PREFACE

This publication has been prepared as a guide for Architectural and Engineering (A&E) firms in the preparation of documents for the design and construction of new structures and the remodeling of existing structure for Indiana University. Items pertinent to requirements of Indiana University are contained herein.

The specification section numbers referenced by these standards are to help the A&E firms identify where IU Engineering standards are to be applied. These specification section numbers are based upon CSI standards and may not correspond to a particular A&E firm’s standard specification section numbering scheme.

Compliance with codes and OSHA regulations are minimum requirements. When requirements of Federal and/or State Codes are at variance with the contents of this publication, the most demanding requirements shall be observed.

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IT IS NOT INTENDED THAT THESE STANDARDS BE COPIED AND USED AS A SPECIFICATION!

MATERIAL CONTAINED HEREIN SHALL NOT BE COPIED VERBATIM IN SPECIFICATIONS OR IN NOTES ON THE DRAWINGS EXCEPT WHEN INSTRUCTIONS ARE GIVEN TO COPY CERTAIN ARTICLES OR PARAGRAPHS.

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Changing technology and changes in State or University policies will require continuing revisions of these standards. Revisions will be maintained online at www.indiana.edu/~uao. Architects and Engineers doing work for the University are expected to ensure that they are working with the latest revision of the standards.

Throughout these standards, cross-references have been made frequently to emphasize the importance of coordination of all parts of the contract documents for a project. Because of the requirement for complete coordination, the holder of this document is cautioned to furnish complete standards to consultants or to ascertain that consultants have copies of the referenced sections and paragraphs affecting the consultant’s work.

If questions arise concerning instructions contained herein, please request clarification from Indiana University, Department of Engineering Services, (812) 856 - 7055.
Also Included:

26 11 16 - Secondary Unit Substations

26 22 13 - Low Voltage Distribution Transformers

26 24 13 - Switchboards

26 24 16 - Panelboards

26 25 00 - Enclosed Bus Assemblies

26 28 16 - Enclosed Switches and Circuit Breakers

A. General

1. The University does not accept “Series-Rated” equipment for power distribution switchboards, distribution panels and branch circuit panelboards. Equipment must be “fully-rated” to minimum short circuit ratings specified.

2. Provide electrical metering where directed by Engineering Service or CFS. Electric meter shall be Schneider Electric PowerLogic ION 7650, and shall be installed in a separate, arc flash resistant compartment. Electric meter shall have the following features and accessories.
   a. Meter shall have minimum 10Base-T and/or 10Base-FX Ethernet option as specified by Engineering Services or CFS.
   b. Provide ANSI Accuracy Class 0.3 current transformers. CT range shall be selected appropriately for the load and shall not exceed the load by more than 50%.
   c. Provide CT shorting block and/or test switches.
   d. Provide voltage transformers as necessary.
   e. Meters shall have fuse protection for voltage and power supply inputs.
   f. For each meter, supply a data jack in the metering enclosure, connected to the campus Ethernet.

3. Lock Out TagOut (LOTO)
   a. Refer to latest version of Indiana University Building Design Standards, Section 01 92 14 for LOTO procedures. This standard can be found on IU University Architects Office (UAO) web site; http://www.iu.edu/~vpcpf/consultant-contractor/standards/building.shtm

4. Arc Flash
   a. Power distribution equipment shall be labeled for Arc Flash Hazards as required by NFPA 70E and NFPA 70.
b. The University’s goal is to have, and the Consultant should strive to design, a system such that no more than PPE Class 1 is required for maintenance of any electrical equipment with the exception that in main electrical rooms, PPE Class 3 is acceptable.

c. When designing electrical distribution equipment (main unit substations and main switchgear), the use of a coordinated system to temporarily reduce arc flash potential while the equipment is being maintained is encouraged. The arc flash reduction system is to be activated by manually operating switches or keypads located at the distribution equipment or at individual power circuit breakers.

d. Electrical Contractor shall be responsible for supplying a complete arc flash, short circuit and time-current coordination study for the entire electric distribution system from the building service entrance to branch circuit panelboards and for applying appropriate labels to all equipment.

5. For buildings greater than approximately 10,000 square feet per floor, consider the use of multiple power distribution risers to limit the number of branch circuits over 100 feet long. If the floor plan is such that two telecommunications risers would be required to limit any run to less than 300 feet, then the use of multiple power distribution risers in separate closets shall also be provided.

6. There shall be no foreign systems installed in low voltage electrical rooms unless they are associated with the room function.

B. Unit Substations (Section 26 11 16)

1. The secondary section of unit substations shall utilize copper bussing and fused switches, or air circuit breaker overcurrent devices like Type AKR from General Electric Co. Device hoists for drawout type devices shall be unit mounted. In some instances molded case breakers may be acceptable; coordinate with Engineering Services or CFS.

2. Unless directed otherwise the outgoing equipment shall consist of a single main overcurrent device with separate feeder devices. Metering and ground fault protective schemes shall be as detailed below in “Power Distribution Switchboards” section.

3. Air circuit breakers shall be drawout type with stored energy, manual operation.

4. Circuit breaker type overcurrent devices shall utilize solid state trip units.

5. The interrupting rating for overcurrent devices shall be specified by the consulting engineer. Engineering Services or CFS will provide the available fault current on the primary distribution system at a point nearest to the building when structure is served by the campus distribution system.
C. Power Distribution Switchboards (Section 26 24 13)

1. Power Distribution Switchboards (PDS) shall be specified with copper bus and shall have bus extensions provided at ends where future sections can be added.

2. On 277/480 volt systems that require the installation of Ground Fault Protection (GFP) both the main overcurrent device and the feeder overcurrent devices shall have GFP. The GFP system shall utilize a zone interlock technique.

3. The PDS shall have a copper equipment ground bus installed for its entire length.

4. On systems where the grounded circuit (neutral) conductor is distributed (120/208 & most 277/480) a 100% capacity neutral bus shall be provided. On systems where the grounded circuit (neutral) conductor is not distributed (480 and 277/480 serving only 3 phase loads) lugs for proper bonding of the equipment grounding conductor shall be provided.

5. Where applicable, the PDS shall be U.L. listed suitable for use as service entrance equipment.

6. A minimum of 4 spare overcurrent devices shall be provided with space for an additional 4 devices.

7. The minimum interrupting rating of overcurrent devices and bus bar bracing of the PDS shall be determined by calculations made by the consulting engineer. These ratings shall be specified in the construction documents.

8. Care should be used in locating the PDS. At minimum the location should meet requirements of NEC Table 110.26(A)(1) for a Type 2 condition. The exclusively dedicated space requirements of NEC Article 110.26(F) shall be strictly enforced. Additional space for maintenance, future extensions, and possible replacement should be factored into the location selected. The consultant shall work with the Engineering Services or CFS in locating this equipment.

9. Preferred equipment suppliers for Power Distribution Switchboards
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens
D. Motor And Circuit Disconnects (Section 26 28 16)

1. Motor and circuit disconnects shall be provided at all motor and equipment locations. Utilizing the “lock-out” feature on remotely located motor controllers is not acceptable as a disconnecting means. The University has dedicated maintenance crews who do such things as oil and grease bearings and replace belts on equipment. These personnel are not expected to be familiar with the location of starting equipment for the device being serviced. A non-fusible disconnect shall be provided on or adjacent to equipment for maintenance personnel use.

2. Heavy-duty type disconnects shall be specified with NEMA enclosure suitable for the environment to be encountered.

3. Preferred manufacturers for motor and circuit disconnects
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens

E. Dry Type Transformers (Section 26 22 13)

1. Dry type transformers shall be specified with temperature rating of 150 degree C rise above a 40 degree C ambient. Units 30 KVA and larger shall be floor mounted only. Taps to adjust the secondary voltage, 2 – 2.5% above and 2 – 2.5% below nominal shall be provided.

2. Where variable frequency drives 100HP and larger are used, a drive isolation transformer shall be installed ahead of each unit. These transformers shall be specifically designed for the application and shall include symmetrically placed taps and added coil bracing. Locate the transformers adjacent to the drive.

3. Shielded isolation transformers shall be utilized where load requires such enhanced protection. These units shall have copper shielding with appropriate connections for grounding the shield.

4. Secondary feeder conductors from transformers shall have overcurrent protection installed within 10 feet of transformer.

5. Care shall be used in locating dry type transformers. Adequate clearances around units shall be provided and minimum clearances from walls and etc. should be specified in the contract documents. Consideration should be given for how the units would be replaced in event of failure. Where units are installed adjacent to offices, library areas, or other noise sensitive locations, consideration shall be given to specifying “quiet” rated transformers. An excellent reference standard for use by the consulting engineer is the ANSI C57.X series.
6. Transformers shall meet NEMA TP-1 efficiency requirements.

7. Preferred manufacturers for dry type transformers
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens

F. Feeder And Plug-In Busway (Section 26 25 00)

1. Bus material shall be copper with full capacity neutral, separate equipment ground bus, and standard impedance. Enclosure shall be non-ventilated type. Splice plates and all component contacts shall be silver plated.

2. Floor Penetrations.
   a. Where busways penetrate walls or floors specify an integral fire stop as a part of the system.
   b. NEC required curbs shall be cast-in-place concrete that are formed as an integral part of the floor.

3. Plug-in units shall be fusible type.

4. Preferred manufacturers of bus ways
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens

G. Distribution Panelboards (Section 26 24 16)

1. Distribution panelboards shall have copper bus with full capacity neutral and equipment ground bus. Over current devices shall be fusible switch type wherever possible. Circuit breaker style distribution panelboards shall have a minimum AIC rating of 35,000 amps symmetrical. If a distribution panel board must be located in an area of a building which may be accessed by the general public it shall have a full cover door over all overcurrent devices. Exposed switch or circuit breaker handles in areas accessible to the public are not allowed.

2. Preferred manufacturers for distribution panelboards
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens
H. Branch Circuit Panelboards (Section 26 24 16)

1. Branch circuit panelboards shall have copper bus, full capacity neutral, and equipment ground bus. Circuit breakers shall be bolt-on type with a minimum interrupting rating of 22,000 amps symmetrical at 240 volt and 14,000 amps symmetrical at 480 volt. Specify a panelboard with a concealed trim and recessed lock. Where isolated ground devices are connected to panel specify a separate insulated equipment ground bus in panel. Provide minimum 20% spare capacity in panelboards.

2. Specify multi-pole circuit breakers that have one (1) operating handle. Using circuit breakers with handle ties is not acceptable.

3. Where panelboards are flush mounted specify a minimum of (3) 1” spare conduits to be installed from panelboard to ceiling space for future use.

4. In new buildings, panelboards shall be labeled as “Panel - floor/source/voltage/riser/panel” according to the following code.
   a. floor = building floor per architectural drawings
   b. source = N for normal, E for emergency
   c. voltage = H for 480V or 480/277V, L for 120/208V
   d. riser = number risers consecutively beginning with 1
   e. panel = number panels by floor beginning with 1

5. In existing buildings, match existing panel nomenclature.

6. Preferred manufacturers for branch circuit panelboards
   a. Eaton, Cutler-Hammer
   b. General Electric
   c. Schneider Electric, Square D
   d. Siemens

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