FACILITIES STANDARD

NAME : HVAC Controls - General
NUMBER : 15950

ORIGINAL DATE :02-09-98
REVISION DATE :11-03-99

PURPOSE:

1. The general purpose of each Facilities Standard is to provide minimal criteria for construction materials at University facilities regarding code compliance, warranty, approved products, execution and uniformity.

2. To protect the health and safety of patients, visitors, students, faculty and staff, in addition to protecting non-project UAB property, all construction must be in accordance with: NFPA 241 safeguarding construction, alteration and demolition operations; Standard Building Code, Chapter 33, regarding site work, demolition and construction; NFPA 101 Life Safety Code.

3. Construction safety is the responsibility of the contractor in accordance with the regulations and codes of the agency having jurisdiction, and according to the guidelines adapted by OSHA.

4. The **HVAC Controls - General Facilities Standard** establishes a series of guidelines for specifying this particular item on any construction project at the University. ***This Facilities Standard is not to be regarded as a specification.***

GENERAL:

1. It is the desire of the University that system types within each building remain the same, or, if that is not possible, are 100% compatible with the existing system front end. This policy was not established to circumvent the bid process; however, cost is always a concern. If it is in the best interest of the University, the Resident Professional Engineer may require the new control system to be the same as the existing system.

   All new control system operating stations will be PC (Personal Computer) based. The main system computer selection must be coordinated with Maintenance, Energy Management and Design Build Services through the Project Manager. When in the University's best interest, upgrading an existing computer or replacing an existing building computer (including program transfer and/or upgrade as necessary) must be considered.

It is desired that all control systems tie into a central building control system either existing, or as part of the ongoing project. However, in order to prevent component failures from affecting too much of a building's operation at the same time, the subsystem controls must be capable of operating in a stand-alone mode so as not to require remote access or communication with another controller or front end to function. As a rule, the amount of equipment affected by the stand- alone control should not exceed one large air handler (as defined under TYPE 1 Controls) or four energy-using systems per stand-alone control.

The control strategy should take advantage of current ASHRAE (American Society of Heating, Refrigeration Air Conditioning Engineers) energy conservation measures that are cost effective and applicable to the current project.

This Standard divides controls into two categories defined by application and accuracy required. More detailed descriptions of Type 1 and Type 2 Controls are found in Facilities Standards 15951 and 15952.

All control projects must also refer to Central Monitoring and Alarm system Standard No. 15953 for information regarding interfacing with the Central Monitoring and Alarm system.

PRODUCTS: and YEAR 2000 Compliance

Equipment and software used shall be limited to the following: Siebe, Siemens, and Johnson Controls Companies.

All software, hardware, third party software, equipment with computer chips and services provided will be year 2000 compliant. Year 2000 compliant means the system will:

1. Function without interruption or human intervention with four-digit year processing on all data.
2. Provide data interchange in the ISO 8601:1998 standard of CCYYMMDD or YYYYMMDD.
3. In the event that hardware, software or vendor generated programs do not meet the above conditions, the expense of new software, hardware and labor will be the expense of the Licensor/Vendor.

EXECUTION:

TYPE 1 CONTROLS are associated with large energy using systems such as:

1. Chillers and other central plant equipment (200 Refrigeration Tons and up).
2. Boilers and associated heating plant equipment (50 Boiler horsepower and up).
3. Large air handling units, cooling and heating coils, fans, dampers, filters, and their associated equipment (10,000 Cubic feet per minute and up).
4. Large capacity steam converters and associated equipment (1,000 pounds per hour and up).
5. Large fans for ventilation systems (20,000 Cubic feet per minute and up).
6. Large pumps and associated equipment (1,000 Gallons per minute and up).
7. Large preheat, reheat, and sub-cooling systems (10,000 Cubic feet per minute and up).
8. Large air distribution and exhaust systems (20,000 Cubic feet per minute and up).
9. All energy using equipment in critical areas such as operating rooms, burn treatment rooms, animal areas, special labs, etc. as directed by UAB Department of Design Build Services.

TYPE 2 CONTROLS are those mounted in or above the space and controlling terminal devices such as VAV (Variable Air Volume) boxes, terminal reheat boxes, fan coil units, small air handling units or other such devices.

DOCUMENTATION

1. In addition to the manufacturer’s nameplate, a durable identification tag shall be permanently attached to the body of all instruments and devices. This tag will show the same identification that is shown on the control prints. Field mounted devices shall be provided with stainless steel tags, and panel mounted instruments with hard plastic nameplates.

2. "Control loop diagrams" shall be submitted to the Consulting Engineer for review and approval, and after approval three copies shall be submitted to the University’s Project Manager for distribution to Maintenance, Energy Management and Design Build Services for comments. These drawings should be clear and legible, but not necessarily the final drawings.

3. All instrument drawings shall identify the instruments with the same tag number as provided on the instrument itself. All tag numbers shall include the function identification as well as the instrument loop number common to all devices on that loop. The form to be used for identification is defined by the American Standards Institute/Instrument Society of America, Standard 5.1, “Instrumentation Symbols and Identification.” (A sample form will be provided by the University’s resident mechanical engineer, if requested). In addition to printed copies, instrument drawings and information other than manuals will be provided to the University in electronic format compatible with AUTOCAD or Microsoft Word.

4. A typical "loop diagram" as defined by the American Standards Institute/ Instrument Society of America Standard 5.2, 5.3 and 5.4 “Instrumentation Symbols and Identification” shall be provided for each loop of each instrument, identifying the connections for each instrument.

5. **Control drawings shall be provided for every control system during the design stages and shall be submitted with the design stages**. These drawings shall show all major equipment and the control components associated with this equipment, including connections between sensors, controllers, all interlocks from external systems, and actuators on typical ISA (Instrument Society of America) standards number 5.3. The drawings shall also define the sequence of operation of the system.

6. Three sets of **as-built** control drawings, including the as-built sequence of operation, must be delivered to the University’s Project Manager fourteen calendar days before orientation for distribution to Maintenance, Energy Management and Design Build Services. If changes are made during the warranty period, three additional sets showing those changes are to be submitted at the completion of the warranty period. All drawings must show each control loop, complete with all external components that affect operation of the loop. All field wiring must be shown and individually marked for field identification. **No field wiring should be shown as typical.**

7. Operating, maintenance and repair manuals must be delivered to the University’s Project Manager fourteen calendar days before orientation for distribution to Maintenance, Energy Management and Design Build Services. These manuals must be complete with information to operate, maintain and repair the equipment. The University understands that control manufacturers may have some proprietary information relating to MICRO chips, program execution, board level components and built-in program subroutines; however, it is unacceptable to the University for a manufacturer to limit information for operating, repairing and programming control systems to its employees or representatives exclusively.

8. Fourteen days before orientation the Contractor shall provide and mount, in the equipment location, design operating sequences as well as set points for all energy consuming equipment installed. The Contractor will provide framing to encase and protect such information. At the end of the warranty period this information will be upgraded if changes have been made. The University's Energy Management and Maintenance Departments should receive this information on a computer disk in a standard word processor or AUTOCAD format.

9. Software and hardware required to operate, maintain and repair all parts and equipment related to the control system shall be turned over to Maintenance through the University's Project Manager at the time the University takes over operation of the area. This information will include copies of the program, configuration files in a format for downloading directly into the systems, and a format that allows editing and reinstalling. Communication boxes, cables, coded keys, and any other hardware required to work with the system will be provided to the University's Project Manager at this time.

10. **The University will comply with software license for systems**. Due to the number of systems installed at the University, and the rapid changes expected in software, the University desires all software to be University site licensed (all of the University), with basic verbal assistance when requested, so that software may be installed in remote locations within the University. It is also required that all software be backward compatible to existing systems of the same brand name.

COMMUNICATIONS BETWEEN CONTROLS

Type 1 Controls must be installed with the capability of communicating over the University's fiber optic Ethernet LAN (Local Area Network) network, **using TCP/IP protocol only,** to the University's computers without going through the operator's station. The network interface card will be 100 meg Ethernet compatible 10/100 switchable. Although some buildings are not tied into the fiber at this time, all buildings will be in the future. Whether or not fiber is available, the controls will be Ethernet compatible for access when fiber is available. Off campus access is also required through a call-up modem (this can be through the operator's station). Type 1 Controls shall be provided with translators, software and other equipment as required to allow these controls to be monitored, reset, histories read, and all other functions performed from the existing central computer(s).

Type 2 Controls shall also communicate as described above but may use type 1 control as a gateway.

RELATED EQUIPMENT

There is certain related equipment, not strictly classified as controls, which has a control function; therefore, that equipment is to be considered as such and is addressed in this section for emphasis.

Variable frequency drives are so interrelated to the control system as to be considered a part of that system. **Drive specifications are addressed in Facilities Standard 15958**. Signals between the control system and the drive shall be optically isolated to prevent a conflict between grounding. The drive shall be given full consideration as to its function in the design of the controls as they relate to airflow, coil conditions, chilled and hot water reset, etc.

WIRING

1. All control wiring must be shielded and twisted as pairs equal to the following Beldon numbers: Single twisted shielded pair - 8760; three conductor twisted shielded for RTDs (Resistance Temperature Devices) - 8770; two conductor twisted shielded plenum rated - 88760; three conductor twisted shielded plenum rated - 83653.

2. All control wiring should be installed in steel conduit as specified in Electrical Standard 16750. Conduit will be marked as defined in Electrical Standard 16010. A minimum distance of twelve inches shall be maintained between conduit containing power wiring and control wiring. Where power and control wiring cross, it shall cross at right angles.

3. The system’s electrical power and ground circuit will be tested for ground loops, voltage spikes, harmonics, etc., and shall be verified suitable for operation with the control system. A copy of this test will be included in the calibration documents. When necessary, power conditioners will be installed.

4. All cables between instruments, panels, and other control components shall be identified by permanently identified cable markers on each end of the cable at each termination point. This identification should be unique for each cable or wire so that each will be identified on the control print. All terminals shall be numbered in the same unique manner and should have a separator between the screw heads. All cables and loose wires in panels shall be run in plastic enclosures designed for that purpose. All panels should be wired so that low voltage 24 Volts alternating or direct current is kept separate from high voltage 120 volts alternating current.

5. All control panel wiring will enter through the bottom of the cabinet. No penetrations into the top of the cabinet are acceptable.

6. Color coding identification will comply with Electrical Standard 16010.

CERTIFIED FACTORY TRAINING AND ORIENTATION

Training and Orientation needs will vary greatly for different projects. Factory training for the University's Maintenance and Energy Management personnel is a necessity. The specific requirements should be discussed with the directors of UAB Maintenance and Energy Management or representatives from those departments. Complete factory training shall be provided for the operation, maintenance and repair for the total control system proposed, and there shall be an allowance, including living expenses and meals, for three UAB employees to attend the training sessions and orientation for the system proposed.

The University shall be granted an allowance as part of the control bid to train the three representatives on operation, programming and maintenance of the control system proposed.

Five days of on site training should be provided. This will be performed during normal working hours and will be in addition to orientation. The University will work with the Contractor to schedule these days to be acceptable to both the University and the Contractor, but no more than fourteen calendar days notice should be required. This training will be videotaped by the Contractor. Professionally produced training tapes may be substituted for the Contractor taping the training.

Through the warranty period, four additional days of training in eight-hour increments will also be provided when requested by the University. Fourteen days advanced notice will be given to the Contractor.

END OF STANDARD

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