Design Documentation Guidelines | Electrical Services

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❒
- Architectural sketch concept. ❒
- Project time schedule. ❒
- Preliminary fire safety report. ❒
- Site survey information. ❒
- Site and environmental condition constraints. ❒
- Project delivery methodology. ❒

Design:

- Review of client requirements including reliability, redundancy, and efficiency. ❒
- Establish design criteria and develop functional services brief. ❒
- Investigate interface requirements with existing buildings and equipment. ❒
- Establish hazardous area classification if applicable. ❒
- Review preliminary fire safety report. ❒
- Review applicable authority codes and standards. ❒
- Establish contacts with utility companies. ❒
- Total load estimates (W/m^2). ❒
- Main supply methodology. ❒
- Standby power requirements. ❒
- Main plant space requirements. ❒
- Emergency lighting concept. ❒
- Earthing. ❒
- Review concepts for significant and unusual health and safety risks relevant to the design. ❒

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes. ❒

Specifications:

- Nil.

Reports:

- Concept services brief – to establish available system concepts and a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. ❒
- Design standards to be used. ❒

Commentary

1. To ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per m^2 basis.

Design Documentation Guidelines | Electrical Services

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept services design and budgetary implications. ❒
- Updated fire engineering report. ❒
- Power authority requirements/constraints. ❒
- Client approved architectural, structural, and other services concept designs. ❒
- Design time schedule. ❒
- Preliminary service loadings. ❒

Design:

- Assess supply utility requirements and liase with local authorities. ❒
- Initial sizing of major plant (transformers, generators, and main switchboards. ❒
- Load estimates based on major plant requirements plus W/m^2 for general areas. ❒
- Identification of major service routes. ❒
- Location and capacity of main load centres. ❒
- General area lighting layouts. ❒
- General area power distribution methodology (use of perimeter trunking, etc.). ❒
- Develop services route requirements, both horizontal and vertical and space co-ordination with other trades. ❒
- Define interface requirements with other services. ❒
- Identification of specific earthing and surge protection requirements. ❒
- Identify any special health and safety risks that may present in construction or design and consider alternative, lower risk, options. ❒
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❒

Deliverables

Drawings:

- Single line diagram showing major plant and major distribution (breakers/cables unsized). ❒
- Layout drawings indicating plant room locations, risers and primary service routes. ❒
- Typical area lighting (reflected ceiling plan) and power layouts or schedules. ❒

Specifications:

- Outline specifications. ❒
- Preliminary equipment schedules for major plant. ❒
- Generic lighting/appliance types. ❒

Reports:

- Design features (options) report (with agreed option to take to developed design). ❒
- Preliminary electrical equipment heat loads. ❒
- Energy efficiency analysis. ❒
- Lightning protecting assessment. ❒
- Preliminary building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
2. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | Electrical Services

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design and budgetary implications. ❒
- Client approved architectural, structural, and other services preliminary designs. ❒
- Service loads. ❒
- Defined escape routes with locations for emergency signage ❒

Design:

- Elemental load assessments (including documentation of constraints). ❒
- Fault level calculations. ❒
- Lighting calculations and layouts. ❒
- Determine number of power outlets on area by area basis. ❒
- Control methodologies. ❒
- Finalise earthing requirements. ❒
- Major plant and services routes, including access for installation and maintenance, co-ordinated with architecture, structure, and other trades. ❒
- Develop and expand the services concepts, selection of typical plant, review of plant room sizes and service space requirements including sizing of mains, sub-mains, and protection. ❒
- Assessment of specific treatment harmonics (internally and externally generated). ❒
- Identify utility connections. ❒
- Verify significant and unusual health and safety issues have been addressed in the design. ❒

Deliverables

Drawings:

- Single line diagram showing connections to all equipment and boards (breakers and cables sized). ❒
- Layout drawings indicating plant room locations, risers and service routes, and main cable trays. ❒
- Lighting and power layouts. ❒
- Reflected ceiling plans with preliminary co-ordination. ❒

Specifications:

- Preliminary technical specifications. ❒
- Equipment schedules. ❒

Reports:

- Updated design features (options) report, including options selected. ❒
- Supply authority approval submissions. ❒
- Updated energy efficiency review. ❒
- Building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all electrical elements

Design Documentation Guidelines | Electrical Services

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed design and budgetary implications. ❒
- Client approved architectural, structural, and other services developed designs. ❒

Design:

- Detailed load assessment. ❒
- Equipment sizing and generic selection. ❒
- Supplies to ancillary systems (public phones, fire alarm panels, etc.). ❒
- Sub-circuit cable sizing and breaker selection discrimination checks. ❒
- Co-ordination in principle with structure, architecture and other building services. ❒
- Design of harmonic treatment. ❒
- Finalise utility supplies. ❒
- Highlight significant and unusual health and safety risks that were identified through the design process. ❒

Deliverables

Drawings:

- Single line diagram showing connections to all equipment and boards (breakers and cables sized). ❒
- Layout drawings indicating plant room locations, risers and service routes and main cable tray routes. ❒
- Plant room and riser outline layouts. ❒
- Lighting and power layouts including switching and circuiting. ❒
- Lighting control zoning and specification. ❒
- Distribution schedules with final circuit breakers and cables sized. ❒

Specifications:

- Detailed technical specifications. ❒
- Detailed equipment schedules. ❒
- Luminaire and fitting schedules. ❒

Reports:

- Nil. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of all electrical elements. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. Co-ordination. In ceiling zones identified with appropriate clearance from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas.
3. Define in the specification the significant and unusual health and safety risks that were identified in the design.

Design Documentation Guidelines | Electrical Services

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❒
- Construction time schedule. ❒

Design:

- Production of larger scale detailed shop drawings including seismic details. ❒
- Co-ordination of all services, structure and architecture. ❒
- Equipment selection and technical submissions. ❒
- Confirmation of capacities, sizes based on equipment selection of all trades. ❒
- Seismic bracing. ❒
- Detailed tray routes and supports. ❒
- Control system programming. ❒
- Detailed layouts of plant rooms and risers. ❒
- Provisions for access and maintenance. ❒

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❒
- Equipment submissions as defined in detailed design. ❒
- Fabrication drawings for switchboards and panels. ❒
- Equipment plinth details, mounting and isolation detailing. ❒
- Detailed layouts of plant rooms. ❒
- Detailing of all tray routes and catenary grids including support/hanger details. ❒
- Conduit routing and installation details. ❒
- Seismic bracing details. ❒
- Wiring diagrams and points schedules for control systems. ❒
- Compliance certificates. ❒

Review:

- Review shop/fabrication and layout drawings for compliance with design. ❒
- Review equipment submission. ❒

Commentary

1. Normally prepared by the services sub-contractor to enable fabrication of the services design.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals, and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.