faults.

Trouble silencing switch shall silence trouble alarm which shall be arranged so trouble LED shall remain lit until system is restored to normal. As ring-back feature, trouble alarm shall resound as reminder to return silencing switch to normal position.

Supervisory LED, separate from trouble LED, and alarm, operating together, shall signal opening of door shown on drawings. Alarm silence switch shall operate in same manner as trouble alarm.

SUBMITTALS

Shop Drawings:

Prepared by authorized factory representative and including:

Single line diagram of actual system. Typical riser diagrams are not acceptable.
Complete wiring diagrams.
Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.
All documentation and submittals required by the Authority Having Jurisdiction are to be submitted within 30 day of the contract award.
Approval of the Authority Having Jurisdiction and permitting are required before work on the project is to commence.

Quality Assurance/Control - Certificate of completion, from Manufacturer's Representative, in accordance with NFPA 72 requirements.

Closeout:

Operations And Maintenance Manual Data:

Provide operating and maintenance instructions for each item of equipment submitted under Product Data. Provide instruction manual from Manufacturer which explains what is to be done in event of various indications.

Include copy of approved shop drawings.

QUALITY ASSURANCE

Regulatory Requirements:
System shall meet approval of Authority Having Jurisdiction (AHJ). NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.

Equipment, devices, and cable shall be UL or Factory Mutual listed for use in fire alarm systems.

OWNER'S INSTRUCTIONS

Instruct Owner's representative in proper operation and maintenance procedures.

PART 2 - PRODUCTS

COMPONENTS

Equipment and accessories furnished under terms of this Specification shall be standard products of single manufacturer, or include written statement by Control Panel Manufacturer confirming compatibility of components and inclusion of these components under system warranty.

Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

Operator Control
Acknowledge Switch:
Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.
Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

Alarm Silence Switch: Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

Alarm Activate (Drill) Switch: The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

System Reset Switch: Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all

associated output devices and circuits, to return to their normal condition.

Lamp Test: The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

System Capacity and General Operation:
The control panel or each network node shall include Form-C alarm, trouble, snd supervisory relays rated at a minimum of 2.0 amps @ 30 VDC.

It shall include Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.

The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, and Notification Appliances.

The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch keys for the field programming and control of the fire alarm system.

The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers.

The system shall allow the programming of any input to activate any output or group of outputs

The FACP or each network node shall provide the following features:

Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.

Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.

Multiple sensitivity levels for alarm, selected by detector. The system shall also support sensitive advanced detection laser detectors. The system shall also include multiple levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.

The ability to display or print system reports.

Alarm verification, with counters and a trouble indication to alert maintenance personnel.

PAS presignal, meeting NFPA 72 3-8.3 requirements.

Devices shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.

Periodic detector test, conducted automatically by the software.

Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.

Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.

Walk test, with a check for two detectors set to same address.

Day/night automatic adjustment of detector sensitivity.

The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), and Temporal (NFPA 72 A-2-2.2.2). Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation. Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates.

Network Communication

The FACP shall be capable of communicating on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol.

Central Microprocessor

The microprocessor shall be a state-of-the-art, high speed device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.

The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

A special program check function shall be provided to detect common operator errors.

An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete

testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

System Display
The system shall support the following display mode options:

80 character display option. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.

The display shall provide all the controls and indicators used by the system operator:
The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.

The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

The display shall also provide Light-Emitting Diodes.
The 80-character display shall provide 12 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, ALARM SILENCED, Controls Active, Pre-Discharge, Discharge and Abort.

The display shall have QWERTY type keypad.
The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

The system shall support the display of battery charging current and voltage on the 80-character LCD display.

Voice Command Center (VCC)
The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. A Message generator shall be capable of automatically distributing up to four (4) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of at least 16 or 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

The audio portion of the system shall sound the proper audio signal (consisting of tone,

voice, or tone and voice) to the appropriate zones.

Notification Appliance Circuits (NAC) speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.

Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.

Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.

Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.

The emergency voice alarm communication system shall incorporate a Two-way emergency telephone communication system.

Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.

Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.

Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.

Alarm Initiating Devices:
Ceiling Mounted Smoke Detectors - Combination of photoelectric and thermal type.

Photoelectric type.
Listed under UL Standard 268.
Provide visual indication of alarm on unit when normally pulsed supervisory LED glows continuously.

Duct Mounted Smoke Detectors:
Photoelectric type.
Listed under UL Standard 268.

Manual Fire Alarm Boxes:
Double-action requiring two actions to initiate alarm.
Box shall mechanically latch when actuated and require key to reset. Key shall match control panel door lock.

Notification Appliances:

Combination Horn/Strobe:
Wall mounted flush or semi-flush.
Non-coded audible output of 90 dB minimum at 10 feet.

Integrally mounted flashing light unit with block letters 'FIRE'. Minimum light intensity of 75 candela and flash rate between one and three Hertz.
Listed under UL Standards 464 and 1971.

Strobe Only:

Wall mounted flush or semi-flush.
Integrally mounted flashing light unit with block letters 'FIRE'. Minimum light intensity of 75 candela and flash rate between one and three Hertz.
Listed under UL Standard 1971.

Speakers:
All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.

Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).

Frequency response shall be a minimum of 400 HZ to 4000 HZ.

The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

Accessory Devices:

Air handler shutdown relays. Provide and install an addressable interface module at the air handling units to shut down activation of the appropriate level alarm.

ACCEPTABLE MANUFACTURERS

Existing main fire alarm control is a Simplex Model 4005 system. The fire alarm panel for the new building shall be a Simplex model 4007 or equal. New panel shall be compatible with existing fire alarm system. New panel shall be an addressable type that can be integrated with the existing zone type system to have one fully functional campus wide fire alarm system.

Cerebrus Pyrotronics, Cedar Knolls, NJ (973) 593-2600
Edwards Systems Technology, Cheshire, CT (203) 699-9300
Faraday Inc, Tecumseh, MI (517) 423-2111
Honeywell, Minneapolis, MN (800) 328-5111
Notifier, Northford, CT (800) 454-9779
Simplex, Gardner, MA (800) 221-7336

PART 3 - EXECUTION

INSTALLATION

Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions, and complying with applicable portions of NEC, NFPA and NECA's 'Standard of Installation'.

Mounting Heights:
Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor:

Manual Fire Alarm Boxes (Pull Stations) - 48 inches
Fire Alarm Horns/Strobes - 80 inches

Conductors:
Install conductors in conduit.

Fire alarm system conductors from different devices may be combined in common conduit. Make certain that raceway size and wire quantity, size, and type is suitable for equipment supplied and is within NEC standards. Label pull and junction boxes 'FIRE ALARM'.

Install conductors and make connections to elevator control panel and duct smoke detectors.

Loop wires through each device on zone for proper supervision. Tee-taps not permitted.

Minimum conductor size shall be 14 AWG unless otherwise specified.

Do not install ceiling mounted detectors within 3 feet of air discharge grilles. Do not install manual fire alarm boxes close to light switches. Coordinate with other trades as required.

FIELD QUALITY CONTROL

Manufacturer's Field Service:
Provide factory trained representative to perform complete system testing in presence of Owner's representative and local fire department personnel upon completion of installation.

Test each initiating and annunciating device for proper operation, except fixed temperature heat detectors.

Test operation of trouble annunciation on each circuit.

Perform complete testing of control panel functions.

PROTECTION

Provide dust protection for installed smoke detectors until finish work is completed and building is ready for occupancy.

Protect conductors from cuts, abrasion and other damage during construction.

END OF SECTION 16720

SECTION 16730 - GPS WIRELESS CLOCK SYSTEMS

PART 1 - GENERAL

Reference Division 16730 Clock Systems

SECTION INCLUDES

Transmission Systems

G.P.S. Receiver
Primary Transmitter

Clocks

Analog (120V)

RELATED SECTIONS

Division 16

Electrical (120 volt grounded dedicated outlet required for transmitter and each analog clock).

REFERENCES

This Technical Specification and Associated Drawings

Wireless GPS Satellite Time System User Manual.

DEFINITIONS

GPS: Global Positioning System, a worldwide system that employs 24 satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits atomic time, the most accurate and reliable time.

SYSTEM DESCRIPTION

GPS wireless clock system shall continually synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired.

The system shall synchronize all clocks to each other. The system shall utilize GPS technology to provide atomic time. The system shall not require hard wiring. Clocks shall automatically adjust for Daylight Savings Time.

Analog Clocks shall be synchronized to within 10 milliseconds 6 times per day, and the system shall have an internal oscillator that maintains plus or minus one second per day between synchronizations, so that clock accuracy shall not exceed plus or minus 0.2

seconds.
The system shall include an internal clock reference so that failure of the GPS signal shall not cause the clocks to fail in indicating time.

The system shall incorporate a “fail-safe” design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.

Clock locations shall be as indicated, and clocks shall be fully portable, capable of being relocated at any time.

The system must operate in accordance with a “Radio Station Authorization”, Form FCC 601 – LM, granted by the Federal Communications Commission (FCC). This license will be issued to and held by the end user.

REGULATORY REQUIREMENTS:

Equipment and components furnished shall be of manufacturer’s latest model.

The end user will hold a license, known as a “Radio Station Authorization” granted by the FCC.

This license grants the end user protected use for wireless transmission at the designated frequency.

This license will designate a unique “call sign” for each end user.

Transmitter and receiver shall comply with Part 90 of FCC rules as follows:

This device may not cause harmful interference, and

This device must accept interference received, including interference that may cause undesired operation.

Transmitter frequency shall be governed by FCC Part 90.35.

Transmitter output power shall be governed by FCC Part 90 257 (b)

System shall be installed in compliance with local and state authorities having jurisdiction.

SUBMITTALS

Product Data: Submit complete catalog data for each component, describing physical characteristics and method of installation. Submit brochure showing available colors and finishes of clocks.

Operating License: Submit evidence of application for FCC Radio Station Authorization

prior to installing equipment. Furnish the license or a copy of the application for the license, to the Owner prior to operating the equipment. The original license must be delivered to the Owner.

Samples: Submit one clock for approval. Approved sample shall be tagged and shall be installed in the work at location directed.

Manufacturer's Instructions: Submit complete installation, set-up and maintenance instructions.

Floor plans indicating the location of system transmitter(s), approved by manufacturer, will be submitted to owner prior to installation.

SUBSTITUTIONS

Proposed substitutions, to be considered, shall be manufactured of equivalent materials that meet or exceed specified requirements of this Section.

Proposed substitutions shall be identified not less than 10 days prior to bid date.

Other systems requiring wiring and/or conduit between master and clocks will not be accepted.

Other systems using wireless technology in an unlicensed frequency range will not be accepted.

Other systems using wireless technology where the license is held by any party other than the end user will not be accepted.

QUALITY ASSURANCE:

Permits
Obtain operating license for the transmitter from the FCC.

Qualifications
Manufacturer: Company specializing in manufacturing commercial time system products with a minimum of 30 continuous years of documented experience including 4 years experience producing GPS wireless time systems.

Installer: Company with documented experience in the installation of commercial time systems.

Prior to installation, a site survey must be performed to determine proper transmitter placement.

DELIVERY, STORAGE, AND HANDLING

Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and

other related information.
Store equipment in finished building, unopened containers until ready for installation.

PROJECT SITE CONDITIONS

Clocks shall not be installed until painting and other finish work in each room is complete.

Coordinate installation of GPS receiver for access to the roof or exterior side wall so that the bracket and related fasteners are watertight.

SYSTEM STARTUP

At completion of installation and prior to final acceptance, turn on the equipment; ensure that all equipment is operating properly, and that all clocks are functioning.

WARRANTY

Manufacturer will provide a 5 year warranty on GPS receiver, transmitter, and satellite transmitter. All other components will have a 1 year warranty.

PART 2 - PRODUCTS

MANUFACTURER

GPS wireless clock system shall be manufactured by SIOSCAN Wireless, Inc., or approved manufacturer with an equal system.

SEQUENCE OF OPERATION:

Transmitter Operation: When power is first applied to the transmitter, it checks for and displays the software version. It then checks the position of the switches and stores their position in memory. The transmitter looks for the GPS time signal. Once the transmitter has received the GPS time, it sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmitter updates its internal clock every time it receives valid time data from the GPS.

Analog Clock Operation:
Insert batteries: Follow set up procedures detailed in manufacturer's instructions.
After initial setup, the clock will shut off the receiver. Six times each day, the microprocessor will activate the receiver and starting with the stored channel, it will again look for a valid time signal. If necessary, the clocks will resynchronize to the correct time.

If the clock has not decoded a valid time signal for a pre-determined number of days, it will go to a step mode.

EQUIPMENT

General
The clock system shall include a transmitter, a roof or window mounted GPS receiver, indicating clocks, and all accessories for complete operation.

GPS Receiver
GPS roof mounted, with 10 foot cable (3m) attached Wireless extension cable available: 200 ft.

The GPS Receiver shall be a complete GPS receiver including antenna in a waterproof case, designed for roof or outdoor mounting. Provide mounting bracket for attachment to roof structure.

The GPS Receiver cable must be plenum rated where required by local code.

Transmitter
Consisting of wireless transmitter with GPS receiver, a surge suppressor/battery backup, and a mounting shelf. Unit shall obtain current atomic time from satellite. The clock system shall transmit time continuously to all clocks in the system.

Transmission:
Frequency Range: 72.100 to 72.400 MHz.

Transmission Power: 1 watt (30dBm) maximum

Radio technology: narrowband FM

Number of channels: 16

Channel bandwidth: 20 kHz maximum

Transition mode: one-way communication

Data rate: 2 KBps

Operating range: 32ºF to 158ºF (0ºC. to 70ºC).

Transmitter:
Transmitter output power: +26 to +30 dBm

Frequency deviation: +/- 4 kHz

Transmitter power requirements: 120 VAC 60 Hz

Internal power requirements: 5 VDC

Carrier frequency stability: +/- 20 ppm

Transmitter shall have 16 selectable channels to assure interference-free reception.

Transmitter shall have the following switches:

Time zone adjustment switches for all time zones in the world: Eastern, Central, Mountain, Pacific, Alaska, and Hawaii.
Daylight Saving Time bypass switch.
12-hour or 24-hour display.

Transmitter housing shall be black metal case, 16-3/4 inches (424.4mm) by 12 inches (304.8mm) by 1-7/8 inches (46.4mm) in size.

Antenna shall be 46 inches (1168mm) high, commercial type, mounted on top center of transmitter housing. Antenna gain shall be < 2.2 dB. Antenna polarization shall be vertical.

Transmitter housing shall incorporate a display which shall include the following:
Time readout AM and PM indicator if 12-hour time display is set Day and date readout
Indicator for daylight savings or standard time LED which shall flash red in event of reception problemGPS reception indicator.

Transmitter shall contain an internal clock such that failure of reception from the GPS will not disable the operation of the clocks.

Power supply (included):

Input: 120 volt AC 50/60 Hz, 0.4 amps.
Output: 9 volt DC, 1.5 amps.

Surge Protector/Battery Backup (included).

Input: 120 volt AC 60 Hz +/- 1 Hz.
Output: 120 volt AC, 500VA, 300 watts
Surge Energy Rating: 365 joules

Additional Equipment:
Wireless Receiver Switches: Switches shall receive time packets from the Primary Transmitter and relay the synchronized time to the Satellite Transmitter connected to it. The unit shall include the following:

Antenna mounted on top of the switch housing, 11-1/2 inches (292mm) long.

Power Supply:
Input: 120 VAC 50/60 Hz, 0.4 amps

Output: 9 volt DC, 1.5 amps

RS 232 data cable, 5 feet (1.5mm) long

Daylight Savings Time bypass switch

Dimensions: 4-1/4 inches (108mm) long, 5-3/4 inches (146mm) wide, 1-1/4 inches (31.75mm) deep.

Weight: 12 ounces (.34kg)

Operating Range: 32ºF to 158ºF
(0º to 70ºC)

Satellite Transmitters shall receive the signal from the Wireless Receiver Switches and transmit the signal to the devices in its vicinity, which are out of the range from the Master Transmitter. The unit shall include the following:

Antenna mounted on top of the housing, 46 inches (1168mm) long.

Wireless Receiver Switch
Power Supply

Input: 120 VAC, 50/60 Hz, 0.4 amps
Output: 9 volt DC, 1.5 amps.

6 foot (1.83m) cord

Surge Suppressor/Battery Backup

Mounting Shelf.

Transmission Power: 1 watt maximum

72 MHz frequency.

Traditional analog clocks (battery): Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black.

12-1/2 inch (317.5mm) diameter analog clock:

Additional colors, finishes, and dial faces are available from manufacturer.
Analog clocks shall be battery-operated, and shall have minimum 5-year battery life.

Analog clocks shall be capable of automatically adjusting for Daylight Saving Time. An on-off switch located on the transmitter shall disable this function if desired.

Time shall be automatically updated from the transmitter 6 times per day.

9 inch (228.6mm) and 12.5 inch (317.5mm) analog clocks shall have a tamper proof/theft resistant clock lock mounting slots.

Analog clock receivers shall be as follows:
Receiver sensitivity: >-110 dBm
Receiver power: 120 VAC 60 Hz
Antenna type: internal
Antenna gain: -7 dBd

If the transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded. If signal transmission is not restored after 48 hours, the second hand will “five step” as a visual indicator that the signal has been lost. Should the clocks lose power and signal, the clocks will not function.

Traditional analog clocks (AC)
Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black.

Cable Connection Sealant
Radio Shack Coaxial Cable Connector Sealant 278-1645, or approved electrical grade silicone sealant.

PART 3 - EXECUTION

EXAMINATION

Verify that construction is complete in spaces to receive equipment and that rooms are clean and dry.

Verify that 120 volt electrical outlet is located within 6 feet (1.83m) of location of transmitter and the outlet is operational and properly grounded.

INSTALLATION

GPS Unit: Install on roof in location indicated, in clear view of the sky. Install unit in location free from standing water, and above accumulations of leaves or debris. Seal cable connection to GPS with cable connection sealant. Any added cable lengths must be protected from outside elements.

Transmitter:
Locate transmitter where indicated, a minimum of 2 to 3 feet (.6 to 1 meter) above the floor, away from large metal objects such as filing cabinets, lockers or metal framed walls. Transmitter(s) will be placed at locations per plans.
Attach receiver to transmitter using cable.
Connect antenna to transmitter, using care not to strip threads.
Connect power supply to the transmitter.

Set the channel number on the display to correspond to the FCC license.

Plug power supply into electrical outlet.

Analog clocks (120V)
Perform the following operations with each clock:

Set clock to correct time in accordance with manufacturer's instructions.

Observe analog clock until valid signals are received and analog clock adjusts itself to correct time.

Install the analog clock on the wall in the indicated location, plumb, level and tight against the wall. If using 12-1/2 inch (317.5mm) clock, attach using clock-lock hanging method and suitable fasteners as approved by clock manufacturer.

ADJUSTING

Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

CLEANING

Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer. Remove temporary labels from clock faces. Do not remove labels from backs of clocks.

DEMONSTRATION

Provide training to Owner's representative on setting and adjusting clocks, replacing batteries and routine maintenance.

PROTECTION

Protect finished installation until final acceptance of the project.

TESTING

All devices must be tested at their operational location under normal operational conditions to assure reception of signal.

END OF SECTION 16730

SECTION 16820 - INTERCOM/SOUND

PART 1 - GENERAL

GENERAL

Furnish and install a microprocessor controlled voice communication system with all conduit, wire, outlets and equipment as herein specified to provide a complete sound and voice communication system in the building(s). The main system is existing as indicated on the plans. Additional systems are to be provided and installed and be programmed and interfaced with the existing unit such that the system functions as a whole.

All material and/or equipment necessary for the proper operation of the system, even though not specifically mentioned in the contract documents, shall be deemed part of this contract.

All equipment shall be installed and connected in strict accordance with the manufacturers recommended instructions.

Equipment shall be listed by Underwriter's Laboratories, Inc.

All equipment shall be installed by a Factory Authorized Distributor of equipment specified herein. The installing contractor must have a minimum of five years experience in the specific application of the equipment proposed for this system. The owner shall be furnished with three brochures that provide written operating instructions for the system, wiring diagrams and maintenance notes. The system shall be guaranteed for a period of one year from date of final acceptance.

Submit with quotation a copy of factory authorized franchise of the equipment proposed.

The vendor shall show satisfactory evidence that he maintains a service organization capable of furnishing adequate service to the equipment provided and shall be prepared to offer a service contract for the service of the equipment after the guarantee period. Service shop shall be within one (1) hour driving time of the project site. Sub-letting of service shall disqualify vendor.

The contractor shall have equipment installed on the AC voltage supply taking care to arrest damaging electrical transient and spikes which can cause damage to the microprocessor components of the system. Central office telephone lines shall have equipment installed to arrest high voltages from electrical and/or lightning from entering the system and causing damage. The system shall incorporate Transient Voltage Surge Suppression Technology at all input and output signal (data, voice, signal, etc.) terminations. For sites with multiple buildings, SPD devices shall be incorporated at the input and output terminations of each building.

The specified equipment shall be supplied, installed, adjusted, tested and guaranteed by a factory authorized communications contractor for the products furnished. The

vendor is responsible for verifying the completeness of the parts list and the suitability of the equipment to meet the intended purpose of the specifications and drawings.

The vendor shall provide the following documentation and service:

Shop Drawings. These drawings shall include the manufacturer's specification sheets, including all the component parts.

As-Built Drawings. These drawings shall include the information above. They should include up-to-date drawings that include any changes made to the system during installation. Circuit diagrams and other information necessary for the proper operation and maintenance of the system shall be included.

Operating Instructions: These instructions are to be permanently affixed to all administrative control stations.

In Service Training: Provide the owner with a training program designed to make all administrative control stations users familiar with the operation of the voice communication system. A minimum of one (1) 4 hour session.

The contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will within one year from the date of installation, repair or replace all or any part of the equipment found to be defective. This warranty shall not apply if damage is caused by abuse, accident, improper operation, or negligence. Warranty maintenance shall be provided by the contractor during his normal working hours at no expense to the owner.

PART 2 - PRODUCTS

SYSTEM DESCRIPTION

The system shall consist of a central equipment cabinet, microprocessor control unit, power supply, zone modules, administrative control centers (ACC's), amplifiers, remote display units, classroom loudspeaker assemblies, call-in switches, and all associated material, hardware, wiring, and options as described herein to provide a complete working system which shall meet the specified requirements:

The system shall provide the following communication paths and functions:

ACC to a single classroom loudspeaker.
Administrative control center to administrative control center.
Simultaneous program distribution directed from any ACC without interrupting the intercom channel. Remote cordless phone to a single classroom or to outside horns. The system shall be designed so as to accomplish any combination or all of the above functions simultaneously.

The system shall provide the facilities for:
Paging
Sounding emergency signals

Timed event signals
Control and distribution of one program channel to individual classrooms, selected groups, or all classroom speakers.

The system shall include the facilities for a master clock and programmer. The system master clock will be capable of correcting compatible brands of analog or digital or both types of secondary clocks.

The system shall have an RS232 port for down load/up load capability. Provide owner with a diskette containing their bell schedule, architectural room number information, zone assignments for paging, and bell schedule. Information shall be loaded and unloaded from a standard P.C.

Provide off-site diagnostic capability through RS232 port. Use of programming mode shall not inhibit system operation.

SYSTEM FUNCTION

The system shall provide a minimum of two intercom channels.

Provide microprocessor-based equipment of modular design, utilizing plug-In connections between all modules.

Facilities to originate emergency calls which take precedence over all routine calls.

System check with self diagnostics.

System to support up to twelve ACC's each having identical functions and control features.

Automatic gain control on intercom speech channel.

Built-in battery backup for internal system clock to maintain correct time for a period of 7 days after power loss. All other programmed data shall be stored in non-volatile EEPROM memory and will be retained indefinitely. Automatic pre-announce tone over any loudspeaker selected for two-way communications. A privacy tone will sound whenever a loudspeaker is being monitored.

Distribution of paging announcements via any ACC.

Classroom loudspeakers are user programmable to any of eight paging zones or class change zones.

Unique system tones for emergency and civil emergency

Special tone for custodial call to all speakers.

Programmable tones such as warble, siren, chime, etc. six separate items available.
Two way intercom communication from each speaker location.

Last number redial.

Speed dial access to specific remote stations.

Clear all calls registered on the ACC queue.

Scroll waiting calls and select calls to be answered in any order.

Call waiting indication: Steady display for normal calls; flashing display for emergency calls in order of priority.

Call-in reminder in which unanswered calls will repeat until answered.

LCD display for current call/calls waiting. Current time is displayed when the ACC is in an idle state.

Provide one VOX handset (for private communications), built-in microphone, speaker, and push-to-talk button on each ACC for intercom communications.

Sequential review of all incoming calls/calls waiting at each ACC with 100% call retention.

Manual time tones which can be initiate by any ACC.

<u>The system shall be zoned as follows:</u>
Each classroom shall be considered one zone and shall have a dedicated audio circuit to the central equipment cabinet.
All corridor speakers will be on one zone.
All outside horns will be on one zone.
Capability for any ACC to direct a program to any one, group of, or all remote stations.

Self diagnostics for each ACC.

Easy menu-driven programming

Programmable system functions, including:

Five call-in priority levels.

Two, Three, or four digit alphanumeric dialing.

Twelve hour or twenty-four hour clock display when ACC is in the idle state.

Two hundred and fifty -six events, eight time schedules, eight zones, and eight user-programmable tones.

Each classroom shall be programmed to annunciate at any one or all ACC'S.

Automatic distribution of user programmable time signals activated by an internal time clock.

Program room stations, zones, or multiple zones to receive the program source on a selected basis.

The system shall not require motor driven fans to keep system components cool.

Outside horns shall be activated for emergency announcements and tones only. Routine announcements and class change tones shall not go out over the outside horns.

Simultaneous program distribution and two intercom channels.

Compatible with remote display units for display of incoming calls and activity within the system.

System is to be compatible with a DTMF phone system and be able to use touch-tone phones to make and receive call from within the system.

System is to have a user-programmable, battery-backed master clock.

System is to be able to drive either digital or analog clocks or both from within the system.

System capacity shall be up to 256 remote stations and/or call points with up to twelve administration control units [ACC4's], up to 12 remote display units and unlimited interconnection to a phone system.

The system is to have user programmable input ports that allow external devices to trigger time and emergency tones, external all-call, door monitor, night transfer switch, and other system functions. User programmable dry contact outputs are provided to signal external devices when such functions as clock synchronization, all call, and remote annunciations occur.

System is to have an RS-232 Port for P.C.

SYSTEM MASTER CLOCK

The system shall contain an integral master clock and programmer which shall be capable of performing the following functions:

Displaying the time of day in either twelve or twenty-four hour format at each Administrative Control. Providing 256 discrete time event entries for programming functions based on;

The time of day in hours and minutes:
The day or combination of seven {7} days of the week the event is to occur.
Selection of any one or any combination of eight {8} zones or outputs to be activated.

Selection of any one of eight schedules to allow for maximum flexibility due to special circumstances or seasonal changes. Selection of fourteen user programmable tones. Provide for an editing and review routine to permit the user to change and edit time events, zones, and schedules.

ADMINISTRATIVE CONTROL CENTER [ACC]

The administrative control center {ACC} shall be the control center for communications, paging, program distribution and signaling. The ACC will provide the following:

Listening level control for intercom channel or program channel.

Automatic gain control on intercom microphones.

Provide one VOX handset {for private communications}, built-in microphone, speaker, and push-to-talk button on each ACC for intercom communications.
ACC self Diagnostics.

Provide ACC-keypad, menu-driven programmable systems functions, including:
Architectural alphanumeric room numbers with option to program call-in registering only at specific ACC's.

Room Call-in priority levels.
Twelve or twenty-four hour time clock.
Two-hundred-fifty-six event, eight time schedules, eight zones.
Eight (8) speaker paging zones.
System tone characteristics.
Eight (8) Speaker program zone assignment.
Eight (8) Speaker time tone zone.

Provide access code for user-restricted entry to system programming functions.

Facility for emergency calls to take precedence over routine calls.

Distinct call-in alert tone for emergency call-in.

Provide distribution of special tone to all speakers for custodial call.

Provide built-in speaker at ACC to monitor program channel.

System programming may be accomplished from an ACC or from a P.C. type computer.

Each ACC shall have an LCD display.

CENTRAL EQUIPMENT

The central equipment shall be rack mounted in a standard cabinet. The central cabinet shall contain the following equipment:

Trunk or Digital card.
Analog card.
Zone switching card as required to accommodate system capacity.
Power supply as required

System Amplifier(s) {125 watts minimum}

The unit shall require 110 VAC power but in the event of a power failure, the system shall switch over to a standby battery backup system provided by this contractor.

New units shall interface with the existing unit and provide adequate number of zones to meet specifications plus 10% spare.

Emergency Tone Generator
Provide seven distinct tones. Tones shall be activated by emergency push button panel specified below.

Emergency Tone shall go over outside horns.

Emergency tones shall be distributed to all speakers

Emergency tone generator included with the system.

ADMINISTRATIVE CONTROL CENTER (ACC)

The administrative control center shall be a desk top unit located as shown on the plans. It shall have a modular jack for quick disconnect for servicing.

The administrative control centers shall be a DUKANE ACC4, MCDS3, or Simplex 5120-9921.

AM-FM TUNER/CASSETTE PLAYER

The AM-FM Cassette Player shall be Dukane Model RTC350P, Bogen CR-100, or Simplex 5120-9197 including an AM/FM antenna. The Antenna shall be mounted outdoors. It shall have a microphone input and be suitable for mounting in a standard 19” free standing equipment rack. Power for the AM/FM tuner/cassette player shall come from the central enclosure.

AM-FM CD PLAYER

The AM-FM CD Player shall be Dukane Model Rauland MCX350, or Bogen CDC-3, or Simplex 5120-9197 including an AM/FM antenna. The Antenna shall be mounted outdoors. It shall have a microphone input and be suitable for mounting in a standard 19" free standing equipment rack. Power for the AM/FM CD Player shall come from the central enclosure.

CALL-IN SWITCH

The call-in switch shall be the Dukane Model PCS499, Bogen CA-21 or Simplex 5120 9320 Call-In Switch with Privacy. The call-in switch shall use one, three-position rocker switch secured to a brushed stainless-steel wall plate for mounting to a standard single-gang electrical box. The switch shall provide for selecting privacy or normal operation in intercom-type sound systems. The switch shall have spring return closure in the CALL position for placing calls from a speaker location. The switch used shall provide momentary contact in the CALL position, maintained contact in the PVCY position. One button shall be capable of both normal and emergency call-in. A normal call-in becomes an emergency call-in when the CALL position is held and switch contact maintained for 3 seconds. External connections shall be to screw terminals. The switch shall bear PVCY and CALL designations in non-removable, hot-stamped lettering. The dimensions of the call-in switch shall not exceed 4-1/2 inches high, 2-3/4 inches wide and 1-3/16 inches deep.

WEATHERPROOF HORN

The outside speaker shall be Dukane Model 5A30, Bogen SPT-15-A or Simplex 5120-9583 Re-entrant type and shall be furnished and installed as indicated on the drawings. Each unit shall have a power rating of 15 watts full range. The frequency range shall be 275 to 14,000 Hz. The trumpet shall have a screwdriver adjustable switch that can be set externally to select 15, 8.0, 4.0, 2.0, 1.0 watts on a 70-volt line or 15, 13, 7.5, 7.0, 3.7, 2.0, 1.8, 1.0, 0.5 watts on a 25-volt line. Available impedances shall be 5000, 2500, 1250, 625, 325, 90 or 45 ohms. The sound pressure level shall be 121 dB at 4 feet on axis with 15 watts input and 110 degrees dispersion. The horn shall be 8" wide, 8" high, and 9" deep. It shall be fabricated from beige high impact ABS type plastic. External connections shall be screw terminals. The Terminal housing and transparent cover shall function together as a strain relief. The horn shall be provided with a three-way adjustable mounting bracket.

FLUSH CEILING LOUDSPEAKER SPEAKER ASSEMBLY

The loudspeaker shall be Dukane Model 5A606, Bogen S86 or Simplex 5120-9481 furnished and installed as indicated on the plans. The loudspeaker shall be eight inch, seamless cone type. The ceramic magnet shall weigh at least 4.8 ounces. The frequency range shall be from 90 to 15,000 Hz. The normal wattage rating shall be 8 watts with a program rating of 12 watts. The voice coil diameter shall be 3/4" and the impedance 8 ohms.

The overall speaker diameter shall be 8-1/32 inches, and the speaker depth shall be 2-3/4 inches. The weight shall be 1 pound, 14 ounces. All external parts shall be cadmium plated and conform to EIA standard. The loudspeaker shall be equipped with a universal matching transformer suitable for use on a 25-volt output line with taps at 1/2, 1 or 2 watts or a 70-volt output line with taps at 1/2, 1, 2 or 4 watts.

The Flush Ceiling Baffles shall be Dukane Model 6A338, Bogen WB8, or Simplex 5120-9421. The baffle shall be 12-5/8" in diameter, and the circular design shall match the surrounding motif. It shall be solid white, molded, high impact styrene, highly resistant

to scratches and mars. The baffle finish shall accept any good latex paint to match the mounting surface where required. It shall mount an 8-inch loudspeaker with concealed screws and provide a 60% opening for the sound. The baffle weight shall not exceed 7.5 ounces.

The Speaker Backbox shall be Dukane Model 8A300, Bogen RE84, or Simplex 5120-9491. The enclosure shall have four 8-32 J nuts installed in the mounting flange. The backbox shall have four combination knockouts 1/2" – 3/4" spaced 90 degree apart. The backbox shall have a durable finish and shall use a Visco/elastic damping compound. It shall have a 9" diameter by 3/8" thick polyester urbane acoustic foam pad applied to the inside bottom to prevent mechanical and acoustical resonances.

The Speaker Support Bridge shall be Dukane Model 677-67, Bogen TB8, or Simplex 5120-9499. The speaker support bridge shall be made of steel and finished with a durable protective coating. The speaker support bridge shall be 14-1/2" high and 23-3/4" wide and weigh 1-1/2 pounds.

INTERCOM ROOM STATION

The Dukane 4A1480, Bogen or Simplex 5120-9610 Intercom Station with Call-in Switch shall be flush-mounted and shall consist of a water and flame resistant speaker/microphone with Mylar cone and momentary call-in switch. The speaker/microphone and momentary call-in switch shall be mounted to a heavy-gauge, stainless steel faceplate, which in turn shall mount to a standard three-gang masonry backbox. The speaker/microphone cone shall be protected from flame or liquids by five barriers. Three of these barriers shall be metal plates with strategically positioned holes for speaker cone protection. The fourth barrier shall be perforated vinyl and shall be placed behind the other three barriers but in front of the speaker cone. The Mylar speaker cone shall provide a fifth barrier that is moisture proof.

PART 3 - EXECUTION

CABLE

Cable and wire as recommended by manufacturer.

END OF SECTION 16820

SECTION 16950 - COMMUNICATIONS

PART 1 - GENERAL

RELATED DOCUMENTS

The General and/or Special Conditions Sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to this work.

SCOPE

Furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete communications systems as shown on the drawings and specified herein. Contractor shall report any discrepancies pertaining to this project scope between the plans given and the existing building. All work pertaining to cutover, removal of electronics and any other items indicated on plans shall be coordinated with Baldwin County Board of Education IT dept. Work shall include but is not necessarily limited to the following items:

Data
Telephone

Contractor shall be solely responsible for quality control and shall maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, safety, temporary facilities, and site conditions, to produce Work in accordance with Contract Documents.

Work shall be free from faults and defects in workmanship. Materials and equipment incorporated into the work shall be new, unless noted otherwise.

Required testing and inspection are intended to assist in determination of probable compliance of the work with the Contract Documents, but do not relieve Contractor of responsibility for this compliance. Specified testing and inspection are not intended to limit Contractor's quality control program.

CONTRACTOR QUALIFICATIONS

The Structured Cabling System Contractor (SCSC) shall be an experienced firm regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. The Structured Cabling System Contractor, under the same company name, shall have successfully completed the layout, installation, testing and warranty of not less than five Structured Cabling Systems of the scope of the largest system on this project for a minimum period of three years prior to the bid date, and shall have been regularly engaged in the business of Structured Cabling Systems contracting continuously since. The Contractor shall have an existing permanent office located within 100 miles of the job site from which installation and warranty service operations will be performed.

The contractor shall be a certified contractor by the structured cabling system (SCS) manufacturer and shall be in good standing. The contractor shall provide certificates of said certifications if required. In addition, the RCDD/ Project manager and not less than 50% of the installing technicians shall be BICSI certified installers and/or manufacturer certified. The contractor shall assure that all requirements of the warranty of this project can be met by the manufacturer and the contractors subsequent certification from the SCS manufacturer.

The head Installer assigned for the project shall be a BICSI registered Level II installer.

The Structured Cabling System Contractor shall present, with his signed contract, the name and certification number of a BICSI certified Registered Communications Distribution Designer (RCDD) who is a permanent employee of the Contractor. **Contract RCDD's shall not be acceptable.** The Contractor shall maintain this RCDD, or another RCDD approved by the Engineer, in his permanent employment throughout this project. The RCDD shall have overall responsibility for certifying that the installed structured cabling system conforms to these contract documents and to the referenced EIA/TIA, IEEE, BICSI, and UL standards. Specific requirements for the RCDD are as follows:

The RCDD shall be, in the judgment of the Engineer, thoroughly experienced in the design, layout, and installation of structured cabling systems of similar size and complexity as required for this installation. The RCDD shall submit evidence of these qualifications to the Engineer upon request.

The RCDD shall affix his stamp to the Contractor's pre-installation submittal drawings, indicating that he has reviewed and approved the drawings for conformance to the contract documents and to the referenced codes and standards.

The RCDD shall periodically visit the site and inspect the work in progress. RCDD site visits shall be made not less than once per month when the job is in active progress. The RCDD shall prepare a field report for each site visit for submission to the Engineer.

The RCDD shall sign off on all copper and fiber optic cable test results, indicating that he was in responsible charge of all cable testing procedures and that all cables were tested in compliance with the contract documents and met or exceeded the requirements stated therein.

The RCDD shall affix his stamp to the Contractor's as-built drawings, indicating that he has reviewed and approved the drawings as being complete, accurate, and representative of the system as actually installed.

The RCDD shall be present for and participate in not less than four hours of user training.

CONTRACTOR QUALIFICATIONS – CONDUIT INSTALLATION:

All conduit shall be installed by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid

documents.

BID REQUIREMENTS

The Structured Cabling System Contractor shall provide the following documentation, to be presented with the bid, as evidence that the requirements for Structured Cabling System Contractor qualifications listed above are satisfied. If the bidder does not meet the requirements of this specification section for structured cabling system work, he shall provide the following documentation, to be presented with the bid, as evidence that the requirements listed above are satisfied by the Structured Cabling System Contractor he proposes to use as a subcontractor to perform work under this section. In either case, all work under this section shall be performed by permanent employees of the Structured Cabling System Contractor listed on the bid form, and shall not be performed by another subcontractor, employees of another company, or by temporary employees.

A list of not less than five (5) references for jobs of similar size and complexity including project name, location, contact person and phone number. These projects shall all be performed in K-12 schools while school was in session.

RCDD name, BICSI certification number, and qualifications.

Location of office from which installation and warranty work will be performed.

ADDITIONAL MATERIAL REQUIREMENTS

In addition to the contract documents, the structured cabling contractor shall provide additional parts/materials for additional services and unforeseen conditions and additions. These additional materials shall include all labor to install and test per these specifications. These additional requirements shall include:

25 data cables and outlets ports, including faceplates, cable, patch panels (if needed) in locations to be determined under construction. Assume cables to be approximately 75’ in length and terminated on nearest consolidation point or patch panel. These shall include all cable pathway requirements.

Four installations of data surge protection (as specified on drawings), including grounding conductor and enclosure.

These additional materials shall be used to replace existing damaged cables or newly added outlets. These items shall only be installed when approved by the Owner and engineer.

Effort has been made to identify/locate all existing outlets on the drawings. It is anticipated that 10% of the outlets in the building have not been identified. Contractor shall locate these outlets when found and provide with new cabling, jacks, faceplates, labeling etc., and test as required by the plans and specifications. *The quantity of additional, new outlets listed above are not included in these 10% of existing outlets that were not identified on the drawings.*

RELATED REQUIREMENTS

The contractor shall understand and apply the Baldwin County Board of Education telecommunications infrastructure standard to their installation. Any discrepancies between these specifications and the design drawings from these standards shall be noted and expressed to the Owner and engineer for a decision and direction.

Division 16 Specification Sections regarding conduit and raceway apply to work under this section, with the additions and modifications specified herein and on the drawings. The special requirements indicated on the drawings for structured cabling system conduit shall take precedence over any requirements specified in Division 16 Specification Sections.

EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

Prior to providing a proposal for this work, the Contractor shall visit the proposed sites of work to become familiar with any condition that may in any manner affect the work to be performed. No allowances shall be made because of lack of knowledge of these conditions.

The Contractor shall have total system responsibility to assure a fully operational system. Any additional labor and components required for the installation of a complete operating system but not specifically required by the bid documents shall be provided and the cost borne by the Contractor.

The Contractor remains the owner of all components provided under this contract and is responsible for all risk of loss or damage to all components up to and including the date and time of Final Acceptance by the Engineer and the Owner's Authorized Representative. After the date of Final Acceptance, the Owner shall assume full ownership of the equipment.

JOB CONDITIONS

Existing Conditions: All existing systems, and conditions shown on the plans as existing are approximate, and the Contractor shall verify all details of the project before any work is started.

Scheduled Interruptions: Planned interruptions of telephone/data/, to any facility affected by this contract, shall be carefully coordinated and approved by the Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until specific approval has been granted by the Architect. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and material required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.

Maintaining Service: Any existing service (or operating system) which must be interrupted for any length of time shall be supplied with a temporary service as necessary for continuation of the normal operation of this facility.

Removal of Existing Work: Where noted or indicated on the drawings, or specified herein, existing electrical materials and equipment shall be removed from the building. All materials designated to be removed by the Contractor, not to be salvaged and given to the Owner or required to be reinstalled, including scrap, shall become the property of the Contractor, and shall be promptly removed from the site. Existing items required to be removed temporarily in order to properly install new work shall be replaced in a satisfactory manner upon completion.

CODES, PERMITS AND INSPECTIONS

Minimally, the following standards must be met when applicable to the work performed:

International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS 11801
Underwriters Laboratories (UL) Cable Certification and Follow up Program.
ANSI/TIA/EIA-568-B.1 -- *Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements*
ANSI/TIA/EIA-568-B.2-1 -- *Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components*
ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding Requirements for Telecommunications
ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
ANSI/TIA/EIA-526-14A -- *Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant*
ANSI/TIA/EIA-758(A) -- *Customer-Owned Outside Plant Telecommunications Cabling Standard*
AHJ -- Local Authority Having Jurisdiction (AHJ)
NEC -- National Electrical code
NFPA -- National Fire Protection Association
NESC -- National Electrical Safety Code
BICSI -- BICSI Telecommunications Distribution Methods Manual (TDMM)

The installation shall comply with all local, state, and federal laws and ordinances applicable to communication equipment installation and with the regulations of the latest published edition of the National Electrical Code (N.E.C.) and the Federal Communications Commission (FCC) where such regulations do not conflict with those laws and ordinances. The Contractor shall obtain and pay for all permits and inspection fees, and after completion of the work, shall furnish the Architect a certificate of final inspection and compliance with the standards listed above as applicable. Any charges by a utility (Data, Telephone, etc.) for providing service as shown shall be included in the bid and paid by the Contractor.

JOB-SITE CONDITIONS

The Contractor shall be required to coordinate working hours at each site with the School Principal. Work at the site shall not be allowed during hours when school is in session, unless specifically approved by the School Principal on a day-by-day and case-by-case basis. The Contractor shall work at night and/or weekends (or at any time school is not in session) to meet these requirements at no additional charge to the Owner.

The Contractor shall be responsible for ensuring that his employees and any subcontractors:

Refrain from smoking or the use of tobacco in any facility, property or vehicles owned by the School District. Any person wishing to use tobacco products must leave School District property to do so.

Refrain from the use of vulgarities while on School District property.

Wear proper attire to include full length pants or jeans and appropriate shirts. Clothing shall have no vulgarities or sexually suggestive graphics. Clothing shall bear contractor's company name.

Refrain from contact with students or staff. Communications with staff shall be limited to that related to the work.

The School District retains the right to require the Contractor to dismiss any employee or any employee of his subcontractors deemed incompetent, careless, insubordinate or otherwise objectionable, or any personnel whose actions are deemed to be contrary to the public interest or inconsistent with the best interest of the School District.

The Contractor shall be responsible for all damages to any building, equipment, furnishings, or other property of the School District that are caused by the Contractor or his subcontractors. The Contractor shall, as directed by the Engineer or the Owner's Authorized Representative, repair or replace any damaged item at the Contractor's expense. Any item which the Engineer or the Owner's Authorized Representative allow to be repaired shall be restored to the condition which existed prior to the damage occurring, or better.

PRE-INSTALLATION WALK-THRU

Contractor shall schedule a walk-thru with principal and school district IT representative. The purpose of the walk-thru will be to identify any damage that exists prior to installation and potential conflicts/discrepancies with the design documents. All issues shall be documented and signed off by the principal and school district IT representative.

PRE-CONSTRUCTION CONFERENCE

Contractor shall schedule a pre-construction conference with principal, school district IT

representative and engineer. Contractor shall present any issues/discrepancies from pre-installation walk-thru, schedule of construction including start date and completion date, scheduled progress meetings, anticipated daily work schedule and any required scheduling with principal, school IT representative and engineer.

DRAWINGS AND SPECIFICATIONS

The drawings and these specifications are complimentary each to the other. What is called for by one shall be as binding as if called for by both. Where the drawings and/or specifications differ as to quantity or quality, the greater quantity or higher quality shall be provided. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

STANDARDS OF MATERIALS AND WORKMANSHIP

Materials: All materials shall be new and shall be listed and approved by the Underwriters' Laboratories, Inc., in every case where a standard has been established for a particular type of material in question. All work shall be executed in a workmanlike manner and shall present a neat appearance.

Prior Approvals: Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer. It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the Contractor's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Other named manufacturers, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the engineer shall reserve the right to reject it.

For approval of products other than those specified, bidders shall submit to the Architect, a request in writing, at least ten (10) days prior to bid date. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data, model numbers, list of references or other information necessary to completely describe the item. Approval will be in the form of an Addendum to the specifications issued to all prospective Prime Contract Bidders on

record. The Addendum will indicate the additional products which are approved for this project.

Substitutions: Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing samples if required.

Shop Drawings: The Contractor shall submit a list of items proposed for use. He shall also submit catalog data and shop drawings on proposed systems and their components, panelboards, safety switches, starters and contactors, transformers, lighting fixtures, and wiring devices. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Data shall be submitted within ten (10) calendar days after the contract is awarded. Provide six (6) copies of shop drawings unless a greater number of copies is required by the General Conditions. Each submittal data section shall be covered with an index sheet listing Contractor, Sub-Contractor, Project Name, and an index to the enclosed submittals.

Each major section of submittals such as power, equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:

General contractor with phone number and project manager.
Subcontractor with phone number and project manager.
Supplier of equipment with phone number and person responsible for this project.
Index of each item covered in submittal and model number as proposed in the attached.

Any deviation from contract documents shall be specifically noted on submittal cover index and boldly on specific submittal sheet.

Operating and Maintenance Manuals: At completion of the work, furnish three (3) copies of written operation instructions which shall include manufacturer's descriptive bulletins, operating and maintenance manuals and parts lists of all equipment installed. Also include in such instructions, the specified size and capacity ratings of all equipment installed. Each set of instructions shall be assembled into a suitable loose-leaf type binder and presented to the Architect for delivery to the Owner.

Record Drawings: Maintain one extra set of black-line, white print drawings for use as Record drawings. Records shall be kept daily, using colored pencil. As the work is completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Architect.

INTERFACE WITH OTHER CONTRACTS

It shall be the responsibility of the Contractor to cooperate with all other crafts working

on this project. All cutting, trenching, backfill, and structural removals to permit entry of the communications system components shall be done by this Contractor. All patching and finishing shall be done by the General Contractor.

GROUNDING

Provide grounding and bonding systems in strict accordance with the latest published edition of N.E.C., except where more stringent requirements are specified herein. Inter-connection of neutral and ground is not permitted at any point in the communications system. Install grounding conductors to permit shortest and most direct path to ground. Inaccessible joints are not to be made in grounding conductors. Where grounding conductors are in raceway, bond conductor and raceway at both ends. Grounding and bonding fittings used shall be UL listed and be compatible with metals used in system. Sheet metal type straps are not acceptable.

The Equipment Rack shall be connected to the existing ground system that consists of driven electrodes, ground ring, building steel, water pipe electrodes, concrete encased electrode, rod and pipe electrodes, or plate electrodes by a #3/0 conductor. The driven electrodes, building steel, water pipe electrodes, and concrete encased electrodes are the minimum requirements. Extend grounding conductor to main telephone equipment space.

The Contractor shall test and provide written certification of final ground system; including test method, equipment model and serial numbers, and final measurements at each point. The ground electrode system must be less than 25 ohms.

GUARANTEE AND SERVICE

Upon completion of all tests and acceptance, the Contractor shall furnish the Owner of a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 - PRODUCTS

GENERAL

All equipment and materials shall have ratings established by the recognized independent agency or laboratory. The Contractor shall apply the items used on the project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory. Use of equipment or materials in applications beyond that certified by the agency or beyond that recommended by the manufacturer shall be cause for removal and replacement of such misapplied items. See section 16100 for raceway and junction/pull box requirements.

CABLES

Data/Communication Cable: Cable shall be Category 5e unshielded twisted pair. The vendor shall determine if plenum or riser rated cable is required for the specific installation.

Cable Pathway: Extension of all data cables shall be within raceway, conduit, cable tray or j-hook cable delivery system provided and installed by the contractor.

Fiber: Fiber shall be 6 strand count multi-mode fiber optic cable.
Cabling will have a 15 year *manufacturers* warranty on all parts and labor.

All copper cable terminations shall comply with, and be tested to TIA/EIA 568B and TSB-67 standards for Category 5e installations.

All test results shall be compiled and given to the Owner in electronic format.

Cables to be provided by the Contractor:

One 6' patch cord with terminations per data connection point.

One 6' telephone cable with terminations per telephone connection point.

RCA outlet connection cabling as shown on the plans.

Cat-5e cabling and labeled terminations from the Data Equipment Rack to all data connection points.

Cat-5e cabling and labeled terminations from the Telephone Equipment Rack to all Telephone connection points.

All cables and labeled terminations required in the MDF/IDF's to interconnect patch panels, data equipment, fiber optic patch panels, Telephone distribution hub, computers, etc. to provide a fully functional and operational system.

Cables and labeled terminations between all Main Distribution Frames (MDF's) and Intermediate Distribution Frames (IDF's) (existing and new), and between all Cable TV and Telephone distribution backboards/network centers.

CABLE ROUTING

Cabling:
All communications cabling used shall comply with the requirements as outlined in the National Electric Code (NEC) article 760 and the appropriate local codes. All cabling shall bear CMP (Plenum Rated), CM/CMR (Riser Rated) markings. All cabling shall be solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 5e cables with four individually twisted pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-B.2-1 up to 1 GHz.

Cabling Bundling:
Install horizontal cabling shown to be free-routed parallel and perpendicular to building lines, up high and over piping, ductwork, conduit and other utilities, and in protected locations. All cabling shall be neatly and symmetrically bundled (maximum individual bundle size 25 four pair Category 5e cables), bound with black velcro wraps at a minimum of four feet on center, properly supported, and otherwise installed as indicated on the drawings. Support all free-routed horizontal cabling bundles individually with Category 5e J-hooks (Erico "CABLCAT") at a minimum of four feet on center. Attach J-hooks to building structural members only using factory support system components. Secure cables bundles within J-hooks with factory contact free containment cable ties. Do not attach J-hooks to ceiling grids, ceiling supports, piping, ductwork, conduit or anything other than building structural members unless specifically approved by the Engineer. Do not support free-routed horizontal cabling by running over or directly attaching to building structural members, piping, ductwork, conduit or any other utility.

Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables. Route conduits together wherever possible.

Provide wire management devices on backboards and racks as indicated and as required to facilitate organized routing of cables and patch cords. Bundle cables together behind racks and fan out to points of termination. The finished installation shall meet the approval of the Engineer for overall quality and neatness of appearance.

The Contractor, in providing a bid, shall be fully responsible for any and all damage to cabling which may occur during the installation, and shall replace any damaged cabling with new cabling of the type specified for the application.

Fire Stopping:
Sealing of openings between floors, through rated fire and smoke walls, existing or created by the contractor for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work.

Warning Labels:
All fiber optic cable running through crawl spaces, in attics, or above drop ceilings shall be clearly and noticeably marked as fiber optic cable, unless completely covered and protected in conduit. Warning markings must be placed at a minimum of every five (5) feet.

STRUCTURED CABLING SYSTEM

All drops installed and maintained by vendor must support (but not be limited to) the following application standards: 100Base-T (IEEE 802.3), 1000Base-T (Fast Ethernet), 100VG - AnyLAN (IEEE 802.12), 4/16 Mbps Token Ring (IEEE 802.5), and 52/155Mbps ATM (ATM Forum).

SYSTEM DESCRIPTION

The system work or projects shall consist of a network of fiber optic, and unshielded twisted pair, riser, tie, patch, and station cables. Cables and terminations shall be provided and located as shown and in the quantities indicated on any drawings, or determined during school walk through. Fiber cables shall terminate on fiber distribution centers (FDC's), fiber patch panels (FPP's), lightguide interconnect unit (LIU's), and/or modular patch panels located in all designated demarcation points. All cables and terminations shall be identified at all locations. All cables shall be terminated in alphanumeric sequence at all termination locations. All copper cable terminations shall comply with, and be tested to TIA/EIA 568B and TSB-67 standards for Category 5e installations. Station cables shall terminate on wall plates equipped as designated by Baldwin County Board of Education (BCBE) personnel.

Outlets

Outlets for data communication shall consist of two gang utility outlet boxes. Wall plates will be equipped with 8-pin modular (RJ-45) jacks, utilizing T568B wiring. Single-gang mounting plates may have one, two, three, or four openings. The following are the specifications for each type of opening:

Voice Outlet - AMP, Ortronics, or Hitachi 8-pin modular, category 3, unkeyed, black, pinned to T568B Standard.

Data Outlet - AMP, Ortronics, or Hitachi 8-pin modular, category 5e, unkeyed, orange, pinned to T568B Standard.

Optical Fiber Connectors - MTRJ adapter.

All wall boxes, faceplates, track, and all other associated pieces shall be the color of white. Each port shall be clearly marked what type of port it is and the number in which that port associates to in the termination point. All outlet cabling shall terminate on termination patch panels in their associated TC or WC.

Station Cable

Category 5e UTP, 4 Pair, data cables shall be extended between the station location and its associated TC or WC. These cables shall consist of 4 pair, 24 gauge, UTP, and shall be terminated on the 8-pin modular jacks provided at each outlet. Cable jacket shall comply with Article 800 NEC for use as a plenum cable. The 4 pair UTP cable shall be UL certified.

Fiber Optic Cabling

Fiber optic cabling shall be provided between MDFs and classrooms, libraries, and other rooms and furnished with the quantity of fibers designated by Baldwin County Board of Education.

Same Manufacturer

All fiber in a cable run shall be from the same manufacturer and shall be of the same type. A mix of fibers from different manufacturers may not be used without BCBE permission.

Multimode Fiber Specifications

All fiber optic cables within the premises will use multimode, graded index, fibers with 62.5 micron cores only. Fibers must comply with EIA/TIA 492 specifications and IS 11801 standards. Fibers will have dual-wavelength capability: transmitting at 850nm and 1300nm ranges. All fibers shall be color coded to facilitate individual fiber identification.

Fan-out Kits

All loose tube cables will be provided with fan-out kits at each termination point.

Equipment Racks

The TC, TWC, or ER shall be equipped with a floor mounted EIA/TIA standard 19" rack as designated. Provide shelves and wire managers as required by Baldwin County Board of Education. Racks shall be manufactured by Ortronics or approved equal. Provide and install all wire management hardware. Rack wire management is to be vertical and mounted on the sides.

The minimum rack size shall be a standard 19 inch rack with sufficient rack space to allow the fiber distribution center (FDC) to be placed at the top of the rack.

Floor mounted racks shall be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement. All racks shall be grounded to the isolated ground bar within the ER using a standard ground lug and #6 jacketed green cable.

Patch Panels

Patch panels shall be in 12, 24, 48, and 96 port configurations as designated and be AMP, Ortronics or Hitachi. Patch panels shall be wired for T568B configuration.

Designation strips for each jack shall be provided on the patch panel. All cables shall be terminated in numerical sequence.

Category 5e Patch Cords

Provide Category 5e Modular Patch Cords for each assigned port on the patch panel. All cords shall conform to the requirements of EIA/TIA 568B Commercial Building Telecommunications Cabling Standard and be part of the UL LAN Certification Follow-up Program. Cords shall be equipped with an eight (8) pin modular connector on each end and shall conform to the length(s) required maintain proper installation and bend radiuses.

Fiber Patch Panels

Lightguide Interconnect Unit (LIU): LIU is a termination and administration point for the fiber in the network. The LIU will protect the fiber connectors from mechanical stress, macro-bending, and tampering with the circuit. The LIU will provide circuit identification and will be wall-mounted. The LIU shall be manufactured by Siecor and have connector panels that accommodate ST connectors. The LIU shall provide terminating, cross-connecting or interconnecting capability of 6, 12, or 24 fibers.

Fiber Patch Panels

Lightguide Distribution Shelves (LDS): LDS is a high fiber-count termination and administration point for the fiber cables in the network. The LDS will provide a place for

circuit identification and be mounted securely at the top of the equipment rack. LDS shall be manufactured by Siecor or approved equal. The LDS shall have connector panels that accommodate ST connectors. The LDS must be mountable in a 19” rack and have front and rear access panels. The LDS shall provide terminating capability of 24, 48, 72, or 144 fibers.

Fiber Patch Cords

The fiber patch cords shall consist of a buffered, graded index fiber with 62.5 micron core and a 125 micron cladding for multimode application. The fiber buffer shall be covered by aramid yarn and have a jacket of flame retardant PVC. The connector shall be ST as manufactured by Siecor or approved equal.

Multimode Fiber Optic Connector

Provide a field installable multimode connector to terminate fiber optic cables from cable-to-cable, cable-to-equipment or equipment-to-equipment, and make jumpers. The connector must be AMP light crimp, ST, stainless steel.

CABLE LADDER

The cable ladder is to be as indicated on the plans with heavy-duty 3/8" steel bar construction. Channel cross slats are to be welded between stringers. Provide and install all associated support hardware, transitions, curves. See the plans for the actual size of the ladder.

A CSD Firsto firestop system is to be provided and installed where fire barriers are penetrated by cable ladders.

IDENTIFICATION:

All labels shall be produced using a laser printer and shall be easily readable from floor level when viewing a backboard, panel, or communications outlet from the front.
Labels for communications outlets, horizontal patch panels, and fiber optic drawers shall be made using factory laser printer label sheets furnished by the outlet and block manufacturer. Sheets shall be preformatted with perforated tear-out labels sized for the specific application. Use spreadsheets furnished by the manufacturer to enter data for printing. Handwritten labels are not acceptable. Provide data sheets describing proposed labeling products for cable and conduit with pre-installation submittals.

Label each main cable at each end based on source and destination room numbers using Engineer approved permanent labeling system.

Label each horizontal wiring conduit at the backboard or panel end based on the identification of the CO served using Engineer approved permanent labeling system.

Label each main (backbone) cable at each end based on source telcom room number and destination telcom room number using write-on mylar wrap wire markers.

Label each existing communications outlet to match new labeling scheme as shown on the plans.

Label each communications outlet, horizontal wiring terminal block, backbone wiring terminal block,communications panel, rack, enclosure, and other devices as indicated on the drawings.

CABLE TESTING

Prior to the installation of patch cords, the Contractor shall test all cables. As part of cable test procedures verify all labeling and correct all inaccurate labeling. Cable testing shall include existing outlets/cables, TC's and new outlets/cables.

The Contractor's RCDD shall be in responsible charge of all cable testing procedures and shall provide a letter to the Engineer at the completion of successful testing certifying that all cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.

The requirement for this project is full compliance/zero tolerance. Cables which do not comply shall be removed and replaced. If certain existing cables do not comply, contractor shall notify engineer and may be deemed (at engineer's discretion) considered part of contractor's required "Additional Materials Requirement" in the specifications and be replaced with new. Partial use of cables by claiming good pairs or strands and abandoning others is not allowable. Defective cables shall be removed.

Tests shall be performed in strict accordance with the test instrument manufacturer's printed instructions.

Technicians performing testing shall be thoroughly trained in the use of the test instruments employed. Factory certification of technicians is desirable. The Contractor shall provide evidence of training if requested by the Engineer.

Test instruments shall be calibrated and traceable to the National Institute of Standards (NIST). Test instruments shall have been recently calibrated. The Contractor shall provide evidence of test instrument calibration if requested by the Engineer.

The Contractor shall be required to retest installed cables in the Engineer's presence to verify the Contractor's test documentation. The percentage of cables to be retested shall be determined by the Engineer based on compliance of the installation with the contract documents, quality of workmanship, and results of initial cable tests. Retesting shall be performed as required until all cables, in the judgment of the Engineer, comply with the requirements of the contract documents.

Cable Test Manual

Prior to the Substantial Completion Inspection, complete the digital (CD/DVD format) Cable Test Manual. Submit the Cable Test Manual to the Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Engineer indicating that the Contractor is providing one CD/DVD disk containing cable test results.

Quantity: One (1).

Format: *CD/DVD disk with printed label indicating the following:*
Project Name
Contractor's Name
Owner's Name
Owner's Project Number or Purchase Order Number

CD/DVD Contents:
RCDD Certification (PDF format):
Written Certification of Contractor's RCDD, digitally signed, stating that all fiber optic, Category 5e, and multi-pair telephone cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.

Test Reports
Test reports of all fiber and copper cabling. Provide with software compatible reader, similar to Fluke Networks LinkWare. Refer to test requirements in this section.

Fiber Optic Cable Testing
Fiber optic cable shall be tested with an OTDR tester.

Notify the Engineer in writing not less than five days prior to commencing fiber optic cable testing. The Engineer may elect to be present for and witness fiber optic cable testing.

Clean all fiber optic connectors, sleeves and test cords prior to testing. Follow all other recommendations of the test instrument manufacturer for cable and instrument preparation.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation. Setup parameters shall include the length of the fiber launch cord.

All fiber optic cable tests shall be performed with a section of launch cord of known length preceding the FUT (fiber under test) and with a section of cord following the FUT. The trace for each test shall clearly display the two-point loss in db, which shall include the loss of the FUT and both mated connectors of the FUT. The operator shall carefully position the first cursor just ahead of the first mated connector of the FUT, and the second cursor just behind the second mated connector of the FUT.

Post-Installation Testing
After installation and termination of fiber optic cable, test each strand of fiber to verify that the installed cable meets the performance requirements described below. Each strand shall be tested at both the 850nm and 1300nm wavelengths. Provide a printout of the trace for each test to the Engineer for review and
approval.

Documentation
Test documentation for fiber optic cabling shall include the following:
A digitally signed PDF document from the Contractor's RCDD certifying that all cables have been tested in compliance with the contract documents and have met or exceeded

the requirements stated therein.
An introductory discussion documenting test instruments used, qualifications of operators, test conditions, setup parameters, length of the fiber launch cord, and any other pertinent information.

A full size full page of the OTDR trace for each strand at 850nm and 1300nm wavelengths. Each strand shall be clearly identified using the labeling nomenclature described on the drawings. Each trace shall clearly indicate the name of the operator who performed the test, and the date of the test.

Insert all fiber optic cable test documentation in the Cable Test Manual.

Fiber Optic Cable Performance Requirements
Each strand of the installed fiber optic cabling, with mated connectors at each end, shall have a total power loss (in db) less than or equal to the manufacturers' performance specifications for the cable and connectors called for in the contract documents, when adjusted for the installed length, and with an allowable deviation of 1.0 db. If the test results for a given strand or strands, in the judgement of the Engineer, indicate excessive power loss, the Contractor shall repolish, reconnectorize, or replace the affected cables as required to achieve specified performance levels as demonstrated by retesting.

Category 5e UTP Cable Testing
Category 5E cable shall be tested with a Level II tester.

Notify the Engineer in writing not less than five days prior to commencing Category 5E UTP cable testing. The Engineer may elect to be present for and witness cable testing.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation.

Post-Installation Testing
After installation and termination of the Category 5e UTP cable, test each cable in accordance with TIA/EIA test specifications. Test each cable from both ends with a Category 5e tester, Fluke DSP 4000 series or approved equal, to verify compliance with TIA/EIA specifications for Category 5e UTP, "Basic Link" configuration, Level II accuracy, with no allowable deviation. Test at the full range of frequencies indicated by TIA/EIA up to and including 100 MHz. Use the tester to measure near-end crosstalk (NEXT) and attenuation-to-crosstalk (ACR) from both ends of each cable. Make connections at each end using access cables provided by the tester manufacturer.

Documentation
Test documentation for Category 5e cabling shall include the following:

A letter from the Contractor's RCDD certifying that all cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.

An introductory discussion documenting test instruments used, qualifications of operators, test conditions, setup parameters, and any other pertinent information. One copy of a full page hardcopy printout for each cable test using the tester manufacturer's standard "Cable Certification Report - CAT5e Link Autotest". Each report shall include the NEXT and ACR results for each pair combination from both ends of each cable. Each cable shall be clearly identified using the labeling nomenclature described on the drawings. Each report shall clearly indicate the name of the operator who performed the test, and the date of the test.

Insert all Category 5e cable test documentation in the Cable Test Manual.

Category 5e Cable Performance Requirements

If the test results for a given cable or cables, in the judgment of the Engineer, fail to confirm acceptable performance, the Contractor shall reconnectorize or replace the affected cables as required to achieve specified performance levels as demonstrated by retesting.

PRODUCT DELIVERY, STORAGE AND HANDLING

Protections

Take necessary precautions to protect all material, equipment, apparatus, and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment, or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the Owner

Cleaning

Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical, and mechanical injury. At the completion of the work, the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

PART 3 - EXECUTION

CLEANING UP

Prior to the Substantial Completion Inspection, perform final cleanup of all work and all areas in which work was performed. All work areas shall be left vacuum clean. All raceway, faceplates, jack assemblies, racks, panels, data hub equipment, and the like shall be wiped down to remove dust accumulated during the course of the project. All painted surfaces such as backboards shall be touched up with paint to remove scuff marks, pencil marks, scratches, etc. All factory surfaces shall be touched with matching paint.

SUBSTANTIAL COMPLETION

After Final Checkout of system operation, and with the Final Checklist, Final Compliance Cable Test Results CD/DVD disk, and the O&M Manuals in hand, the Contractor shall notify the Architect/Engineer in writing and with a completed copy of the

Final Checklist. The Contractor's project manager and project senior technician shall be present for the Substantial Completion Inspection.

CORRECTIVE ACTION

The contractor shall correct any and all deficiencies listed for completion or correction within a reasonable amount of time after deficiency is noted.

If, in the opinion of Owner, Architect, or Engineer (A/E), the Contractor fails to correct any items to the A/E's satisfaction after sufficient corrective action has been attempted by the contractor, then the A/E shall have the right, after forty-eight (48) hours written notice, to employ such workmen to complete the requirements of this project, who will perform work as required to the satisfaction of the A/E, and the cost to complete the Work shall be charged to Contractor.

OWNER PERSONNEL TRAINING

Subsequent to Substantial Completion but prior to Final Completion, the Contractor shall provide on-site training to Owner personnel on the operational use of the features of the system and the use of all equipment provided. The cost of training shall be included in the cost of the system.

The Engineer shall be notified prior to training and may participate in training at their discretion.

The instruction shall be presented in an organized and professional manner by personnel who are thoroughly familiar with the structured cabling system in the existing facility. Training shall include a "walk-through" of the systems to identify and locate closets, panels, and important system components, a discussion of overall system concepts and configuration, specific instruction in labeling and patch cord move/changes, a review of the as-built drawings, a review of the system verification and acceptance documentation, and guidelines for basic trouble-shooting and operation of the structured cabling system and data hub equipment.

The Contractor shall provide documentation of training (including names of personnel present at each training session) to the Engineer at the Final Completion Inspection. The documentation shall be signed-off by the Owner. The documentation shall be three-hole punched and ready for insertion in the O&M manuals.

FINAL COMPLETION

Following completion of punch list items generated by the Architect/Engineer as a result of the Substantial Completion Inspection, the Contractor shall notify the architect/Engineer in writing, stating that all punch list items have been completed.

WARRANTY AND MAINTENANCE

Contractor warrants all work performed by him directly and all work performed for him by others. Contractor shall assume ownership of all data systems within area of work as defined by the plans. Contractor shall provide new outlets/jacks/cabling as required for

systems to ensure permanent link solution testing. The requirement for this project is full compliance/zero tolerance. Cables which do not comply shall be removed and replaced. If certain cables do not comply, contractor shall notify engineer and may be deemed (at engineer's discretion) considered part of contractor's required "Additional Materials Requirement" in the specifications and be replaced with new.

All materials, equipment and workmanship incorporated in the work shall be guaranteed by the Contractor for a period of fifteen years from the date of Substantial Completion of the project.

Any work, material or equipment which during the warranty period is, in the opinion of the Engineer or the Owner's Authorized Representative, defective or inferior and not in accordance with the contract documents, shall be made good at no additional cost to the Owner, including any other work which may have been damaged because of such deficiencies. The Contractor shall be the contact person and the person responsible for coordinating all warranty work for the Owner.

When equipment cannot be repaired at the site, the Contractor shall be completely and solely responsible for the coordination and completion of equipment repairs, including pickup at the project site, transportation and shipping costs to and from the repair site, and reinstallation and reintegration into the system. Equal or better loaner equipment shall be provided and installed by the Contractor any time equipment cannot be repaired at the site, so that the system is maintained in continuous working order as before the equipment failed.

The services of a qualified technician shall be available to make necessary warranty repairs in a timely manner during the warranty period.

SUPPORT SERVICES

Service Description

System Startup
After Equipment Verification and before Final Checkout, the Contractor shall start the systems up, and in coordination with the Owner make it fully operational. The System Startup shall be made at a time, approved in writing by the School District, when school is not in regular session. A weekend startup may be required, and if so shall be provided at no additional cost to the School District. All existing circuits and connections disturbed by work under this contract shall be reconnected, properly identified/labeled, and checked out for proper operation during the System Startup.

Final checkout
After System Startup and before the first day of school following System Startup, the Contractor shall perform a Final Checkout of the system as a whole to verify that it is ready for use by school personnel. The Contractor shall utilize a Final Checklist to fully document Final Checkout. Provide a copy of the Final Checklist to the Engineer at the Final Inspection.

First day operation

The Contractor shall have a senior technician present at the site for the first full 8 hour day of school following the Final Checkout to train/assist school personnel and to verify/fine tune system operation. The senior technician shall make follow-up visits as required to bring the system into full operating condition to the satisfaction of the School Principal, the Owner's Authorized Representative, and the Engineer.

Documentation
Manufacturer shall provide system documentation including:

System one-line showing all patch panels, racks, number and type of devices and the connections between systems and to the service entrance.
Drawings for each system showing hardware configuration and numbering.
Typical wiring diagrams for each component.

The manufacturer will certify that the products will meet the product specifications.

END OF SECTION 16950