PREFACE AND IMPLEMENTATION GUIDANCE TO THE DESIGN ENGINEER

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I. Preface and Implementation Guidance to the Design Engineer

These Standards set forth guidelines to assist the designers of building mechanical systems in specifying and procuring the controls for those building systems, including laboratory controls. The intent of this document is not to require a "one-size-fits-all" solution because that is simply not in the best interest of UNC, nor is it a practical approach for procuring controls given the state of the control industry.

This document provides tools for the designer to specify the appropriate level of control system quality for reliable control.

Decision-making guidance to the design A/E is provided throughout these documents in the form of bold, blue and italicized 'Editor's Notes' so that the A/E may make prudent decisions and specify the most effective requirements for the system being installed and for those that have to use them. It is ultimately the designer's responsibility to assess the systems to be controlled and the environments in which they will be installed, commissioned, and operated and utilize the appropriate elements of this specification. Further it remains the designer's responsibility to design a controls system to meet the project requirements. The Editor's Notes are formatted as 'Hidden Text' and are not intended to be printed.

Edits to each section shall be performed in Microsoft WORD software. All editing shall be performed using the 'Track Changes' options with all changes not accepted. This allows UNC to review all changes proposed to the Master Documents.

The designer should submit the modified Word document and the modified ACAD schematics for UNC review. These should be submitted prior to the Construction Document phase and must be submitted electronically, in the format and software version they are provided to the designer. Word documents shall have modifications identified using the 'track changes' function previously mentioned. The designer shall also note in the transmittal which schematics were modified. This will be reviewed by UNC Facilities Services prior to issuing drawings for CD submittal with comments provided. This controls review may be incorporated into the 50% CD review, should one be scheduled. UNC will make review comments on the DrChecks online review comment system.

Only those items listed in Blue Italic Text are to be modified, all other items in the document are to remain unchanged unless prior, explicit permission has been obtained by UNC Facilities Services to approve the modification. The designer is cautioned to apply or find the appropriate level of expertise to prepare their specification - otherwise, the result could be a specification with inadequate and contradictory requirements that cannot be enforced.

UNC Facilities Services will review the controls submittal and provide comments to the designer. The designer should coordinate with UNC the schedule requirements for response. The designer shall not stamp any temperature control submittal 'approved' or 'no exceptions taken' without also considering and incorporating appropriate comments from UNC Facilities Services.

Modifications or additions to the library of control schematics should use the format established by the current schematics.

A. THESE GUIDE SPECIFICATIONS APPLY THE FOLLOWING PRINCIPLES TO THE CONTROL SYSTEMS IN THE UNC SYSTEM IN THE ORDER THEY ARE PRESENTED:

1. Principle 1 – The control system must first and foremost provide effective and reliable control, commensurate with the systems it is controlling.

Obviously the types, complexities and the criticalities of the systems being controlled will dictate the quality/power of the control system that should be applied to them. The ultimate quality of the control

system is primarily dictated by the components that sense, execute logic for, actuate, and document the systems they are controlling. These components are generally specified in Master Sections 230901 (BAS Basic Materials, Interface Devices, And Sensors), and 230903 (BAS Field Panels). This specification applies the concept of an "Application Category" for controllers whereby the performance requirements of the controllers are grouped into categories, and the Specification must remain unchanged.

2. ***Principle 2 – The manufacturer and installer must be highly qualified with extensive experience and must be committed and bound to thorough Commissioning (Cx).***

While the control system power/quality is very important, equally or more important is the expertise and commitment of the installing contractor and their collaboration with the overall commissioning team. Qualifications should insure that a quality contractor with an extensive proven track record is specified; and that effective, thorough commissioning of the control systems by that contractor – whether or not a formal Commissioning process is employed - is essential. Given this, there lies a challenge to the designer to fairly restrict installers to those that can deliver effectively within the context of both the construction and the service/support arenas. To deal with this, Section 230900 (BAS – General) provides for qualifications of both the installer and manufacturers of the systems. Section 230801 (BAS Commissioning) dictates a high standard for the Commissioning of the system by the installer. It is our intent to fully comply with NC General Statute 133-3. As such, no limitation on bidders is allowed. Rather the intent is to provide a performance specification requiring high level of both products and services.

3. ***Principle 3: Specify Sequence of Operations Logic***

The designer must specify the logic of equipment sequences of operations. Often sequences of operations are specified only in general, and often ambiguous, terms, with much of the sequence left to the contractor's programmer. The programmers should not be put in the position of having to complete the engineer's sequence, and often resort to sequences which are not optimal for the particular building. Therefore, logic diagrams must be included in design documents. If the project is being done using a design-build methodology, then the design-builder must submit logic diagrams as a design submittal in advance of programming.

4. ***Principle 4: Require Sufficient Instrumentation***

The designer must require instrumentation to support both the sequence of operations, and the data acquisition capability to support equipment performance monitoring and building diagnostics analysis. A listing generally establishing minimum instrumentation requirements is included with the specifications. This identifies minimum instrumentation for common types of system. The designer is responsible for requiring additional instrumentation as necessary to support the sequence of operations, or to supplement data acquisition capabilities when the nature of the equipment or systems to be installed makes this sensible. Additional higher end devices shall be specified for control of critical systems or areas in the facility. It is the responsibility of the design engineer, in consultation with UNC, to specify the appropriate products for the application.

5. ***Principle 5 – The control installation must be fully documented as consistently as practical with nothing required to fully operate and maintain the system withheld from UNC.***

The system must always be put in the context of the Enterprise Building Management System (UNC EMCS VLAN) and implemented and documented using standard approaches wherever possible.

Point naming conventions, programming logic, network configuration requirements, security information, etc. must be strictly adhered to and totally documented. No element for the continued operation and maintenance of the control system may be withheld in any way. No part of the installation may be considered confidential or proprietary information. This specification requires applicable documentation

throughout. These requirements are not optional; however, certain documents are only applicable for certain approaches.

Laboratory controls shall generally be handled by the BAS. Fume hoods are to be controlled with a closed loop controller which controls the exhaust air terminal unit serving that hood. The volume control for the general exhaust and the supply air would be via BAS in a manner to maintain space pressurization first, thermal control second. The network architecture would otherwise be the same as our BAS specification.

B. BAS FRONT ENDS AND CONNECTIVITY TO EMCS:

All BAS systems shall be connected to EMCS. We are currently in the process of installing a system which is based on web services (Enterprise Building Management System, EBMS), not on BAS manufacturer standard offerings. Until this project is complete the designer should employ the following practices:

- Schematic design submittal should be based on estimation of control point count as identified in the standard. A reserve should be established with the project manager for $8000 plus $20 per point.
- Design Development submittal should include a revised point count and reserve estimate.
- Construction Document submittal shall include a finalized point count and reserve calculation. This should be based on UNC approved controls design. The design documents shall also include SECTION 230906 – (BAS) LOCAL OPERATOR INTERFACE SUPPLEMENT as an ALTERNATE.
- During construction the designer should coordinate with UNC Facilities Services to determine if the alternate is to be implemented or if connectivity is desired to the EBMS. If connectivity to EBMS is desired then the designer shall submit approved control drawings to UNC Facilities Service for coordination and management of the integrator's services in connectivity to EBMS.

All submittals for UNC Facilities Services review should be coordinated and submitted through the UNC Capital Projects project manager.

C. CONCLUSION:

UNC has determined that it is in their best interest to precede with new control system procurements to maintain as much competition as possible while maintaining quality and the ability to retain a competitive environment for upgrades and maintenance in the future.

Application of these Principles to a given project requires the designer to research/consider the project-specific environment and requirements and to edit this specification appropriately. The specific decision depends on a number of other important variables, including the specific HVAC control applications being served, the critical nature of the area or facility being served, the quality and capabilities of the local installer, and operator capabilities. This specification extensively references detailed control drawings, detailed sequences of operation, point lists, binding diagrams, etc. The A/E and design team must provide and incorporate these into the design documents.