



STATEMENT OF WORK (SOW)

Task Order No: FA4861-23-F-0203 (RKMF 23-0064)
Construct Addition and Repair for 328 WPS, BLDG. 47

APPENDIX L

Nellis and Creech AFB IFS Utility Meter Requirements

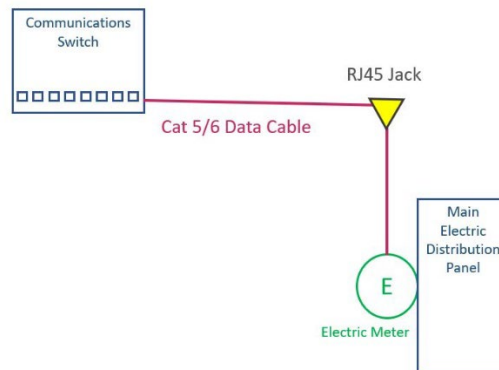
NELLIS AND CREECH AFB **INSTALLATION FACILITIES STANDARDS (IFS)** **UTILITY METER REQUIREMENTS**

01 AUGUST 2023

This document is an appendix to Nellis & Creech Air Force Bases IFS which is located here:
<https://www.wbdg.org/ffc/af-afcec/installation-facilities-standards-ifs/nellis-creech-afb-ifs>

- 1. Installed Equipment:** All design and construction shall be in compliance with the most recent versions of the following:
 - 1.1** Air Force Facility Metering Policy Memorandum (06 May 2010)
 - 1.2** Advanced Meter Reading System (AMRS) Meter Specifications (13 Sep 2019)
See attachment at end of document (Pages 4 to 7)
 - 1.3** Electric Meters Unified Facilities Guide Specification (UFGS) section 26 27 13.10 30
 - 1.4** Natural-Gas Metering UFGS section 33 51 13.00 30
 - 1.5** Water Utility Metering UFGS section 33 12 33.00 30
 - 1.6** Nellis and Creech AFB Installation Facilities Standards (IFS)
- 2.** Any discrepancies between code or standards provisions and the contract documents shall immediately be brought to the Contracting Officer's attention, and the more stringent requirements shall apply unless otherwise directed. Contractors shall be responsible for obtaining any copies of all items referenced in this paragraph. The most current versions of UFGS can be found at <http://www.wbdg.org/ccb/ccb.php>. The most current AMRS Meter Specification is attached to this document.
 - 2.1 VLAN Connection:** All meter installs are required to be connected to the base VLAN with following exceptions:
 - 2.1.1** HVAC systems less than 10 tons. Total tonnage is calculated by summing all air condition units installed on the facility.
 - 2.1.2** When a VLAN connection is not available in the facility.
 - 2.2 Electric Meter:** Contractor shall install meters that are UFGS compliant and will function on the AMRS platform. The AMRS native Data Access communication protocol is "MODBUS/TCP". Meters shall be equipped with 10/100BaseT Ethernet.

- 2.2.1** The installed electric meter shall be listed in the AMRS Meter Specifications (see attachment).
- 2.3** The contractor shall install an RJ45 jack, within 6 feet of the meter, and install Ethernet Cat 5/6 cable from the communication switches to the RJ45 jack. Also, connect a Cat 5/6 patch cable from the meter output to the RJ45 jack. If the meter is panel mounted than the Cat 5/6 cable must be rated for the panel voltage. See diagram below.



- 2.3.1** All new and replacement meter installations, shall be provided with voltage and current safety disconnect devices or equivalent, so that the meter assembly can be worked on safely over the life of the meter installation and not require utility outages for servicing.
- 2.3.2** The Contractor shall include all disconnects, mounting hardware, enclosures, wiring and conduit, and safety equipment as required and appropriate to complete the task and provide fully functioning meters and a meter data management system. The Contractor shall provide all wiring equipment, and conduit required to connect the new meter to a "RJ 45" connector VLAN drop that will allow transmission of the metering data to the AMRS platform. Electric Meter shall not be mounted on or attached to outdoor transformers.
- 2.3.3** All current, power, and voltage circuit termination points for wires entering the meter or enclosure must be clearly marked, to avoid installation error and simplify future identification of wires for maintenance purposes. These identifying markings shall be reflected on the As-Built drawings.
- 2.3.4** Meter voltage taps shall be downstream of the facility main breaker.
- 2.3.5** The meter shall be installed in a hinged NEMA Type 4 enclosure when installed outside.
- 2.3.6** The contractor shall perform basic meter setup per the user guide; to include, inputting the Current Transformers (CTs) and Voltage information. The meter shall measure/display accurate data to include voltage, amperage, power, energy, and power factor.
- 2.3.7** Once the contractor performs the basic meter setup and connects all communication cables, then the AMRS Meter Program Team (AFCEC/CNP) will program the meter to report data electronically to the Nellis AMRS system.

2.3.8 Meter installation shall comply with UFGS section 26 27 13.10 30

2.4 **Gas Meter:** Contractor shall install an “Elster American Standard” meter with “KY” or “KYZ” pulse output or approved equal.

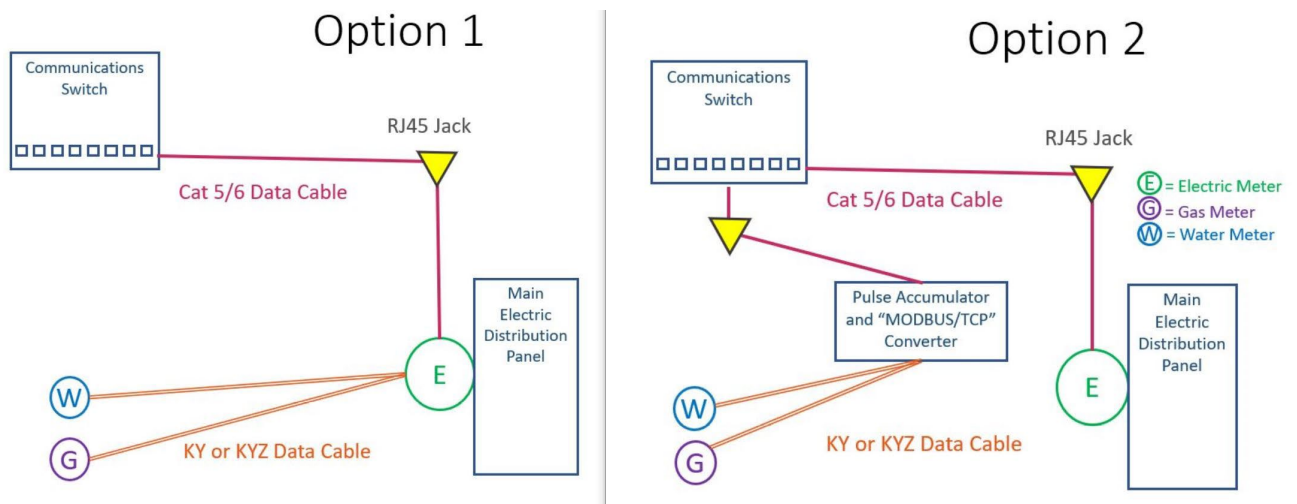
2.4.1 Meter shall be a positive displacement type.

2.4.2 Meter shall have an odometer style display.

2.4.3 The contractor shall use one of two options (Option 1 or Option 2) to connect the meter pulse output to the AMRS platform.

2.4.3.1 Option 1) Using a “KY” or “KYZ” pulse interface, the contractor shall connect to the advanced electric meter’s “KY” or “KYZ” input terminals. The contractor shall be responsible for ensuring that the pulse output interface is compatible with the existing advanced electric meter. The Contractor shall provide all wiring, equipment and conduit required to connect the new meter to the advanced electric meter’s “KY” or “KYZ” input terminals.

2.4.3.2 Option 2) Using a “KY” or “KYZ” pulse interface, the contractor shall connect to a Pulse Accumulator and “MODBUS/TCP” Converter which complies with the AMRS Meter Specifications. (see attachment) Connect the resulting output to a “RJ 45” connector VLAN drop. The Contractor shall provide all wiring, equipment and conduit required to connect the new meter to a “RJ 45” connector VLAN drop that will allow transmission of the metering data to the AMRS platform.



2.4.4 The meter shall comply with the most current AMRS Meter Specifications.

2.4.5 Meter installation shall comply with UFGS section 33 51 13.00 30

2.5 Water Meter: Contractor shall install a "McCrometer" water meter with pulse output or approved equal.

2.5.1 The water meter shall meet or exceed the flow characteristics of the following chart with special emphasis on the "Typical Low Flow (95% Minimum)."

Meter Size	Typical Low Flow (95% Minimum)	Typical Operating Range (100% ± 2%)	Maximum Continuous Operation	Maximum Intermittent Flow
3/4"	1/2 GPM	1 to 30 GPM	25 GPM	35 GPM
1"	3/4 GPM	1-1/2 to 50 GPM	35 GPM	55 GPM
1-1/2"	1-1/2 GPM	2 to 100 GPM	70 GPM	110 GPM
2"	2 GPM	3 to 160 GPM	115 GPM	175 GPM
3"	2-1/2 GPM	4 to 350 GPM	240 GPM	390 GPM
4"	3-1/2 GPM	5 to 650 GPM	450 GPM	715 GPM
6"	5 GPM	15 to 1300 GPM	910 GPM	1430

2.5.2 The contractor shall use one of two options (Option 1 or Option 2) to connect the meter pulse output to the AMRS platform. (See above section 2.4.3. The options are the same as what is used for the gas meter.)

2.5.3 The meter shall comply with the most current AMRS Meter Specifications.

2.5.4 Meter installation shall comply with UFGS section 33 12 33.00 30

3. Contractor shall verify exact equipment and coordinate connection details with Energy Management Control System (EMCS) personnel in Base Civil Engineer (BCE) office (99 CES personnel in Building 812).

4. Meters shall be tested, adjusted and commissioned in accordance with manufacturer's recommendations and also in accordance with the UFGS.

5. Standalone meters may be used on facilities with less than 10 tons of installed cooling AND having no access to a communication rack in the facility.

6. Meters shall be installed inside of buildings, typically in mechanical room near service entrance. Exterior meters may be allowed on a case basis and shall receive written approval from BCE office. If approved, exterior meters shall be installed in a lockable weatherproof enclosure or shall be exterior rated type.

Attachment:

AMRS Meter Specifications v.07.14.21

Appendix 3

1.1 AMRS Electric Meter Specifications

The AMRS Compliant Electric Meter shall meet Department of Defense cybersecurity in addition to the following requirements:

- Onboard memory
- Onboard Ethernet communications, 10/100 base with RJ45 connector or receptacle
- Modbus/TCP communication protocol is required
- Front display with ability to display all measured values
- Current transformer shorting blocks
- Minimum of one (1) external RS485 serial port
- Minimum of two digital and one analog input(s) that shall count pulses from other devices
- If the electric meter does not have the following capabilities on-board, additional modules or devices may be required within the electric meter enclosure:
 - Stand alone step-down transformer compatible with the system voltage that is being monitored
 - Stand alone DC power supply for external devices
 - Digital and analog input/output terminal blocks

1.2 AMRS Compliant Meter List

The following list of meters were evaluated, meet the AMRS meter specification and shall function within the AMRS platform. All networked devices, their integrated firmware and software will be approved by the PMO for use in the AMRS. PMO approval is contingent upon the device, in its fielded configuration, passing USAF cyber and AMRS compatibility testing.

- Schneider Electric PM5560
- Schneider Electric PM8000
- Schneider Electric ION 8650
- Siemens 9410
- Siemens 9810
- Schneider Electric ION 8600 (currently connected to AMRS only, no new installs)
- Electro Industries Nexus 1272 (currently connected to AMRS only, no new installs)
- Electro Industries Nexus 1262 (currently connected to AMRS only, no new installs)
- Schneider Electric PM800 (currently connected to AMRS only, no new installs)

1.3 Meter Installation Guidelines

- Contractor shall assume all existing equipment is working properly. If during the post award survey portion of the SOW an existing piece of equipment is found to be malfunctioning, then the contractor shall bring it to the government's attention to determine how to proceed. An RFI shall be submitted. This may require a contract change to delete this meter from the scope or to add a new meter.
- All due diligence to survey the existing site conditions is the responsibility of the contractor.
- New electric meters shall be installed adjacent to the main distribution panel in a separate enclosure 5 feet above the ground unless otherwise noted.

- All metering device labels shall be black on white phenolic no smaller than 1" x 3"
- New meter installations shall include the installation of new, properly sized, split or solid core current transformers (CTs). Accurate sizing of new CTs is the responsibility of the contractor. Existing, unused CTs are to be removed if possible. If removal is not possible, existing CTs must be shorted out.
 - Instructions explaining how to operate the CT shorting block must be visible inside each meter assembly
- If CT installation method includes disturbing the bonds of existing cables or wiring within the gear, before and after IR scans shall be performed before removing and after torquing the connections to ensure the integrity of the conductor bonds.
- Meter enclosures shall include finger safe voltage and current safety disconnects
- The meter must not require utility outages for servicing
- Meters shall have control power regardless of breaker position.
- All meter enclosures shall be fed by a load break 3-pole fusible disconnect switch that is external of the meter assembly. This safety disconnect switch shall be marked as follows "Meter Disconnect NOT Service Equipment" per the NEC
- New electric meter supply voltages shall be acquired by means of voltage taps from the bus or system breakers for the voltage system that the AMRS meter is monitoring. Insulation piercing connectors are not an approved method and energized electrical work will not be permitted.
- Electric meters with gas or water meters connected shall have two internal registers configured - one for a raw pulse count and one for a weighted pulse count based on the scaling of the connected gas or water meter.
- In the event communications equipment and/or a metering device has to be located in an exterior location, the meter enclosure must be a lockable NEMA 4 enclosure. All new interior communications equipment and metering devices are required to be enclosed in a lockable NEMA 3 enclosure unless otherwise noted

1.4 Cabling Installation Guidelines

- New meter installations shall be connected via CAT6 cable from the meter, to a wall outlet in the mechanical room, to a patch panel in the communications room, and then to the AFnet switch in the communications room. CAT6 cables are not to exceed 328 feet.
- Preferred technical approach to network communication cabling in excess of 328 feet is: Fiber optic cable and fiber media converters with dedicated power outlets. Fiber media converter shall be installed in the communications room within 6 feet of the network switch and within 6 feet of the electric meter enclosure.
- Communication receptacles accessible to the public must be installed in lockable enclosures.
- Cables labels shall be permanent, wrap-around and self-laminating with text generated by a mechanical device. Labels shall be applied at both ends of the cable, visible during normal maintenance of the infrastructure, resistant to environmental conditions.
- All data cable test results (including fiber) shall be completed only after the cable has been terminated in its permanent location, temporary cable test results will not be accepted.
- Surge protection is required on all communication cabling extending from the exterior to the interior of a facility. This includes gas meter communication cables from the exterior to the

interior of the building. Surge suppression devices shall be installed w/in 3 feet of the building entrance inside the facility unless otherwise noted. Devices shall be easily accessible and labeled to aide in location during future troubleshooting efforts. Surge protection devices shall be Power over Ethernet (PoE) compatible and housed within a lockable enclosure that allows space for a proper cable bend radius

1.0 2.0 AMRS Compatible Gas Meter Specifications

AMRS compatible gas metering solutions consist of a componential system to achieve the goal of delivering gas consumption data into the AMRS. To accurately scale output pulses the contractor shall obtain building gas usage from base personnel, taking into account peak demand when sizing the components that are necessary as well as determining peak pulse rate as to not saturate the receiving device and risk losing captured pulse data..

- Pulse kit must be able to produce a two-wire (Form A) pulse output via RS485 cable
- Gas meter or attached pulse kit must include a visual register or dial
- All new gas meter assemblies shall include upstream strainers
- All meter labels shall be white on black phenolic

2.0 3.0 AMRS Compatible Water Meter Specifications

AMRS compatible water metering solutions consist of a componential system to achieve the goal of delivering water consumption data into the AMRS. To accurately scale output pulses the contractor shall obtain building water usage from base personnel, taking into account peak demand when sizing the components that are necessary as well as determining peak pulse rate as to not saturate the receiving device and risk losing captured pulse data..

- Pulse kit must be able to produce a two-wire (Form A) pulse output via RS485
- Water meter or attached pulse kit must include a visual register or dial
- All new water meter assemblies shall include strainers
- All meter labels shall be white on black phenolic

3.0 4.0 AMRS Compatible Translation Devices and Accumulators

The following device is compatible with the AMRS platform, has been tested and passed cybersecurity requirements. It will only be approved for use on a case-by-case basis when dictated by existing site conditions:

- Schneider Electric Link 150 Ethernet Gateway