These Guideline Specifications set forth principles to assist the designers of building mechanical systems in specifying and procuring the controls for those building systems. 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 Engineer is provided in these documents in the form of ‘Editor’s Notes’ so that the Engineer 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 job 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.

Edits to each specification section shall be performed in Microsoft Word. All editing should be performed using the ‘Track Changes’ options with all changes not accepted. This allows the Owner to review all changes proposed to the Master Documents.

These Guideline Specifications apply the following principles to the control systems designed and installed at UNC:

- **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 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 conditions, execute logic commands, control devices 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).

- **Principle 2 – The manufacturer and installer must be highly qualified with extensive experience and must be committed to thorough Commissioning (Cx).** While the control system components are very important, equally or more important is the expertise and commitment of the installing contractor and their collaboration with the overall commissioning team. The approved UNC BAS providers listed in Master Section 230900 are qualified to perform work on the UNC campus and are the only BAS providers allowed to bid the project. Note that on partial renovation projects to existing buildings where exiting BAS controls will continue to be used, the new controls will be bid as sole source to match the exiting building’s BAS system.

- **Principle 3: Specify detailed, energy efficient and proven Sequence of Operations**

  The designer must fully specify the logic for equipment sequences of operations and not leave any programming needs and interpretations to the BAS programmer to figure out. The purpose of the UNC control logic drawings is to provide that detailed, consistent and comprehensive design logic for all projects at UNC. Standardized control design logic
drawings and sequence of operations also helps both installers and UNC maintenance and operating staff as they work on the many buildings on campus. The UNC guidelines include a library of logic diagrams and written sequence of operations that are somewhat general in nature and covers most but not all applications and designs. The written sequences will need to be modified as needed for each project’s specific design application. The UNC logic diagrams should be used as a starting point and will need some editing by the designer to meet the specific project’s control design requirements.

- **Other:** Require monitoring of standalone Equipment and Systems. For standalone equipment and systems that are not controlled by the BAS, a BACnet interface is required for monitoring and when needed alarming to the BAS. Examples include potable water booster pumps and controls, motor VFD interfaces, critical lab equipment such as lab air compressors and vacuum systems, electrical panel energy metering systems and lighting control systems.

**Conclusion:**

Application of these Principles to a given project requires the designer to research/consider the project-specific environment and requirements and to edit these 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. Those specification items identified in Blue Italic Text are to be modified, all other items in the specification are generally to remain unchanged unless approved by UNC personnel.

The designer is cautioned to apply or find the appropriate level of expertise to complete this specification - otherwise, the result could be a specification with inadequate and contradictory requirements that cannot be enforced. Depending on the controls complexity the designer should arrange for a separate meeting with UNC to review and discuss the sequence of operations and control logic during CD design review.

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LIST OF DRAWINGS

C-0.00  SYMBOLS & ABBREVIATIONS
C-1.00  SINGLE DUCT VAV AH WITH PREHEAT & CHW COIL, NO RETURN FAN, DCV
C-1.01  SINGLE DUCT VAV AH WITH PREHEAT, CHW COIL & RETURN FAN, NO EXHAUST AT MIN OA
C-1.01a SINGLE DUCT VAV AH WITH PREHEAT, CHW COIL & RETURN FAN, W/ UNIT EXHAUST AT MIN OA
C-1.02  SINGLE DUCT VAV AH WITH PREHEAT & CHW COIL, MIN OA DAMPER, NO RETURN FAN
C-1.03  SINGLE DUCT CV AH WITH PREHEAT, CHW & REHEAT COIL, MIN OA DAMPER & RETURN FAN
C-1.04  SINGLE DUCT CV AH WITH PREHEAT, CHW & REHEAT COIL, CO2 VENTILATION & RETURN FAN
C-1.05  100% OA CV AH WITH HRAT RECOVERY, PREHEAT & CHW COIL
C-1.06  100% OA VAV AH WITH PREHEAT & CHW COIL
C-1.07  SINGLE DUCT CV AH WITH PREHEAT & CHW COIL, MIN OA DAMPER & RETURN FAN
C-1.08  SINGLE DUCT CV AH WITH PREHEAT & CHW COIL, MIN OA DAMPER, NO RETURN FAN
C-1.09  DUAL DUCT VAV AH CONTROL, NO EXHAUST AT MIN OA FLOW
C-1.09a DUAL DUCT VAV AH CONTROL, WITH UNIT EXHAUST AT MIN OA FLOW
C-1.10  SINGLE DUCT CV AH WITH PREHEAT & CHW COIL
C-1.11  100% OA CV AH WITH HRAT RECOVERY, FACK & BYPASS STREAM, CHW COIL
C-1.12  SINGLE DUCT CV-VSD AH WITH PREHEAT & CHW
C-2.00  SINGLE DUCT VAV BOX (COOLING ONLY)
C-2.01  SINGLE DUCT VAV BOX (WITH HW REHEAT CONTROL)
C-2.01a SINGLE DUCT VAV BOX (WITH HW REHEAT CONTROL) W/HEATING MIN FLOW SETPOINT
C-2.02  DUCT MOUNTED HW REHEAT COIL
C-2.03  DUAL DUCT VAV BOX CONTROL
C-2.04  LAB FLOW TRACKING ZONE
C-2.05  LAB FLOW TRACKING ZONE WITH HOOD
C-2.06  LAB FLOW TRACKING ZONE WITH HOOD & SNORKEL
C-2.07  LAB FLOW TRACKING MULTI ZONE
C-2.08  LAB CV ZONE
C-2.09  STEAM TO HW CONVERSION WITH CV PUMPS
C-2.10  STEAM TO HW CONVERSION WITH CV PUMPS
C-2.11  PROCESS CHILLED WATER LOOP
C-2.12  GLYCOL HEAT RECOVERY RUN AROUND LOOP
C-2.13  UNUSUAL
C-2.14  REDUNDANT CV EXHAUST FAN CONTROL FOR MANIFOLD EXHAUST LAB SYSTEMS
C-2.15  REDUNDANT VAV EXHAUST FAN CONTROL FOR MANIFOLD EXHAUST LAB SYSTEMS
C-2.16  FAN COIL UNITS
C-2.17  ELECTRIC UNIT HEATER
C-2.18  GENERATOR ROOM EXHAUST CONTROL
C-2.19  MISCELLANEOUS CONTROLS
SINGLE DUCT CV AH WITH PREHEAT & CHW COIL

Software Logic Diagram
100% OA CV AH WITH HEAT RECOVERY, FACE & BYPASS STEAM, CHW COIL

Software Logic Diagram
Single Duct VAV Box (with HW Reheat Control)
Single Duct VAV Box (with HW Reheat Control) w/ Higher Heating Flow Setpoint