Basis of Design

This section applies to the design and installation relating to building services.

**UW Service Classifications**

For design purposes, the University has designated several building power service classifications to accommodate different facility uses and differences in available power service.

- **CLASS N1** - Spot Network - to be used in the University of Washington Medical Center, Health Sciences, and major research and laboratory facilities.

- **CLASS N2** - Primary Radial - to be used in most major education, administration, office and support facilities. This class has two subclasses:
  1) **CLASS N2S** - Includes a secondary tie to a second service bus in the same building (double ended substation) or to a separate building.
  2) **CLASS N2P** - Includes a primary selective switching concept. Only to be used if Class N2S is not possible.

- **CLASS N3** - Secondary Radial - to be used only for small annexes, selected branch campus facilities or other outlying facilities.

- **CLASS E1** – Hospitals and health care facilities, i.e. University of Washington Medical Center. Designed to meet the requirements of NEC, Article 517. Requires bypass/isolation switches.

- **CLASS E2** – Health Sciences, and major science research and laboratory facilities. Designed to meet the requirements of NEC, Article 700, 701, 702. Requires bypass/isolation transfer switches.

- **CLASS E3** – Academic, administration and support facilities. Designed to meet NEC, Article 700, 701, 702. Does not require bypass/isolation transfer switches.

- **CLASS E4** – Small annex, addition or similar structure. Designed to meet NEC, Article 700, 701, 702. For facilities not connected to the campus ESPS. Does not require bypass/isolation transfer switches.

**Design Criteria**

- Coordinate with Engineering Services all connections to existing distribution systems, the service capacity, location and configuration.

- When considering service class, serious consideration needs to be given to the University’s operational constraints. The primary select (UW Class N2P) service requires manual switching to the alternate feeder. Therefore, the primary switches at the vault do not provide quick power restoration from the alternate source. The transfer may take hours, especially if the high voltage staff is not on campus when the outage occurs. The (FOMS) Facilities Operations Maintenance Specialist are on duty 24 hours a day but can only switch up to 480V. Double-ended substations or capabilities to close a tie to another building (UW Class N2S) would allow for the FOMS to provide a quick restoration of power. Spot networks (UW Class N1) provide for the automatic separation of the troubled source, while continuing to serve the load uninterrupted by the alternate source(s). Spot networks are the best choice where reliable, uninterrupted power is required.
- UW Class N1 services shall be designed with maximum reliability and flexibility. UW Class N2 and UW Class N3 services shall be designed with reliability and flexibility commensurate with the function of the facility. For all classes of service, minimize the operation and maintenance costs.

- Maintenance, operation and construction must be able to be performed on a feeder without a power outage to other buildings on the same feeder. This is accomplished by switching the buildings to an alternate feeder. Currently, all facilities on the main campus have this flexibility. This flexibility shall remain a requirement for all new services.

- All services shall have a space at the main electrical service to allow temporary generator hookup to the facility. The space shall be marked as such. Facilities housing critical operations (i.e. Medical, Research, Laboratories, Data Centers) shall have spare breakers in these spaces.

- All services shall be fully rated. Series rating of equipment for short circuit protection for these classes of service is not acceptable.

**Service Transformer Sizing**

- CLASS N1: Size the transformers serving as one of three transformers in a spot network to carry 50 percent of the "Code" building demand load. Note that the network has to be able to operate in the "n-1" transformer mode. The increased load capacity from internal fan cooling is to be used only for building spare capacity.

- CLASS N2P, N2R, E1, E2, E3 and E4: Size the transformer to carry their respective calculated "Code" demand load. The increased load capacity from internal fan cooling is to be used only for building spare capacity. Non-fan cooled transformers shall be size to carry building calculated demand load plus 20% spare transformer capacity.

- CLASS N2S: Size the transformers serving as one of the two transformers in a distribution system to carry the entire building calculated "Code" demand load. Note that the system has to be able to operate in the "n-1" transformer mode. The increased load capacity from internal fan cooling is to be used for building spare capacity.

**Design Evaluation**

The following information is required to evaluate the design:

- **Programming**: Statement of design intent on the type of service and description of service equipment and location. Describe system operability and maintainability.

- **Schematic Design Phase**: Verify service point and connection means. Provide a preliminary one-line diagram and layout of the main electrical room indicating the footprints of all major equipment from each of the approved manufacturers indicating actual dimensions. Outline specifications.

- **Design Development Phase**: Finalize service connection point. Provide a finalized one-line diagram for the service connection and a final layout of the main electrical room indicating the footprints of all equipment from each of the approved manufacturers indicating actual dimensions. Draft specifications.

- **Construction Document Phase**: Complete design. Final plan and detail drawings, including the final layout of the main electrical room indicating all equipment from each of the approved manufacturers indicating actual dimensions. Final specifications.
Submittals

- Provide standard industry submittal requirements.

Products, Materials and Equipment

- Refer to the requirements specified in individual Electrical sections.

Installation, Fabrication and Construction

- UW Class N1 services (spot networks) shall be in vaults with concrete or solid masonry walls and ceilings per NEC 450-C.
- Locate lock out relays for the spot networks protectors adjacent to each other.

END OF DESIGN GUIDE SECTION