

2. AMENDMENT/MODIFICATION NO. 0001	3. EFFECTIVE DATE 10 NOV 99	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. <i>(If applicable)</i>
6. ISSUED BY Department of the Army Corps of Engineers Fort Worth District		7. ADMINISTERED BY <i>(If other than Item 6)</i>	

8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>	(✓)	9A. AMENDMENT OF SOLICITATION NO. DACA63-00-B-0010
	(X)	9B. DATED <i>(SEE ITEM 11)</i> 02 NOVEMBER 1999
		10A. MODIFICATION OF CONTRACTS/ORDER NO.
		10B. DATED <i>(SEE ITEM 13)</i>
CODE	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers tended. is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
 (a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(✓)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

E. IMPORTANT: Contractor is not, is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*
 The Solicitation for Force XXI Soldier Development Center - Phase II, Fort Hood, Texas, is amended as follows:
 See Continuation Sheet.

NOTE: The Bid Opening Date and Time remains "02 December 1999 at 2 p.m. local time," as previously announced.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>	16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>
15B. CONTRACTOR/OFFEROR _____ <i>(Signature of person authorized to sign)</i>	15C. DATE SIGNED
16B. UNITED STATES OF AMERICA BY _____ <i>(Signature of Contracting Officer)</i>	16C. DATE SIGNED

Item 14. (cont'd)

a. Specifications

The following section shall be voided and the attached new section of the same title and number, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-00-B-0010," shall be substituted therefor:

<u>SECTION NO.</u>	<u>TITLE</u>
13814	BUILDING PREPARATION FOR ENERGY MONITORING AND CONTROL SYSTEMS (EMCS)

b. Drawings - Reissued.

The drawings listed below shall be voided and the attached new drawings of the same number, each bearing the notation "AM #1", shall be substituted therefor:

s01_1.cal	Seq 110	S1	STRUCTURAL NOTES AND MISCELLANEOUS DETAILS
s02_1.cal	Seq 111	S2	FOUNDATION PLAN - AREA G
s03_1.cal	Seq 112	S3	FOUNDATION PLAN - AREA H
s04_1.cal	Seq 113	S4	FOUNDATION PLAN - AREA J
s05_1.cal	Seq 114	S5	FOUNDATION SECTIONS AND DETAILS 1
s06_1.cal	Seq 115	S6	FOUNDATION SECTIONS AND DETAILS 2
s07_1.cal	Seq 116	S7	FOUNDATION DETAILS 3
s08_1.cal	Seq 117	S8	FOUNDATION DETAILS 4
s09_1.cal	Seq 118	S9	FOUNDATION DETAILS 5
s10_1.cal	Seq 119	S10	2ND FLOOR FRAMING PLAN AREA G
s11_1.cal	Seq 120	S11	2ND FLOOR FRAMING PLAN AREA H
s12_1.cal	Seq 121	S12	2ND FLOOR FRAMING PLAN AREA J
s14_1.cal	Seq 123	S14	2ND FLOOR FRAMING SECTIONS 2
m01_1.cal	Seq 132	M1	MECHANICAL LEGEND & SCHEDULES
m12_1.cal	Seq 143	M12	HVAC PLAN, CENTRAL PLANT
m13_1.cal	Seq 144	M13	HVAC FAN ROOM PLANS AND SECTIONS
m15_1.cal	Seq 146	M15	HVAC DETAILS
m26_1.cal	Seq 160	M26	MISC. SYSTEM CONTROLS
m31_1.cal	Seq 165	M31	PLUMBING RISERS RISER ONE (R1)
m32_1.cal	Seq 166	M32	PLUMBING RISERS RISER TWO (R2)
fp3_1.cal	Seq 172	FP3	FIRE PROTECTION DETAILS

SECTION 13814

BUILDING PREPARATION FOR ENERGY MONITORING AND CONTROL SYSTEMS (EMCS)

[AM0001]

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.1 (1995) Code for Electricity Metering

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE ANSI/IEEE C57.13 (1993) Instrument Transformers

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment
(1000 Volts Maximum)

NEMA ICS 1 (1993) Industrial Controls and Systems

1.2 GENERAL REQUIREMENTS

1.2.1 Preparation of Building for Interface

The Contractor shall provide all services, materials, and equipment necessary to prepare the building for interface to the existing EMCS.

1.2.2 Williams DDC Option

If the option to provide Williams Electric Direct Digital Control (DDC) is selected in HVAC Controls Section 15950, all EMCS points specified and/or shown on the drawings or in the specifications to connect to the EMCS or the DDC shall be mapped into the Fort Hood Williams Electric Central Utility Control System (UCS). All necessary wiring and communication equipment shall be provided. DDC cabinets are not required when the Williams Electric DDC option is selected.

1.2.3 REMOTE EMCS WORKSTATION, required with or without Williams DDC option.

The central EMCS computer shall have added to it an internet hardware interface, an ip address and all other features required to provide an

internet connection from the central head end computer system to the internet that will allow full control and monitoring from the new remote Williams Electric UCS-3000 Work Station. The features of this workstation are as follows:

- a. Fully compatible with the Williams Electric UCS-3000 software.
- b. Processor: AMD K6II-300-450MHz.
- c. Memory: Minimum of 64Mb.
- d. Hard Drive: Controller DTC 3130 or other NCR 810 based SCSI controller. Minimum storage of 10 GB.
- e. Floppy Drive: 3.5" 1.44 Mb.
- f. Video: Trident 96855 chipset, 2MB, card must be supported by Xinside Accelerated X.
- g. CD ROM: ATAPI CDR-ROM
- h. Tape Drive: Tandberg 9145 or equivalent.
- i. Network Interface: 3Com Fast EtherLink XL 10/100Mb TX Ethernet NIC (3C905B-TX)
- j. Mouse: Logitech Serial Mouse
- k. Monitor: 21" Viewsonic GT series
- l. Okidata ML395 dot matrix printer.

The unit shall be installed in Fort Worth, Texas in the Federal Building at 819 Taylor Street, Ft. Worth, Texas 76102-0300 in room 4-A13 the Mechanical Engineering Section of the US Army Corps of Engineers at an office work area. This unit shall be installed and made fully operable for the monitoring and control of systems at Fort Hood with full capability to monitor and control any building that is also under the control of the central EMCS workstation at Fort Hood. Unit shall be made operable prior to the commissioning of the first phase of this building which has been awarded under another construction contract DACA63-98-C-0034 General Instruction Building - Phase I. The full basewide system at Fort Hood as well as the Phase I HVAC control system and Phase II HVAC control system shall be available for full monitoring and control from this remote workstation terminal over the internet for immediate HVAC engineering services to the DPW during the warranty and is to be delivered by the government to DPW when warranty period is completed.

1.2.4 Environmental Conditions

Equipment shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered at the installed location.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment and Performance; FIO.

Six copies of the hardware and maintenance data, in manual format, bound in hardback, loose-leaf binders, within 30 days after completing the site testing. The contents of each manual shall be identified on the cover. The manuals shall include the names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of the nearest service representatives for each item of equipment and each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies, to be submitted after completion of the site test, shall include all modifications made during installation, checkout, and acceptance.

Hardware data, shall describe all equipment provided, including:

- a. General description and specifications.
- b. Installation and checkout procedures.
- c. Electrical schematics and layout drawings.
- d. Alignment and calibration procedures.
- e. Manufacturer's repair parts list indicating sources of supply, and National Stock Number when obtainable from the manufacturer.
- f. Interface definition.

The maintenance data, shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

SD-04 Drawings

Equipment and Material; FIO.

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Drawings shall contain complete wiring, routing, and schematic diagrams. Drawings shall show proposed layout and installation of all equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-08 Statements

Test Plan; GA.

Six Copies of test plan and test procedure. Six Copies of test report that documents the test results, in booklet form. Test plan documents for the test, 120 days prior to the test. The test plan shall define all the tests required to ensure that the equipment meets technical and performance specifications. The test plan shall define milestones for the test exercises and shall identify the capabilities and functions to be tested.

Test Procedure; FIO.

Test procedure documents, 60 days prior to the test. Test procedures shall be developed from the test plans and design documentation. The procedures shall consist of detailed instructions for test setup, execution, and evaluation of test results. The procedures shall explain and shall detail, step by step, actions and expected results to demonstrate the requirements of this specification and the methods for simulating the necessary conditions of operation to demonstrate performance of the equipment. All test equipment to be used shall be furnished by the Contractor.

SD-09 Reports

Site Testing; FIO.

Test report, within 15 days after completion of the test. The test report shall be used to document results of the test.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Units of the same type of equipment shall be products of a single manufacturer.

2.2 ENCLOSURES

Enclosures shall conform to the requirements of NEMA 250 for the types specified. Finish color shall be the manufacturer's standard, unless otherwise indicated. Damaged surfaces shall be repaired and refinished using original type finish. Enclosures installed indoors shall be Type 12, or as shown. Equipment installed outdoors shall be housed in a Type 4 enclosure, unless otherwise shown.

2.3 NAMEPLATES

Laminated plastic nameplates shall be provided for all equipment furnished. Each nameplate shall identify the function, such as "mixed air controller" or "cold deck temperature sensor." Laminated plastic shall be 1/8 inch thick, white with black center core. Nameplates shall be a minimum of 1 x 3 inches, with minimum 1/4 inch high engraved block lettering. Nameplates for devices smaller than 1 x 3 inches shall be attached by a nonferrous

metal chain. All other nameplates shall be attached to the equipment.

2.4 INSTRUMENTATION AND CONTROL (I&C) DIAGRAMS

Framed mylar drawings in laminated plastic shall be provided. Drawings shall show complete I&C diagrams for all equipment furnished and interfaces to all existing equipment, at each respective equipment location. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system manually shall be prepared in typed form, framed as specified for the I&C diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting. The instructions shall be posted after completion of the Contractor's site testing. Provide a mylar reproducible of each I&C diagram in addition to the posted copy.

2.5 DATA TERMINAL CABINET (DTC)

Data terminal cabinet shall be provided for each mechanical room as an interface to the data environment (DE) instrumentation and controls. No instrumentation and control devices shall be located within the DTC.

2.5.1 Enclosure

The DTC shall be a separate metallic enclosure. The DTC shall be sized to accommodate the number of functions required by the control and monitoring devices as shown plus 25 percent expansion for each type of function provided.

2.5.2 Groupings

The DTC shall be divided into analog and digital groupings, each with separate sensor and control signal wiring raceways.

2.5.3 Terminal Strips

The DTC shall be provided with double sided screw type terminal strips. One side of the terminal strip shall be used for termination of field wiring from instrumentation and controls. The other side shall be used to connect the DTC to the existing FID or MUX. Terminal strips shall have individual terminal identification numbers.

2.5.4 Power

A 120-Vac, 15-A, 60 Hz duplex outlet shall be provided within 6 feet of each DTC.

2.6 INSTRUMENTATION AND CONTROL

2.6.1 Temperature Instruments

2.6.1.1 Resistor Temperature Detector (RTD)

RTDs shall be platinum with an accuracy of plus or minus 0.1 percent at 32

degrees F and shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Each RTD shall be furnished with an RTD transmitter specified and mounted integrally, unless otherwise shown.

2.6.1.2 Resistor Temperature Detector (RTD) Transmitters

The RTD transmitter shall be selected to match the resistance range of the platinum RTD. The transmitter shall produce a linear 4 to 20 mAdc output corresponding to the required temperature span. The output error shall not exceed 0.1 percent of calibrated span. The transmitter shall include offset and span adjustments unless the RTD element is integral to the transmitter and system calibration is provided.

2.6.1.3 Continuous Averaging RTDs

Continuous averaging RTDs shall have an accuracy of plus or minus 1.0 degree F at the reference temperature, and shall be of sufficient length to ensure that the resistance represents an average over the cross section in which it is installed. The sensor shall have a bendable copper sheath. Each averaging RTD shall be furnished with an RTD transmitter selected to match the resistance range of the averaging RTD. The transmitter shall produce a linear 4 to 20 mAdc output corresponding to the required temperature span. The output error of the transmitter shall not exceed 0.1 percent of the calibrated span. The transmitter shall include offset and span adjustments.

2.6.1.4 Temperature Switches

Temperature switches shall have a repetitive accuracy of plus or minus 1 percent of the operating ranges shown. Switch actuation shall be adjustable over the operating temperature range. The switch shall have a snap-action Form C contact rated for the application.

2.6.1.5 Thermowells

Thermowells shall be monel, brass, or copper for use in copper water lines, wrought iron for measuring flue gases, and series 300 stainless steel for all other applications. The thermowell shall include a connection box, sized to accommodate the temperature transmitter.

2.6.1.6 Instrument Shelters

Instrument shelters shall be fabricated from wood and painted white. Shelters shall have louvered sides, double tops, and slotted bottoms.

2.6.2 Relative Humidity Sensors

Relative humidity sensors shall use nonsaturating sensing elements capable of withstanding a saturated condition without permanently affecting calibration or sustaining damage. Sensors shall have a range of 20 to 80 percent, with an accuracy of plus or minus 5 percent of full scale. A transmitter located at the sensor shall be provided to convert the sensor output to a linear 4 to 20 mAdc output corresponding to the required humidity span. The output error shall not exceed 0.1 percent of calibrated

span. The transmitter shall include offset and span adjustments.

2.6.3 Pressure Instruments

2.6.3.1 Pressure Transducers

Pressure transducers shall withstand up to 150 percent of rated pressure, with an accuracy of plus or minus 1 percent of full scale. The sensing element shall be either capsule, diaphragm, bellows, bourdon tube, or solid state. A transmitter located at the transducer shall be provided to convert the sensing element output to a linear 4 to 20 mAdc output corresponding to the required pressure span. The output error shall not exceed 0.1 percent of calibrated span. The transmitter shall include offset and span adjustments.

2.6.3.2 Pressure Switches

Pressure switches shall have a repetitive accuracy of plus or minus 5 percent of their operating range and shall withstand up to 150 percent of rated pressure. Sensors shall be diaphragm or bourdon tube. Switch actuation shall be adjustable over the operating pressure range. Switch shall have a snap-action Form C contact rated for the application. Gauge pressure switches shall have an adjustable differential setting.

2.6.4 Electric Power Instruments

2.6.4.1 Potential Transformers

Potential transformers shall conform to IEEE ANSI/IEEE C57.13.

2.6.4.2 Current Transformers

Current transformers shall conform to IEEE ANSI/IEEE C57.13.

2.6.4.3 Transducers

Transducers in Watthour shall have an accuracy of plus or minus 0.25 percent for outputs from full lag to full lead power factor. Input ranges for transducers shall be selectable without requiring the changing of current or potential transformers. The output shall be 4 to 20 mAdc.

2.6.4.4 Current Sensing Relays

Current sensing relays shall be of a design that provides a normally-open (NO) single-pole, single-throw (SPST) contact rated at a minimum of 50 volts peak and one-half ampere or 25 VA, noninductive. Current sensing relays shall be single unit construction with provisions for firm mounting.

They have a single hole for passage of current carrying conductors and sized for operation at a nominal 50 percent of current rating of sensed device. The Contractor shall use multiple turns of sensed leads for higher rate loads. Voltage isolation shall be for a minimum of 600 volts.

2.6.5 Output Devices

2.6.5.1 Control Relays

Control relay contacts shall be rated for the application, with a minimum of 2 sets of Form C contacts enclosed in a dust-proof enclosure. Relays shall be rated for a minimum life of one million mechanical operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.5.2 Latching Relays

Latching relay contacts shall be rated for the application with a minimum of 2 sets of Form C contacts enclosed in a dust-proof enclosure. Relays shall be rated for a minimum life of one million mechanical operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.5.3 Reed Relays

Reed relays shall be encapsulated in a container housed in a plastic, epoxy, or metal case. Contacts shall be rated for the application. Operating and release times shall be 1 millisecond or less. Relays shall be rated for a minimum life of 10 million mechanical operations and shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.5.4 Contactors

Contactors shall be of the single coil, electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semipermanent magnets. Contacts shall be double-break silver-to-silver type protected by arcing contacts where necessary. Number of contacts and ratings shall be selected for the application. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.5.5 Solid State Relays

Input-output isolation shall be greater than 1000 megohms with a breakdown voltage of 1500 volts root mean square or greater at 60 Hz. Relays shall be rated for a minimum life of 10 million operations. The ambient temperature range shall be at least minus 20 to plus 140 degrees F. Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release times shall be 1 millisecond or less. Transients shall be limited to 150 percent of control voltage. Solid state relays shall not be used on inductive loads which are switched on-off.

2.6.5.6 Electric Solenoid Operated Pneumatic (EP) Valve

EP valves shall have three port operations: common, normally open, and

normally closed. EP valves shall have an outer cast aluminum body with internal parts constructed of brass, bronze, or stainless steel. The air connection shall be a 3/8 inch NPT threaded connection. EP valves shall be rated for 50 psig when used in control system operation at 25 psig or less, or rated at 150 psig when used in control system operation from 25 to 100 psig. EP coils shall be equipped with transient suppression to limit transients to 150 percent of rated voltage. EP valve operation shall be rated for a minimum of 220 degrees F.

2.6.5.7 Electric to Pneumatic (EP) Transducers

EP transducers shall be matched to a signal of 4 to 20 mAdc the analog output signals from the existing FID or MUX and have linearly proportional pneumatic output compatible with the pneumatic control loop to be interfaced. The EP transducer shall have pressure calibration adjustments and shall withstand pressures at least 150 percent of the maximum range. The pneumatic output shall be linearly proportional within 1 percent of the electric input. Transducers shall have offset and span adjustment capabilities. EP transducers shall be rated for zero to 140 degrees F continuous operation. The body shall be cast aluminum with internal parts constructed of brass, bronze, or stainless steel.

2.6.5.8 Potentiometer to Current Transducers

Potentiometer to current transducers shall have an accuracy of plus or minus 0.1 percent of span for 3-wire potentiometer inputs between 100 and 10,000 ohms full scale. Potentiometer transducers shall provide continuous span adjustments between 75 and 100 percent of the input range and continuous zero offset adjustment between 0 and 10 percent of the input range. Potentiometer transducers shall provide excitation current to the potentiometer and shall drive a 4 to 20 mAdc output signal, with 500 volts peak to peak isolation between input and output terminals. Potentiometer transducers shall be suitable for operation at ambient temperatures of minus 20 to 175 degrees F.

2.6.6 Key Operated Switches

Hand-off-automatic (HOA), off-automatic, and all similar-use switches shall be key operated with all switches keyed alike. All switches shall be rated for a minimum of 600 Vac, 5-A, and shall be mounted in an enclosure as specified or shown. An auxiliary set of contacts rated for at least 120 Vac, 1 ampere shall be provided with each switch.

[AM0001]

2.6.7 Meter Interface Unit (MIU)

Dial in-bound type Meter Interface Units (MIUs) shall be installed to record pulses or encoded signals from electric, gas, and water meters. Collected data from the MIUs will be transmitted to the existing Teldata Inc. AMRS, central computer via existing telephonic conductors. The meter interface units shall be compatible with the existing Automatic Meter Reading System (AMRS) which is a Teldata Inc. system. MIUs can be obtained from Teldata Corporation, 35 E. Wacker, Suite 1600, Chicago, IL 60601, (312) 857-0880. Contractor shall request model DC-4. The MIUs shall be

mounted in a NEMA type 1 enclosure. All telephone conductors and encoder/pulse initiator wiring shall be routed to the MIU enclosures in conduit and shall terminate with 18" loop of excess conductor. Connections to the MIUs shall not be made by the contractor. Contractor shall inform the Contracting Officer's Representative when the MIUs and wiring are in place and ready for connection. Connection, set-up and checkout of the MIUs shall be performed by the Ft. Hood Energy Management Office.

2.7 WIRE AND CABLE

The Contractor shall provide all wire and cable from the sensors and control devices in the DE to the DTCs.

2.7.1 Control Wiring

2.7.1.1 Digital Functions

Control wiring for digital functions shall be No. 18 AWG minimum with 600-volt insulation. Multiconductor wire shall have an outer jacket of Polyvinyl Chloride (PVC).

2.7.1.2 Analog Functions

Control wiring for analog functions shall be No. 18 AWG minimum with 600-volt insulation, twisted and shielded, 2-, 3-, or 4-wire to match analog function hardware. Multiconductor wire shall have an outer jacket of PVC.

2.7.2 Sensor Wiring

Sensor wiring shall be No. 20 AWG minimum twisted and shielded, 2-, 3-, 4-wire to match analog function hardware. Multiconductor wire shall have an outer jacket of PVC.

2.7.3 Meter Interface Unit to Pulse Initiator Wiring

Wiring shall be No. 22 AWG minimum solid copper with 600-volt insulation, twisted and shielded, 3-wire to match Meter Interface Hardware. Multiconductor wire shall have an outer jacket of PVC.

2.7.4 Class 2 Low Energy Conductors

The conductor types and sizes specified for digital and analog functions shall take precedence over any requirements for Class 2 low energy remote control and signal circuit conductors specified elsewhere.

2.8 RACEWAY SYSTEMS

Raceway systems from the sensors and control devices in the DE to the DTCs shall be provided by the Contractor.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

The Contractor shall install all components and appurtenances in accordance with the manufacturer's instructions and as shown or specified. All necessary interconnections, services, and adjustments required to prepare the building for interface to an EMCS shall be furnished. All wiring, including low voltage wiring, shall be installed in metallic raceways. All other electrical work shall be in accordance with Section 16415 and as shown. Instrumentation grounding as necessary to preclude ground loops and noise from adversely affecting equipment operations shall be installed.

3.2 I/O SUMMARY TABLES

I/O Summary Tables shall be used in conjunction with the drawings to identify the hardware required for each building and system.

3.3 EQUIPMENT INSTALLATION

3.3.1 Temperature Instruments

3.3.1.1 Resistor Temperature Detector (RTD)

When the RTD is installed in pipes or is susceptible to corrosion and vibration, the RTD shall be installed in a thermowell. RTDs which are attached to surfaces shall be clamped or bonded in place. The surface shall be thoroughly cleaned, degreased, and after RTD installation, shall be insulated from ambient temperature effects. RTDs used for space temperature sensing shall include a housing suitable for wall mounting. RTDs used for OA sensing shall have an instrument shelter to minimize solar effects, and shall be mounted to minimize building effects. RTD assemblies shall be readily accessible and installed in a manner as to allow easy replacement.

3.3.1.2 Temperature Switches

Temperature switches shall be installed as specified for RTDs. Temperature switches shall be adjusted to the proper setpoint and shall be verified by calibration. Switch contact ratings and duty shall be selected in accordance with NEMA ICS 1.

3.3.2 Relative Humidity Sensors

Relative humidity sensors shall have air guards when installed in air flows of more than 50 feet per minute across the sensor element.

3.3.3 Pressure Instruments

3.3.3.1 Pressure Sensors

Pressure sensors (all types) installed on liquid lines shall have drains. Pressure sensors installed on steam lines shall have drains and siphons. Pressure sensors shall have valves for isolation, venting, and taps for calibration. Pressure sensors shall be verified by calibration. Differential pressure sensors shall have nulling valves.

3.3.3.2 Pressure Switches

Pressure switches (all types) installed on liquid lines shall have drains. Pressure sensors installed on steam lines shall have drains and siphons. Pressure switches in water and steam lines shall have valves for isolation, venting, and taps for calibration. Pressure switches shall be adjusted to the proper setpoint, and shall be verified by calibration. Pressure switches shall be mounted higher than the process connection. Differential pressure switches shall have nulling valves. Switch contact ratings and duty shall be selected in accordance with NEMA ICS 1.

3.3.4 Output Devices

3.3.4.1 Relays and Contactors

Relays and contactors shall be installed in new cabinets.

3.3.4.2 Electric Solenoid Operated Pneumatic Valve (EP)

EP valves shall be installed in new cabinets.

3.3.4.3 Controllers

Controllers shall be installed in new control cabinets or as shown.

3.3.4.4 Electric to Pneumatic (EP) Transducers

EP transducers shall be installed in new cabinets.

3.3.5 Instrument Shelters

Instrument shelters shall be installed with the bottom 4 feet above the supporting surface, using legs, and secured rigidly to minimize vibrations from winds. Instrument shelters shall be oriented facing north.

3.3.6 Enclosures

All enclosure penetrations shall be from the bottom and shall be sealed to preclude entry of water using a silicone rubber sealant.

3.4 SITE TESTING

Site testing and adjustment of all equipment shall be performed in accordance with approved test procedures. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. Test reports shall be submitted as specified.

-- End of Section --