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## **PART 1 - GENERAL**

### **1.1 WORK OF THIS SECTION**

- A. This section of the specifications details the components to be provided by the BMCS subcontractor relating to the software communications interfaces between the BMCS and the following:
1. Electrical Switchgear.
  2. Chillers.
  3. Variable Frequency Drives.
  4. Emergency Generator.
  5. Fuel Oil System.
  6. Boilers.
  7. Electrical Submeters.

### **1.2 INTERFACES - GENERAL**

- A. The BMCS subcontractor shall coordinate with the Mechanical and Electrical subcontractors and the associated manufacturers responsible for the system and shall determine the points that are to be mapped from the BMCS to the third party system and the points that are to be mapped from the third party system to the BMCS. Where it is possible to map points from one system to the other that are not identified in these contract documents, the BMCS subcontractor shall advise the Owner, Consultant and Engineer and they shall determine whether additional points are to be mapped from one system to the other. Provide mapping, alarm configuration, and graphic creation of, at minimum, twice the listed point quantities within these documents as directed by the Owner.
- B. The BMCS subcontractor shall provide details of the method of integration and the information to be transferred between the systems as part of the shop drawing package.
- C. The Mechanical and Electrical manufacturer/contractor shall provide communication port specifically for the interfacing of the system to the BMCS. The BMCS subcontractor shall be responsible for all cable, conduit, and suitable cable connectors to the port on the system and the BMCS and other components as necessary for the software communications link from the system to the BMCS.
- D. The fact that the points are mapped from Mechanical and Electrical systems to the BMCS shall be transparent to the operator. It shall not be necessary for the BMCS operator to know that the points are mapped from another system in order to implement such functions as adding and deleting a mapped point on a report/graphic, adjusting schedules and alarm limits associated with a mapped point, including a mapped point in a sequence of operations, etc.
- E. If the BMCS subcontractor cannot document that the exact same interface has been performed between the BMCS and the Mechanical and Electrical systems, then the interfaces shall be tested prior to installations at an offsite location. If the test is successful the BMCS subcontractor shall advise the Owner, Consultant and Engineer and a time shall be established that is acceptable to the Owner, Consultant and Engineer when the interface can be demonstrated.
- F. The BMCS hardware shall not be installed at the project location until all system interfaces to the BMCS have been successfully demonstrated or documented.
- G. If demonstration testing is required, the BMCS subcontractor shall be responsible for providing all equipment necessary to perform the demonstration and for ensuring the presence at the testing of suitably skilled personnel from system manufacturer/contractor. The testing of the interface between the two systems shall verify, at minimum, that:
1. All data points mapped from the system to the BMCS are displayed correctly on the BMCS monitor and have the same functionality as points directly monitored/controlled by the BMCS. There is not a requirement that the data be displayed on graphics during the initial tests but they must be displayed on the final graphics at the time of final acceptance testing.

2. All data points mapped from the BMCS to the system are displayed correctly on the Mechanical or Electrical systems monitor.
  3. All mapped points are identical with regard to value, engineering units and significant digits on both systems.
  4. All points mapped from the system to the BMCS meet all of the specifications detailed in the contract documents for points directly monitored/controlled by the BMCS.
  5. The communications watchdog is functioning correctly.
  6. Communications speed between the two systems is satisfactory.
  7. Both systems restart and communications between the two systems resume following a power failure without operator intervention.
- H. Site tests similar to those detailed above shall be repeated as part of the final acceptance testing.
- I. Documentation regarding the BMCS software interfaces shall be provided in sufficient detail as to enable a person reasonably skilled in the writing of real time software applications to add/delete points mapped from one system to the other. At minimum the documentation shall include a detailed description of each protocol used and the model, version and firmware details of any protocol converter (gateway) that is used.
- J. A watchdog procedure must be implemented by the BMCS subcontractor that enables the identification of the point of failure, i.e. where in the communications chain between the two systems did the failure occur. The watchdog function must operate at a frequency that detects a failure within 60 seconds.

## **PART 2 - PRODUCTS**

### **2.1 INTERFACE BETWEEN THE BMCS AND THE SWITCHBOARD ELECTRONIC METERS**

- A. Each switchboard shall be provided with an electronic meter as part of the Electrical work. Provide a software interface between the BMCS and each of the switchgear units using Modbus RTU on an RS-485 communication connection.
- B. The software communications interface shall be set up so as to provide the BMCS with, at minimum, the following monitoring points:
1. RMS Current per phase.
  2. RMS Voltage phase-to-phase and phase-to-neutral.
  3. Current demand.
  4. Peak current.
  5. Watt-hours, three phase total.
  6. Watts per phase and three phase total.
  7. KVA per phase and three phase total.
  8. Watt demand.
  9. KVA demand.
  10. KVAR per phase and three phase total.
  11. KVAR demand.
  12. Power factor per phase and three phase total.
  13. Power factor average.
  14. Peak readings for watts, KVA and KVAR.
  15. KVARH Lag.
  16. KVARH Lead.
  17. Frequency.
  18. Up to ten additional Owner selected points if available.
- C. Coordinate with the electrical trade to ensure that the above information is monitored by the BMCS for all incoming electrical power meters on the project.
- D. Provide any interconnecting cabling and conduit required between switchboards and from the switchboards to the communication gateway provided by Electrical (if required) to ensure a complete turnkey software interface to the switchboards.

- E. Provide all information monitored on a graphical display to mimic the local meter information on the switchgear.
- F. The meter information shall be updated by the BMCS within 30 seconds of change in value.

## 2.2 INTERFACE BETWEEN BMCS AND WATER COOLED CHILLERS

- A. Provide a communication interface between the BMCS and the chiller controller units as identified within the selected Alternate. The communication protocol shall be BACNet or Modbus as outlined in each Alternate.
- B. The software communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:
  - 1. Entering Chilled Water Temperature (monitoring point).
  - 2. Leaving Chilled Water Temperature (monitoring point).
  - 3. Evaporator Pressure (monitoring point).
  - 4. Evaporator Differential Pressure (monitoring point).
  - 5. Evaporator Temperature (monitoring point).
  - 6. Suction Temperature (monitoring point).
  - 7. Pre-alarm (monitoring point).
  - 8. Flow Safety (monitoring point).
  - 9. Motor Run (monitoring point).
  - 10. Current Limit (Control point).
  - 11. Chilled Water Supply Temperature Reset (Control point).
  - 12. Chilled water pump status (monitoring point).
  - 13. Condenser Water Pump Status (monitoring point).
  - 14. Entering Condenser Water Temperature (monitoring point).
  - 15. Leaving Condenser Water Temperature (monitoring point).
  - 16. Up to 20 other Owner selectable points per chiller available at chiller control panel(s).
- C. Provide any required cabling from the BMCS to the chiller interface gateway panel(s). Provide any interconnecting cabling between chiller control panels to the chiller interface gateway panel if required.
- D. Provide all information monitored on a graphical display to mimic the local control panel information on the chiller.
- E. All BMCS setpoint resets and operator overrides shall be executed by the unit mounted chiller control panel within 2 seconds of BMCS command. The chiller control panel status shall be updated by the BMCS within 4 seconds of change in value.

## 2.3 INTERFACE BETWEEN THE BMCS AND VARIABLE FREQUENCY DRIVE UNITS

- A. Provide a BACnet MS/TP interface between the BMCS and the variable frequency drive units. The Mechanical subcontractor shall provide the communication interface card at each VSD.
- B. The software communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:
  - 1. Speed reference feedback.
  - 2. Motor operating status.
  - 3. Fault diagnostics.
  - 4. Metered points:
    - a. Motor power in HP.
    - b. Motor power in KW.
    - c. Motor kWh.
    - d. Motor current.
    - e. Motor voltage.
    - f. Hours run.
    - g. DC link voltage.
    - h. Thermal load on motor.
    - i. Thermal load on VFD.

- j. Heatsink temperature.
- C. Provide hardwired interface between the BMCS and the VSD for the following monitoring and control points:
  - 1. Start and stop control.
  - 2. Motor operating status.
  - 3. BMCS motor speed control.
- D. The VSD information shall be updated by the BMCS within 30 seconds of change in value.

#### 2.4 INTERFACE BETWEEN THE BMCS AND THE STANDBY GENERATOR

- A. Provide a Modbus RTU interface over a RS 485 connection between the BMCS and the PLC on the generator units. Provide an interface to each generator PLC, provided by Electrical.
- B. The software communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:
  - 1. Normal power active.
  - 2. Genset supplying load.
  - 3. Genset running status.
  - 4. Not in Auto mode.
  - 5. High battery voltage.
  - 6. Low battery voltage.
  - 7. Charger AC failure.
  - 8. Fail to start.
  - 9. Low coolant temperature.
  - 10. Pre-high engine temperature.
  - 11. High engine temperature.
  - 12. Pre-low oil pressure.
  - 13. Overspeed.
  - 14. Low coolant level.
  - 15. Low fuel level.
  - 16. Frequency.
  - 17. Total PF.
  - 18. Total KW.
  - 19. Total KVS.
  - 20. Percent KW.
  - 21. Battery voltage.
  - 22. Oil pressure.
  - 23. Coolant temperature.
  - 24. Engine RPM.
  - 25. Engine runtime.
  - 26. General Alarm.
  - 27. Overload.
  - 28. Overcurrent.
  - 29. Genset breaker tripped.
  - 30. Utility breaker tripped.
  - 31. Engine fail to start.
- C. Provide any interconnecting cabling and conduit required between generators and from the generators to the master PLC gateway provide by Electrical (if required) to ensure a complete turnkey interface to the generators.
- D. Provide all information monitored on a graphical display.
- E. The emergency generator information shall be updated by the BMCS within 30 seconds of change in value.

#### 2.5 INTERFACE BETWEEN THE BMCS AND THE FUEL OIL SYSTEM

- A. Provide a Modbus RTU over RS-485 software interface between the BMCS and the Fuel Oil Monitoring System.
- B. The software communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:
  - 1. Fuel filter alarm
  - 2. Tank volume.
  - 3. High level alarm.
  - 4. Low level alarm.
  - 5. Interstitial leak detection alarm.
  - 6. Tank leak alarm.
  - 7. Storage Tank Fuel Temperature.
- C. Provide any interconnecting cabling and conduit required between Fuel Oil System, provided by Mechanical, to ensure a complete turnkey interface to the Fuel Oil System.
- D. Provide all information monitored on a graphical display.
- E. The fuel oil system information shall be updated by the BMCS within 30 seconds of change in value.

## 2.6 INTERFACE BETWEEN THE BMCS AND THE ELECTRONIC SUBMETERS

- A. Each electrical submeter shall be provided as part of the Electrical work. The electrical Submeters will interface to the electrical submeter data collection software provided as part of the electrical system. Provide a software interface between the BMCS and the electrical submeter data collection system to import CSV files.
- B. The software communications interface shall be set up so as to provide the BMCS with, at minimum, the following monitoring points:
  - 1. KW Demand.
  - 2. KVA Demand
  - 3. Watt-hours, three phase total.
  - 4. RMS Voltage phase-to-phase and phase-to-neutral.
  - 5. RMS Current per phase.
  - 6. Current demand.
  - 7. Peak current.
  - 8. KVA per phase and three phase total.
  - 9. KVAR per phase and three phase total.
  - 10. Power factor per phase and three phase total.
  - 11. Frequency.
  - 12. Power factor per phase.
  - 13. Peak readings for watts, KVA and KVAR.
  - 14. Up to ten additional Owner selected points if available.
- C. Coordinate with the electrical trade to ensure that the above information is monitored by the BMCS for all incoming electrical submeters on the project.
- D. Provide any interconnecting cabling and conduit required between the electrical submeters and the sensors and from the switchboards to the communication gateway provided by Electrical (if required) to ensure a complete turnkey software interface to the electrical submeters.
- E. Provide all information monitored on a graphical display to mimic the local meter information on the electrical submeter.
- F. The meter information shall be updated by the BMCS every 5 minutes.

## 2.7 INTERFACE BETWEEN BMCS AND THE BOILER MANAGEMENT SYSTEM

- A. Provide communication interfaces between the BMCS and the boiler management system as identified within the selected Alternate. The communication protocol shall be Modbus RS-485.

- B. The software communications interface shall be set up so as to provide, at minimum, the following monitoring:
  - 1. Entering hot water temperature at each boiler.
  - 2. Leaving hot water temperature at each boiler.
  - 3. Pre-alarm at each boiler.
  - 4. Flame failure alarm at each boiler.
  - 5. Supply temperature setpoint at each boiler.
  - 6. Gas safety shut off valve status at each boiler.
  
- C. Provide all information monitored on a graphical display to mimic the local control panel information on the boilers.

**END OF SECTION**