



DESIGN REQUIREMENTS

GENERAL ELECTRICAL REQUIREMENTS

GENERAL INFORMATION

1.1 These Design/Construction Standards are prepared by the Columbia University Facilities Office. This is an effort to assist Design Professionals to understand the minimum standard requirements for all Columbia University Projects and to assist the design team in selecting systems and equipment that have performed well for the University in recent past projects.

1.2 It is not the intent to relieve the Design Team of their responsibility to comply with all codes and to seek out the best architectural/engineering solutions for this project and to make certain that the project goals of quality, function, durability, aesthetics, budget, and schedule are best served by the design of this project.

Nothing in these design guidelines shall be interpreted to relieve the Design Professional from their contractual requirements.

1.3 The Standards are prepared from past experiences with materials, equipment and systems and with recommendations from consultants and other universities. If, in the course of the design the Design Professionals should wish to deviate from these Standards or indicate a particular item is not in the best interest of the University, the issue should be brought to the attention of Columbia University's Project Managers in writing for review and consideration by the Columbia University authority having jurisdiction.

1.4 Refer to list of Preferred Manufacturers.

1.5 Refer to 23 08 00 for Commissioning requirements.

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2.1 Design facilities to minimize annual operating costs and future repair and replacement costs.

2.2 Electrical rooms must be large enough to house the equipment and provide adequately sized access pathways for the repair, maintenance and eventual replacement of the equipment. Minimum code requirements are to be followed.

2.3 Sustainable design, efficient operation and ease of maintenance are key elements of the Engineering Design. Each project should identify the use of various areas and ensure that

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- the proposed design meets all the requirements of each area within the building (eg. Libraries, Lab Spaces, general use, etc.).
- 2.4 Routing of utilities shall be done with future growth and renovations in mind. Coordinate with all trades to ensure unimpeded access to items requiring maintenance.
 - 2.5 Design systems and components with maximum reliability, flexibility and minimum operation and maintenance costs. Give full consideration for future system alterations with a minimum of system shutdowns. Preventative maintenance should be accomplished without a major building shutdown. Maintenance accessibility is of extreme importance. Meet all current regulations for worker safety including fall protection. Provide access platforms wherever possible to reach equipment located above 10' AFF, group items requiring maintenance around platforms for ease of maintenance. Lifts or removable ladders shall not be relied upon for access unless approved in writing by CU Facilities.
 - 2.6 Mount equipment (eg. Switchgear, Motor Control Centers and transformers) on a concrete housekeeping pad secured to the structural slab. Housekeeping pads shall be sized larger than the equipment and shall extend at least ten times the diameter of the mounting bolts past the equipment. Coordinate with Structural Engineer for final design.
 - 2.7 Include in the Engineering Specifications a statement that all components of the electrical systems are to be kept clean and dry as well as undamaged as manufactured, delivered, stored and installed before operating. The contractor is responsible for inspecting all equipment upon delivery for damage. Additionally, equipment shall be cleaned prior to start-up.
 - 2.8 Electrical Design shall incorporate the latest in energy saving devices and strategies. Electrical Engineer shall work with the University to provide the best energy savings to meet Utility and Carbon Footprint reductions for new work.
 - 2.9 An electrical coordination study is required for all projects. Provide a complete system analysis showing device coordination curves and charts showing that all equipment (e.g. primary fuses, secondary main breakers and secondary feeder breakers) are selectively coordinated. Set all circuit breakers in accordance with this study. Submit the protection study report along with complete current characteristic curves for each overcurrent protective device as part of the turnover process.
 - 2.10 Connection To Existing Panels
 - a. Panels shall be FIELD VERIFIED back to their source substation or breaker. All feeds to panels shall be clearly identified on drawings including location and floor (if applicable).

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- b. Existing panels shall be amp metered and logged for a period of no less than 7 days to ensure power consumption is accurately understood.
- c. Under no circumstances shall panels (existing or new) be provided with less than 20% spare capacity. If tying into an existing panel will reduce its spare capacity to less than 20%, a different source of power must be provided.
- d. Engineer shall ensure that loads are balanced on all phases in a panel.

2.11 Inter-Discipline Coordination

- a. Coordinate the electrical work with other disciplines to define the work and responsibilities of the Electrical Contractor. The Electrical Engineer will need to work closely with the Architect, Structural and Mechanical Engineers to determine the building infrastructure. In many cases, the mechanical and electrical system space requirements will necessitate changes to the floor plans, building sections and exterior elevations if not properly coordinated at the outset.
- b. Ensure all Electrical work is coordinated with other disciplines. The lack of proper coordination can cause both construction and maintenance problems. Advise the Project Manager and CU Facilities of possible conflicts and provide the details necessary to resolve those problems during the design process. Equipment located in ceilings shall be accessible for all maintenance activities required. This includes changing filters and motor / belt adjustments. Equipment located above ceilings shall be placed in hallways or corridors, NOT in offices, classrooms or lab spaces.
- c. Coordinate between the Mechanical Engineer and Electrical Engineer for equipment motors, motor starters, disconnect switches, thermal overload switches and mechanical controls for all mechanical equipment including AHUs, exhaust fans and pumps.

2.12 Record Prints

- a. Record prints are available for most buildings on campus. Due to the age of the buildings, as well as the numerous (and often undocumented) renovations throughout the years, these prints should only be used as a rough guide to what exists. The Architect and Engineer should plan on extensive survey work to verify the accuracy of prints provided by the University.
- b. All record prints loaned to the Architect or Engineer are to be scanned and returned as electronic versions along with the hardcopy. The scanned versions should be placed on a CD and scanned in a format suitable for importing as a background into AutoCAD.



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3.1 Temporary Power

- a. The existing electric system may be utilized for temporary light and power except where the power tools would overload existing circuits or otherwise inhibit the normal operation of the existing building.
- b. Separate temporary electric service shall be provided for all cases where existing service is insufficient or where existing service does not exist. In such cases, the Contractor is required to apply to the utility Company to obtain temporary electric service and to determine the service size required by the project.

3.2 Removals and Relocations

- a. Conduits, outlets, circuit work, feeders, etc., laid bare by the removal of floors, ceilings, walls, and partitions, and which are required to remain active, shall be rearranged, rerouted and reinstalled.
- b. All removed devices, plates, wire, outlet boxes shall not be reused. All existing wire and cable involved or disturbed in any relocation and extension shall be removed back to the nearest outlet, junction or pull box in the runs, and shall be replaced with new wire or cable. Where conduit, boxes, panels, wiring, equipment, materials, apparatus, and other items are removed, disconnect the item along with conduit and circuiting from adjoining boxes, conduit, panels, materials, apparatus, wiring, equipment, and items and terminate, cap, safe-off adjacent apparatus. Where conduit is concealed behind building surfaces, remove wire and cut flush, cap and abandon conduit at building surface penetration.

- 3.3 In renovation projects, shutdowns of existing utilities and services may be required. These shutdowns need to be coordinated through CU Facilities, Capital Project Management and the Client / Users well in advance.

- 3.4 The A/E must caution the Contractor that all shutdowns of systems serving occupied spaces outside the area of this project shall be absolutely minimized. This will require that, for example, branch duct runs shall be capped and sealed at the time of partial duct removal to allow use of the remaining duct system until the new ducts are installed. Temporarily rebalance if pressure relationships are critical. Ducts cannot be left open unless the entire system can be taken out of service throughout the full construction period.

- 3.5 Factor the impact of long lead time equipment in the project cost estimates and schedules.



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- 3.6 All mechanical and electrical equipment shall be protected from construction dust. Before start-up, motors must be covered or enclosed in a dust free manner. After start-up the surrounding area must be kept as dust free as possible by regular and frequent cleaning, dust control compound etc.
- 3.7 Renovation and Demolition
- a. To maximum extent feasible, remove abandoned conduit and equipment back to panels. The abandonment of existing equipment and material in-place is not acceptable. Other systems which are presently operating that are to be abandoned, as well as those previously abandoned should be removed.
 - b. Conserve space as much as possible, ensure designs are compact.
 - c. The correction of existing mechanical problems and removal of abandoned equipment, while maintaining the operation of the building needs to be addressed in the contract documents.
 - d. Clearly identify any equipment or materials that are to be reused on the contract documents.
- 3.8 Operations And Maintenance Manuals/Turnover Documents
- a. Four (4) hardcopy sets of CU Facilities approved job specific operating and maintenance (O&M) manuals shall be provided for each project. These manuals shall be collected in indexed three ring binders and contain manufacturer's operating and maintenance literature for every equipment item furnished for the project. Typical wiring or piping schematics are NOT acceptable; they must reflect the actual furnished equipment, including all options and interfaces with other equipment or systems.
 - b. A single copy of each job specific O&M manual shall be submitted immediately after all shop drawings have been approved. This copy will be reviewed by the A/E and University personnel, then sent back to the contractor for corrections. All corrected copies must be received by the University two weeks prior to any scheduled training.

REFERENCE

- 4.1 The applicable CSI Specification Section is 26 00 00.