Electrical Services Design Documentation Guidelines

DRAFT

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Concept Design Phase

Design Process	Deliverables	Commentary
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 ❒	**Drawings:** ▪ Sketch drawings (may comprise "marked-up" architectural drawings) including preliminary plant room requirements and services routes. ❒ **Specs:** ▪ 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 ❒	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.

Preliminary Design Phase

Design Process	Deliverables	Commentary
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/m² 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. ❒	**Drawings:** ▪ Single line diagram showing major plant and major distribution (breakers/cables unsized) ❒ ▪ Layouts drawings indicating plant room locations, risers and primary service routes ❒ ▪ Typical area lighting (reflected ceiling plan) and power layouts or schedules ❒ **Specs:** ▪ 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 ❒	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.

Developed Design Phase

Design Process	Deliverables	Commentary
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 implications ❒ ▪ Lighting calculations and layouts ❒ ▪ Determine number of power outlets on area by area basis. ❒ ▪ Control methodologies ❒ ▪ Finalise Earthing requirements ❒ ▪ Major plant and services routes co-ordinated with architecture, structure and other trades❒ ▪ Develop and expand the services concepts, selection of typical plant, review of plant room sizes and services space requirements including sizing of mains, sub-mains and protection ❒ ▪ Assessment of specific treatment harmonics (internally and externally generated) ❒ ▪ Identify utility connections ❒	**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. ❒ **Specs:** ▪ 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 ❒	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

Detailed Design Phase

Design Process	Deliverables	Commentary
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, Architect and other Building Services. ❒ ▪ Design of harmonic treatment ❒ • Finalise utility supplies. ❒	**Drawings**: ▪ Single line diagram showing connections to all equipment and boards (breakers and cables sized) ❒ ▪ Layouts 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 ❒ **Specs:** ▪ Detailed technical specifications ❒ ▪ Detailed equipment schedules ❒ ▪ Luminaire and fitting schedules ❒ **Reports:** ▪ Nil	1. Detailed design generally provides a level of documentation to clearly define the design of all electrical elements. Design details should be co-ordinated 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.

Construction Design Phase

Design Process	Deliverables	Commentary
Inputs: ▪ For Construction design level 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. ❒	**Drawings:** ▪ Drawings submitted for "review". ❒ ▪ Fabrication drawings for switchboards and Panels. ❒ ▪ 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. ❒ ▪ As Built drawings, manuals and equipment details. ❒	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, ie "the details have co-ordinated the relevant design information across all disciplines and can be built from". 3. Equipment ordered