## IV. BUILDING AUTOMATION SYSTEM

*System Description*

Mechanical systems will be controlled and monitored through a DDC based Building Automation System (BAS) with distributed processing at the local level. The overall building controls will be Johnson Controls, Inc., Siemens Building Technologies, Honeywell, Inc., Automated Logic Corporation, Schneider Electric, Alerton Technology, or Trane company. High Voltage Electric actuation will be utilized for all larger control valves and dampers while Low Voltage Electric actuation will be utilized for terminal unit control.

The control system will interface with BACnet/IP open protocol to the existing campus system. The control system will seamlessly integrate with existing site web server operator interface. Equipment and meters within the building will interface with BACnet/MSTP open protocol to the building level controller.

The control system will be standalone for monitoring and alarming at a central campus monitoring station.

The BAS will reside on the campus Enterprise network. The BAS will interface with a centralized virtual server that will provide storage capacity for recording and trending for: (1) every digital point each time the point changes state and (2) analog points on fifteen (15) minute intervals. The virtual server will provide storage capacity to trend and archive five (5) years' of data.

BAS will integrate with the following control systems/ equipment via communication based interface or dedicated contacts and will provide graphical user interfaces via BAS Web server as necessary.

**Table M29 – BAS Systems**

| System | Description |
|---|---|
| Boilers (as appropriate) | BAS will provide graphical interface including equipment flow diagram showing all sensing and control devices associated with the system and provide ability to monitor, schedule and override applicable controls. |
| Chilled Water (as appropriate) | BAS will provide graphical interface including equipment flow diagram showing all sensing and control devices associated with the system and provide ability to monitor, schedule and override applicable controls. |
| Variable Frequency Drives | BAS will provide additional monitoring and remote notification for alarming. |
| HVAC equipment | Equipment will include but not be limited to air handling units, fan coil units, fume hoods, and numerous other pieces of equipment. |
| Generator System | BAS will provide additional monitoring and remote notification for alarming. |
| Power Monitoring | BAS will provide additional monitoring for power consumption (LEED) and remote notification for alarming. |

| Table M29 – BAS Systems | |
|---|---|
| **System** | **Description** |
| Lighting Control | BAS will integrate with the lighting control system for remote monitoring and scheduling. |
| Domestic Equipment: Sumps, ejectors, hot water equipment, pure water equipment, pressure boosters, etc. | BAS will provide additional monitoring as needed and remote notification for alarming of all systems. |
| CO2 Sensors | CO2 sensors will be utilized in all densely occupied spaces (conference rooms, Lecture Hall, etc.) and will be used for local demand-controlled ventilation. |
| Fume Hood and Laboratory Air Flow Control System | BAS will provide additional monitoring and remote notification for alarming. |

*Design Criteria*

DDC controllers will utilize distributed architecture and will not rely on "front-end" or higher level controller to perform required control sequence.

Systems with redundant mechanical equipment will have redundant controls installed to prevent a single controller failure from causing a total system failure.

DDC controllers serving major equipment will have a minimum of 10% spare points of each type (DI, DO, AI and AO) at each panel. For universal points, the spares will be divided evenly between the analog and digital types of points.

Control panels and DDC controllers serving equipment fed by emergency/stand-by power shall also be served by emergency/standby power. All BAS and DDC system primary controllers, PC's and communications equipment that monitors life safety and critical points (fire alarm, elevator emergency, etc.) will be supported by emergency generators. Control panels and DDC controllers fed by emergency/standby power will be served by building UPS with minimum of 5 minutes backup time.

Airflow tracking control using DDC will be utilized instead of space pressure control, to maintain the space pressure (positive, neutral or negative) as required by the programming.

Existing graphic workstations will be updated with new systems. Graphics will be designed to match any existing graphic displays on the existing system when integrate with existing systems. Transition from existing graphics to new graphics shall be seamless transition for operator in look, functionality, and operation.

Advanced alarm management strategies will prioritize alarms and suppress cascading alarms to reduce nuisance alarms.

Key performance indicators will allow the operators to understand how the building is performing, including:

1. Space temperature
2. Energy Use Intensity, EUI
3. Number of alarms or work orders

**END OF BOD**