

# Appendix E

## List of Document Types to be Produced During a Project

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During the course of a project there will be a large number of documents produced for structures, systems and equipment. Apart from contractual and commercial documents there will be those for engineering, design, specification and testing of the systems and equipment in particular. These will be produced from two main sources. Firstly those from the design contractor, who is sometimes called the consultant, and secondly those from the many manufacturers who are involved in the project. Let the first set of documents be called 'Contractors Documents', and the second set the 'Manufacturers Documents'. Listed below are the various types of documents that are produced for the different phases of a project for the electrical and allied structures, systems and equipment. The sequence of the list is in approximately the time and logical order of a typical project plan. Some activities run in series whilst others run in parallel. The list is not exhaustive, but is typical for an oil industry plant, and can be used as a starting point or as a checklist when estimating what has to be done in the project. The description or title of each type of document is very typical of those used throughout the industry.

Feasibility studies are often carried out at the beginning of a project to screen out different options that may be possible to develop further. These studies are relatively short in duration and only deal with the essential aspects of the design that will eventually emerge. Effort is usually concentrated in exploring the technical viability of the options available, to assess the amount and size of the main items of equipment, buildings and structures, thereby enabling an estimate of the plot area and its maximum height to be established. A rough estimate of the total weight and cost of equipment and the cost of site construction is usually made. For all the disciplines involved the total man-hours of work done is typically up to 5000.

Conceptual design or front-end engineering and design take the feasibility study work a stage further by expanding the chosen or best option in greater detail, including estimating costs more precisely. The main process systems are divided into more detail and consequently the work to be undertaken by all the other disciplines is increased in order to further delineate their contributions. Typically the total number of man-hours involved can be up to 25,000. For some projects the separation of feasibility studies from the conceptual design work may not take place, they may well be combined in a common scope of work.

Detail design takes the conceptual design or front-end engineering work as its starting reference and develops it in fine detail to the point where each piece of equipment and its location on site

are clearly identified. Much of the work involves producing drawings, diagrams, specifications, and detailed instructions for construction practices, plus all the purchasing and testing documentation. For a large project the total number of man-hours may be several hundreds of thousands, and represents the largest part of the cost of engineering the project.

## **E.1 CONTRACTORS DOCUMENTS**

### **E.1.1 Feasibility Studies**

The contractors documents may include the following:-

- Document list and index.
- Project execution statement.
- Project engineering philosophy divided into major subjects.
- Operating philosophy for the power system.
- Report for the power management system operation and design.
- Key single-line diagram.
- Single-line diagram of each main switchboard.
- Load schedule of each switchboard.
- Report for load flow calculations.
- Short circuit calculations and a report.
- Report for harmonic penetration studies.
- Report of protective relaying studies.
- Report for the study of sizing of major equipment.
- Narrative for describing the interfacing of control and indication with other disciplines.
- Plot plans showing the locations of electrical equipment.
- Plot plans showing hazardous areas.
- Plot plans showing main cable and overhead line routes.
- Plans, elevations and sections of buildings and main rooms.
- Equipment lists, including their unique tag numbers.
- Report of earthing system studies.
- Report for the sizing of the main cables and overhead lines.
- Project specifications for major items of equipment, optional.
- Project data sheets for major items of equipment, optional.

### **E.1.2 Conceptual Design**

Some of the documents developed in this phase of the project may be revised versions of those prepared in E.1.1. The contractors documents may include the following:-

- Document list and index.
- Project execution statement.

- Project engineering philosophy divided into major subjects.
- Operating philosophy for the power system.
- Report for the power management system operation and design.
- Key single-line diagram.
- Single-line diagram of each switchboard.
- Load schedule of each switchboard.
- Report for load flow calculations.
- Short circuit calculations and a report.
- Report for harmonic penetration studies.
- Report of protective relaying studies.
- Report for the study of sizing of major equipment.
- Plot plans showing the locations of electrical equipment.
- Plot plans showing hazardous areas.
- Plot plans showing main cable and overhead line routes.
- Plans, elevations and sections of buildings and main rooms.
- Plans, elevations and sections of large electrical equipment, e.g. switchgear, motor control centers, transformers, generators, HV motors.
- Equipment lists, including their unique tag numbers.
- Schedule of protective relaying settings.
- Report of earthing system studies.
- Report for the sizing of the main cables and overhead lines.
- Report for the selection of lighting equipment types and illumination levels, including sample calculations, optional.
- Block cable schematic diagrams.
- Schedules of cables.
- Project equipment specifications.
- Project equipment data sheets.
- Schedules of switchboard control and indication requirements, optional.
- Block diagrams for control, indication, measurements, interlocking, synchronising, and interfacing with intelligent networks.
- Narrative for describing the interfacing of control and indication with other disciplines.

### **E.1.3 Detail Design**

Some of the documents developed in this phase of the project may be revised versions of those prepared in E.1.2. The contractors documents may include the following:-

- Document list and index.
- Project execution statement.
- Project engineering philosophy divided into major subjects.
- Operating philosophy for the power system.

- Report for the power management system operation and design.
- Key single-line diagram.
- Single-line diagram of each switchboard.
- Load schedule of each switchboard.
- Report for load flow calculations.
- Short circuit calculations and a report.
- Report for harmonic penetration studies.
- Report of protective relaying studies.
- Report for the study of sizing of major equipment.
- Plot plans showing the locations of electrical equipment.
- Plot plans showing hazardous areas.
- Plot plans showing main cable and overhead line routes.
- Plans, elevations and sections of buildings and main rooms.
- Plans, elevations and sections of large electrical equipment, e.g. switchgear, motor control centers, transformers, generators, HV motors.
- Plans and elevations for cable trenching, racking and routing.
- Details of cable trench cross-sections and contents.
- Equipment lists, including their unique tag numbers.
- Schedule of protective relaying settings.
- Report of earthing system studies.
- Report for the sizing of the main cables and overhead lines.
- Report for the selection of lighting equipment types and illumination levels, including sample calculations.
- Block cable schematic diagrams.
- Schedules of cables.
- Schedules of cable drums.
- Project specifications for all items of equipment.
- Project data sheets for all items of equipment.
- Schedules of switchboard control and indication requirements.
- Wiring diagrams for switchboards and motor control centers.
- Wiring diagrams for control and annunciator panels.
- Wiring and terminal connection diagrams for generators, large motors, pumps, compressors and heavy machinery.
- Wiring and terminal connection diagrams for marshalling and junction boxes.
- Wiring and terminal connection diagrams for heat-tracing systems.
- Block diagrams for control, indication, measurements, interlocking, synchronising, and interfacing with intelligent networks.
- Narrative and detailed diagrams for interfacing details with other disciplines.
- Detail design diagrams and drawings for equipment fixings and installation for both large and small equipment.

- Detail design diagrams and drawings for the earthing of equipment and systems, for both large and small equipment including non-electrical items such as vessels and fences.

## **E.2 MANUFACTURERS DOCUMENTS**

### **E.2.1 Feasibility Studies**

The manufacturers documents may include quotations for particular items of equipment such as generators, large motors and main switchboards. These quotations would include technical information and budget cost estimates, and possibly references to other customers and projects.

### **E.2.2 Conceptual Design**

The manufacturers documents may include the following:-

- Document list and index.
- Report for the functional design of the power management system.
- Plans and elevations for the power management system equipment.
- Single-line diagrams for the switchboards.
- Single-line diagrams for the motor control centers.
- Schedules of switchboard protective devices.
- Brochures for the protective relaying equipment.
- Setting up and commissioning manuals for the protective relaying equipment.
- Plans, elevations and sections of switchboards and motor control centers.
- Plans, elevations and sections of generators and their prime movers.
- Plans, elevations and sections of large motors and their driven machines.
- Plans, elevations and sections of power transformers and reactors.
- Termination details in major equipment terminal boxes, e.g. generators, HV motors, optional.

### **E.2.3 Detail Design**

The manufacturers documents may include the following:-

- Document list and index.
- Report for the functional design of the power management system.
- Plans and elevations for the power management system equipment.
- Single-line diagrams for the switchboards.
- Single-line diagrams for the motor control centers.
- Schedules of switchboard protective devices.
- Brochures for the protective relaying equipment.
- Setting up and commissioning manuals for the protective relaying equipment.

- Plans, elevations and sections of switchboards and motor control centers.
- Plans, elevations and sections of generators and their prime movers.
- Plans, elevations and sections of large motors and their driven machines.
- Plans, elevations and sections of power transformers and reactors.
- Plans, elevations and sections of skid-mounted equipment.
- Plans, elevations and sections of UPS and battery banks.
- Plans, elevations and sections of control and large marshalling panels.
- Manuals for commissioning and testing main items of equipment, e.g. switchboards and motor control centers, generators, transformers.
- Block diagrams for control, indication, measurements, interlocking, synchronising, interfacing with intelligent network systems.
- Interfacing details with other equipment and disciplines.
- Wiring diagrams for control and annunciator panels.
- Wiring and terminal block diagrams for equipment.
- Termination details in major equipment terminal boxes, e.g. generators, HV motors.