PART 1 - GENERAL

1.1 SUMMARY

.1 This Section describes various sensors and meters to be installed in the building and connected to the building control system (BCS) for purposes of tracking several parameters of the building's overall environmental performance. These parameters include electricity use, water use etc.

.2 If an alternate system is proposed, contractor shall advise during the tender period, and shall be responsible to ensure a complete end to end system as specified and indicated.

1.2 DEFINITIONS

.1 Building Control System (BCS): The hardware and software that automatically controls / monitors of one or more major building system functions required in a facility, such as heating, ventilating, and air conditioning (HVAC) systems.

.2 Real Time: Data points recorded every 60 seconds or at an interval as close to 60 seconds as possible if not allowed by the building automation system.

.3 Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

.4 Accumulator Point: A data point within the BCS stored digitally as a positive integer that increments over time in proportion to the flow of electrical energy, water, or other resource through the building. Accumulator Points count up to at least 99,999 before "turning over" and starting again from zero.

.5 Analog Value: A datapoint within the BCS that comes from a sensor with an analog output, such as 4-20mA, 0-5VDC, or similar. This includes temperature sensors, etc.

1.3 SERVICE
CONDITIONS
.1 Environmental Service Conditions: Systems, equipment, and components shall be capable of operating continuously in the following conditions without mechanical or electrical damage or degradation of operating capability:
.1   Ambient Temperature Range: 50 deg F to 100 deg F.
.2   Relative Humidity: 10 to 75 percent, non-condensing.

.2 Electrical Service Conditions: Equipment shall operate continuously in the following conditions without damage or degradation of operating capability:
.1   Voltage Range for Equipment with a Nominal Rating of 120-V AC: 88 to 132 V.
.2   Voltage Range for Equipment with a Nominal Rating of 24-V DC: 22 to 85 V.
.3   Frequency Range for Equipment with a Nominal Frequency Rating of 60 Hz: 45 to 63 Hz.

1.4 COORDINATION
.1 Coordinate Work of this Section with that of Sections specifying systems and components required to be integrated with the BCS.
.1   Provide integrated interconnections of compatible components.
.2   Match components and interconnections for optimum performance of indicated functions.

PART 2 - PRODUCTS

2.1 FUNCTIONAL
DESCRIPTION OF
INTERFACE MONITORING
HARDWARE
.1 Sensors:
.1   Sensors/meters that provide information on the following environmental performance features of the building:
.1   Electricity Consumption (whole building).
.2   Total Water Use (whole building).
.3   Electricy Consumption; Domestic Hot Water Use.
.4   Electricy Consumption; Lighting Distriubtion System.
.5   Electricy Consumption; HVAC.

2.1 FUNCTIONAL DESCRIPTION OF INTERFACE MONITORING HARDWARE (Cont'd)

.2   Electricity Consumption Meter:
    .1   Accuracy:
        .1   Real Power and Energy: +/-0.5% typical.
    .2   Compute the following per Phase:
        .1   Energy: kWh, kVAh.
    .3   Communication:
        .1   Connectivity:
            .1   Web Enabled/Integrated Web Server.
            .2   Ethernet 10/100 BaseT.
        .2   Protocols:
            .1   HTTP.
            .2   ModBusTCP.
            .3   Communications protocol shall be compatible with Sustainability Management System Software.
    .4   User Interfaces:
        .1   User access over an IP network by use of only a standard web browser to view (the use of custom PC installed software is not acceptable):
            .1   Real time data including all measured and computed system parameters.
    .5   Electrical Connections:
        .1   Units shall be directly powered from the port being measured without the need for a separate low voltage power feed.
        .2   Units shall have fused terminals for the voltage sensing connection permitting safe disconnection.
    .6   BCS Configuration:
        .1   Configured as an Accumulator Point within the BCS.

.3   Domestic Water Use Meter:
    .1   Type:
        .1   Compound meter integrating both a high-flow meter and a low-flow meter for increased accuracy.
        .2   Compound meter shall suit domestic main pipe from water utility. Coordinate with mechanical.
        .3   Pulse output.
    .2   Placement:
        .1   This meter shall be located such that it measures all potable water from the local utility used in the building.

2.1 FUNCTIONAL DESCRIPTION OF INTERFACE MONITORING HARDWARE (Cont'd)

.3 Domestic Water Use Meter:(Cont'd)
   .3 Accuracy: +/-2%.
   .4 Temperature Tolerances:
      .1 40°F to 110°F.
   .5 Output:
      .1 High-flow meter: Pulse output with no more than 10 gallons per pulse.
      .2 Low-flow meter: Pulse output with no more than 1 gallon per pulse.
   .6 Interface to BCS:
      .1 Shielded cabling must be used.
      .2 Wiring distance between meter and BCS input device shall be minimized as much as possible to maintain signal quality.
      .3 Wire shall be 24AWG or larger.
   .7 BCS Configuration:
      .1 Configured as an Accumulator Point within the BCS.

.4 Domestic Hot Water Meter(s):
   .1 Type:
      .1 Impeller or turbine meter(s) with pulse output.
   .2 Placement:
      .1 This meter(s) shall be located on the cold side of the hot water tank(s), Quantity of meters and location as indicated on mechanical drawings.
   .3 Accuracy: +/-2%.
   .4 Temperature Tolerances:
      .1 40F to 100F.
   .5 Output:
      .1 Pulse output with no more than 1 gallon per pulse.
   .6 Interface to BCS.
      .1 Shielded cabling must be used.
      .2 Wiring distance between meter and BCS input device shall be minimized as much as possible to maintain signal quality.
   .7 Wire shall be 24 AWG or larger.
   .8 BCS Configuration:
      .1 Configured as an Accumulator Point within the BCS.

2.2 SYSTEM EQUIPMENT .1 Multi-circuit Metering Panels.
.1 Each panel shall be a dedicated steel NEMA Type 1 sprinklerproof enclosure.
.2 Operating temperature range from -40°C to 70°C and operating humidity range from 0% to 90% non-condensing.
.3 Capable of metering up to 8 three phase/three-CT circuits.
.4 Front panel complete with backlit LCD featuring 2 lines of 16 characters. Information accessible using right and left arrow buttons to select each metering point, and a display button to cycle through the measurements for that point.
.5 Capable of metering: energy, power, power factor, voltage and current.
.6 Data recording.
.7 Communications through Ethernet.
.8 Communications with Sustainability Management System Software.

.2 Current Transformer (CT) Panels:
.1 .1 Each panel shall be a dedicated steel NEMA type 1 sprinklerproof enclosure.
.2 Capable of housing 10 three phase/three-CT circuit.
.3 Terminal blocks, sized to suit CT's in the field.
.4 Provide spare terminal blocks as required such that each CT panel contains at least 8 metering points.
.5 Ground bar in panel, copper.
.6 Physical dimensions of 500 mm x 400 mm minimum, depth as required.
.7 Additional converter's for higher loads.

.3 Current Transformers (CT's):
.1 Shall be sized to suit the ampere ratings of the feeders being metered.
.2 Insulation Level of 600 volt.
.3 Shall be installed in Main Switchboard or Distribution Panels as indicated. Shall be factory installed for 200 Amp feeds and above, field installed for below 200 Amp. Coordinate as required with Distribution Equipment Supplier.

.4 Potential Transformer (PT) Panels.
.1 Each panel shall be dedicated steel NEMA Type 1 sprinklerproof enclosure.

2.2 SYSTEM EQUIPMENT
  (Cont'd)

.4 (Cont'd)

  .2   Terminal blocks as required. Primary and secondary fusing as required to protect system components.
  .3   Ground bar in panel, copper.
  .4   Transformers for 600/347 Volt PT panels only.
  .5   Physical dimensions of 500 mm x 500 mm minimum, depth as required.

.5   Communication Gateway:
  .1   An integrated server for communicating the metering information to the Sustainability Management System Software package.
  .2   Features:
      .1   View real-time and historical information.
      .2   Automatically detect networked devices.
      .3   View and log data.
      .4   Automatically email specific information to users.
      .5   Select logging intervals.
      .6   Ethernet port, 10/100 base.
      .7   Serial port, RS232 or RS485.
      .8   Web server with 256 MB memory, 64 simultaneous connections.

.6   System Controller:
  .1   Programmable controller with extensive network routing capabilities.
  .2   BacNet and Modbus compatible for input/output.
  .3   100 MHz high performance processor.
  .4   8 MB operating RAM, 4 MB flash drive.
  .5   Ethernet ports, 10/100 base.

PART 3 - EXECUTION

3.1 INSTALLATION   .1   Connect sensors, meters and all system components to building automation system in appropriate manner.

   .2   Installing contractor shall verify field location of sensors and meters with owner and Departmental Representative, and coordinate installation with the work of all involved trades.

3.2 FIELD QUALITY CONTROL   .1   Installing contractor shall inspect Monitoring System components for defects and physical damage, labeling of testing laboratory, and nameplate compliance with the Contract Documents.