

Electrical Design And Documentation **26.05.01**

Description:

The purpose of the section is to highlight the current applicable UMD Design Standards for the design and installation of electrical systems at the UMD campus.

Related Sections:

- 26 32 00 Emergency Power

Effective Date:

January 1, 2023

Applicable Standards:

- Electrical Designs shall comply with applicable codes and standards including, but not limited to the following (or the latest version);
 - NFPA
 - OSHA
 - MOSH

General Requirements:

Products

- All service entry equipment shall be UL listed for such application and an AIC rating shall be required for each component of the equipment. Series ratings for fault capabilities are not acceptable.

Design Calculations

- For both Normal and Emergency power a separate document of Electric Design Calculations, shall be submitted and shall include, but not be limited to;
 - Short circuit calculation and coordination (for new panels, transformers, and switch gear)
 - KVA by switchboard
 - KVA by panel
 - KVA of lighting
 - KVA of receptacles
 - Feeder voltage drop
 - Peak demand (maximum)
 - Diversity factor
 - Lighting illumination levels (interior and exterior)
 - Emergency power KVA
 - Emergency Power Peak Demand
 - Lightning protection (Risk Analysis per NFPA 780)
 - Generator sizing
 - UPS sizing
 - Transformers
 - Switchboards
 - Grounding system
 - OSHA 1910 ARC Flash Calculations
- Design calculations and data sheets shall be set out in a systematic manner to enable an accurate assessment of the equipment/system proposed and submitted in a separate binder. Initial design calculations shall be submitted at the design development stage.
 - Revised calculations shall be submitted at the 50% construction document stage.
 - Complete final calculations shall be submitted at 95% construction document stage. All calculations shall be presented on applicable forms and all literature used in the determination of the calculations shall be referenced.
 - On Design-Build projects, all calculations shall be submitted with the 50% Construction Documents.

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- Identify the demand factor used for each type of load for estimating the service size. Also, identify the connected load and the demand loads.
- Load analysis shall be for all equipment connected to emergency generator. All loads connected shall be considered continuous.

Computer Calculations

- When computer calculations are included with design calculations the following documentation shall be furnished as a minimum:
 - A synopsis of the computer program(s) stating briefly; required input; method of solution; approximations used; second order analysis incorporated; specifications or codes used; cases considered; output generated; extent of previous usage or certification of program(s) and program(s) author.

Drawings

- The A/E shall prepare and submit for review and approval, drawings at schematic, 50%, 95%, and 100% completion.
- Electrical drawings shall indicate university assigned room numbers, and have column line designations.
- Service clearances – The drawings shall indicate the manufacturers recommended service clearance requirements around all electrical equipment.
- All elements of the Work shall be properly coordinated to insure that there are no conflicts between disciplines or between the drawings and the specifications.
- In general, abbreviations should be avoided except those which are generally understood and accepted and listed in the legend and symbols list.
- The power, signal, cable TV, A.V., Security, and communications layouts shall be shown on one set of drawings, and the lighting layout shall be shown on a different set of drawings. Use standard symbol conventions.
- Drawings shall be drawn using AutoCAD (later version), and provided in electronic format with the 100% submittal.
- Floor Plans (Scale: Not less than 1/8 inch= 1 foot 0 inches). The A/E shall:
 - Provide a single-line electrical distribution diagram showing primary service to substations and secondary service to distribution switchboards, motor control centers, and panel board for power and lighting. This diagram shall include and show the permanent as well as temporary points of connection to external utilities such as high-voltage, telephone, and all signal systems.
 - Electrical drawings shall include circuit #'s (PNL #, Breaker #).
 - Large-Scale Drawings (Scale: Not less than ¼ inch=1 foot 0 inches).The A/E shall provide a layout of all equipment rooms to ensure that the proposed equipment will fit in the allotted space. Large scale Drawings are required for: electric rooms, lecture halls, computer rooms, telecom closets, other rooms serving multimedia functions.
- Electrical schedules shall be included on the drawings, with load values in KVA, and it shall include the following information:
 - schedule name
 - location
 - mounting
 - main device
 - bussing
 - interrupting capacity (integrated rating)
 - voltage
 - phase
 - connected lighting load
 - connected power load
 - connected receptacle load
 - expected demand

- Each circuit shall include the following:
 - circuit number
 - description of load served
 - wire size
 - connected load
 - circuit breaker size
 - room number
- All switchboard and panel board legend information shall be typed and shall include room numbers for locations of loads being served, as well as CB number and panel where device receives power.
- All power, lighting ,and distribution panels, switchgear, MCC's, transformers, and switches (disconnect and transfer) shall be labeled with room number, circuit number, and panel or device number for the power source feeding the device.
- All medium voltage manholes shall be drawn in a fold-down detail.
- Performance data for electrical equipment shall be shown on the drawings. If the data is also included in the specification it shall be carefully edited for conflicts.
- Demolition shall not be shown on the same drawing(s) with new work.
- Grounding systems for buildings served by the Campus 13.8 kV distribution shall be designed based on the NEC definition of a separately derived system. Grounding systems for buildings served directly by PEPCO and utilize a PEPCO transformer shall be designed based on the NEC definition of the pad mount transformers as a service.

Design Conditions

- The following information should be clearly shown on the General Information Drawing: Additions and deletions may be required if package unit equipment is incorporated in the design of facilities.
 - Electrical
 - Primary
 - Secondary
 - Loads:
 - Lighting
 - Devices
 - Mechanical
 - Total Peak Demand
 - Total Connected Load
 - Emergency Power

Specifications

- Specifications shall include the requirement for the contractor to provide Operation and Maintenance manuals. Manuals shall be supplied with each major piece of equipment. O&M manuals shall include all applicable design calculations used in sizing components. Wiring diagrams, spare parts lists, vendor contact numbers, warranty information, and certificates shall be included. Fire alarm O&M manuals shall provide a riser, wiring, annunciator diagram, and catalog cuts.
- Campus color codes for communication, fire, security, and CCMS, junction box covers shall be as set forth below.

<u>SYSTEM NAME</u>	<u>COLOR</u>
CCMS	Green
Communications	Blue
Fire Alarm	Red
Security	Yellow