

## List of Electrical Design Deliverables

| SN | Deliverable                                                               | Tool                      | Deliverable Contents                                                                                                                                                 | Developed During* | Deliverable Data |              |            |         | Comments                                                                                     |
|----|---------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|--------------|------------|---------|----------------------------------------------------------------------------------------------|
|    |                                                                           |                           |                                                                                                                                                                      |                   | Required for     |              |            |         |                                                                                              |
|    |                                                                           |                           |                                                                                                                                                                      |                   | Procurement      | Construction | Start-Up & | Project |                                                                                              |
| 1  | 3D Model                                                                  | 3D modelling and Software | The 3D model shall show realistic depictions and contain relevant design data for all physical disciplines in sufficient detail as per the project 3D CAD procedures | B&D               |                  | Y            | Y          |         | Refer to Project Design Criteria for the requirement of 3D modelling and software to be used |
| 2  | Material Assignment Schedule (MAS) and Contract Assignment Schedule (CAS) | MS Excel                  | Developed by Contracts group with Engineering input                                                                                                                  | B&D               | Y                |              |            | Y       |                                                                                              |
| 3  | Construction Facilities / Site Coordinating Plan                          | 2D                        | Shows the location and type of required facilities, including lay down areas, trailer locations, fabrication areas and temporary warehouses.                         | B&D               |                  | Y            |            |         | Project to determine if this is done by Engineering or Construction,                         |
| 4  | Construction Electrical Power / Camp Electrical Power                     | 2D                        | Layout for Temporary or Construction power supply which includes the arrangement of the temporary substation and electrical panel location                           |                   |                  | Y            |            |         |                                                                                              |

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|    |                                         |                        |                                                                                                                                                                                                                    |                   | Required for     |              |            |         |                                           |
|    |                                         |                        |                                                                                                                                                                                                                    |                   | Procurement      | Construction | Start-Up & | Project |                                           |
| 5  | Permitting submittals                   | PDF                    | Includes documents and drawings required for applicable construction and environmental permitting activities for the project                                                                                       | B                 |                  | Y            |            |         | Refer to project permitting requirements, |
| 6  | Design Basis / Design Criteria Document | MS Word                | Refer document <b>EPM-KEE-TP-000019</b> for the contents of Design Criteria                                                                                                                                        | B                 |                  |              |            |         |                                           |
| 7  | Scope of Work/ Specifications           | MS Word                | Refer to templates for the contents of SOW and Specification                                                                                                                                                       | B&D               | Y                | Y            | Y          |         |                                           |
| 8  | Data Sheet(s)                           | MS Word/<br>MS Excel   | Engineered component data sheets which are generated to include all functional requirements for the inclusion within subcontract packages.                                                                         | D                 |                  | Y            | Y          |         |                                           |
| 9  | Bulk Quantity Takeoff / BOQ             | MS Excel/<br>MS Access | Bulk Quantity Takeoffs (QTOs) for tracking engineering-released quantities at 30%, 60%, & 90% Milestones to support construction installation: Cables (LM), Cable trays/ conduits (LM) by Facility and / or System | B&D               |                  | Y            |            | Y       |                                           |

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|    |                                        |                        |                                                                                                                                                                                                                    |                   | Procurement      | Construction | Start-Up & | Project |          |
| 10 | Tagged Material Tracking / BOQ         | MS Excel/<br>MS Access | Equipment and Specialty Items (EA): Includes tags, sizes, description, quantity, physical dimensions, weight, capacity, datasheet (fit / function) type information.                                               | B&D               |                  | Y            | Y          | Y       |          |
| 11 | Engineering Progress Report            | MS Excel               | Engineering provides input of the progress and performance measurement tool used on the project                                                                                                                    | D                 |                  | Y            | Y          | Y       |          |
| 12 | Single-Line Diagrams                   | 2D                     | Depicts configurations and ratings of electrical equipment and busses for AC, DC, grid interface, UPS and emergency power, and LV distribution system.                                                             | B&D               | Y                | Y            | Y          |         |          |
| 13 | Single Line Relay & Meter Diagrams     | 2D                     | Shows basic protective relaying and metering schematics.                                                                                                                                                           | B&D               | Y                | Y            | Y          |         |          |
| 14 | Hazardous Area Classification Drawings | 2D                     | Depicts extent of hazardous areas as defined by applicable code as defined in Mechanical Design Criteria. Typically, areas will be delineated with cross-hatching on plan view sketches showing sufficient detail. | D                 |                  | Y            | Y          |         |          |

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|    |                                                               |         |                                                                                                                                                                                                                                                                                            |                   | Required for     |              |            |         |                                                                                                                                                                           |
|    |                                                               |         |                                                                                                                                                                                                                                                                                            |                   | Procurement      | Construction | Start-Up & | Project |                                                                                                                                                                           |
| 15 | Fire Alarm and Fire Detection Layout drawings (Zone Drawings) | 2D / 3D | Layout for building fire detection riser drawing for design intent, prepared for each fire zone.                                                                                                                                                                                           | D                 |                  | Y            | Y          |         | 3D if used on the project                                                                                                                                                 |
| 16 | Equipment room layout design                                  | 2D / 3D | General layout of Equipment, MEP, UPS, Telecoms. (ensure it's captured for each discipline)                                                                                                                                                                                                | D                 |                  | Y            |            |         |                                                                                                                                                                           |
| 17 | Electrical Equipment Plans & Installation Details             | 2D / 3D | Shows arrangement layout and cross sections of electrical equipment including dimensions, access door details, and wire ways. Depending on the complexity of the area (BMS / VMS / SCADA, Switchgear room, etc.) this information may be included in the raceway plan section and details. | D                 |                  | Y            |            |         |                                                                                                                                                                           |
| 18 | Schematic Diagrams                                            | 2D      | Typical Schematic diagrams (which includes the three line diagram and three line meter and relay diagram) will be issued for all devices controlled from switchgear                                                                                                                        | D                 |                  | Y            | Y          |         | 1. Where schematic diagrams provided by vendors include details of motor control centers or switchgear, no separate schematics will be generated by the design contractor |

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|    |                                        |      |                                                                                                                         |                   | Required for     |              |                    |         |                                                                                                                                                                                                                                          |
|    |                                        |      |                                                                                                                         |                   | Procurement      | Construction | Start-Up & Project | Project |                                                                                                                                                                                                                                          |
|    |                                        |      | or motor control centers as well as other hard-wired control circuits.                                                  |                   |                  |              |                    |         | 2. Terminal points will be shown for equipment where such information is available at the time of issue and is unlikely to change. Typically, DCS I/O terminal points will not be included because they are subject to numerous changes. |
| 19 | Three-Line Diagrams                    |      | Provided by the Equipment Supplier                                                                                      |                   |                  | Y            | Y                  |         |                                                                                                                                                                                                                                          |
| 20 | Three-line Relay & Meter Diagrams      |      | Provided by the Equipment Supplier which shows basic protective relaying and metering schematics.                       |                   |                  | Y            | Y                  |         |                                                                                                                                                                                                                                          |
| 21 | Block Diagrams                         | 2D   | Graphical representation of cable/ raceway routes/ layout                                                               | D                 |                  | Y            | Y                  |         | If a cable/raceway management software is used which can produce cable/ raceway block diagrams, separate 2D block diagrams are not required                                                                                              |
| 22 | Fire Alarm & detection riser schematic | 2D   | Overall fire alarm & detection network of all interconnected facilities and riser schematics for individual facilities. | D                 | Y                | Y            | Y                  |         |                                                                                                                                                                                                                                          |

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|    |                                                                                 |                                   |                                                                                                                                          |                   | Required for     |              |                       |  |                                              |
|    |                                                                                 |                                   |                                                                                                                                          |                   | Procurement      | Construction | Start-Up &<br>Project |  |                                              |
| 23 | Corrosion / Cathodic Protection and Stray Current Monitoring                    | MS Excel/<br>MS Word/<br>2D (DWG) | Details, physical locations, and cable interconnections for the cathodic protection system and resistance calculation (when applicable). | D                 |                  | Y            | Y                     |  |                                              |
| 24 | Duct bank Plan(s)                                                               | 2D                                | Provides arrangements of UG duct bank, conduit identification, material and sizes.                                                       | D                 |                  | Y            |                       |  | To be coordinated with Civil design drawings |
| 25 | Earthing Diagram and Bonding Details                                            | 2D / 3D                           | A diagram showing earthing and bonding across the disciplines                                                                            | D                 |                  | Y            | Y                     |  |                                              |
| 26 | Earthing and Bonding Strategy                                                   | MS Word                           | Describes how earthing and bonding is carried out across the disciplines                                                                 | D                 |                  | Y            | Y                     |  | Part of design criteria                      |
| 27 | Electrical Heat Tracing Panel Schedule(s)                                       | MS Excel                          | Provides listing of freeze protection circuit breaker panels, and the breaker assignments within each panel (when applicable).           | D                 |                  | Y            | Y                     |  |                                              |
| 28 | Earthing/Grounding Layout, Earthing and Bonding, Lightning Protection & Details | 2D                                | Layout drawing showing the area protected by the lightning protection design and earthing layout.                                        | D                 |                  | Y            | Y                     |  |                                              |

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|    |                                                                      |                                              |                                                                                                                                                                                                        |                   | Required for     |              |            |         |          |
|    |                                                                      |                                              |                                                                                                                                                                                                        |                   | Procurement      | Construction | Start-Up & | Project |          |
| 29 | Earthing/Grounding and Lightning Protection Notes, Symbols & Details | 2D                                           | Lists generic notes, drawing symbols, and details for grounding and lightning protection. GBU Standard Document shall be used.                                                                         | D                 |                  | Y            |            |         |          |
| 30 | Lighting & Power System Notes, Symbols & Details                     | 2D                                           | Lists generic notes, drawing symbols, and details for lighting systems and general-purpose receptacles. Fixture type, description and related vendor information. GBU Standard Document shall be used. | D                 |                  | Y            |            |         |          |
| 31 | Lighting and Power Panels Schedule                                   | 2D/Excel                                     | Provides listing of type and rating of circuit breaker, contactors and photo controls with breaker assignments within each panel.                                                                      | D                 |                  | Y            | Y          |         |          |
| 32 | Lighting Plans & Fixture Schedule                                    | output of the light design software could be | Shows lighting arrangement including hazardous area as part of the drawing.                                                                                                                            | D                 |                  | Y            | Y          |         |          |

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|    |                                                      |                           |                                                                                                                                                         |                   | Required for     |              |            |         |                                                                  |
|    |                                                      |                           |                                                                                                                                                         |                   | Procurement      | Construction | Start-Up & | Project |                                                                  |
|    |                                                      | used to generate schedule |                                                                                                                                                         |                   |                  |              |            |         |                                                                  |
| 33 | MCC Load List                                        | MS Excel                  | Portrays the layouts of the MCCs, including cubicle arrangements, load ratings, circuit breaker sizes and settings, starter sizes and overload ratings. | D                 |                  | Y            | Y          |         |                                                                  |
| 34 | Protection Scheme details                            | 2D                        | Protection logic diagrams.                                                                                                                              | D                 |                  | Y            | Y          |         | Output of the design software could be used to generate document |
| 35 | Protection Settings & Calculations                   | MS Word/ MS Excel         | Protection set points and calculations.                                                                                                                 | D                 |                  |              | Y          |         | Output of the design software could be used to generate document |
| 36 | The containment and Raceway Notes, Symbols & Details | 2D                        | Lists generic notes, drawing symbols, and details for raceway installation. GBU Standard Document shall be used.                                        | D                 |                  | Y            |            |         |                                                                  |
| 37 | The containment & Raceway Plan Sections              | 2D / 3D                   | All scheduled conduits less than 65mm are shown diagrammatically. The conduit From / To locations are                                                   | D                 |                  | Y            |            |         |                                                                  |



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|    |                                                                                  |         |                                                                                 |                   | Required for     |              |            |         |                                                                                                                                                               |
|    |                                                                                  |         |                                                                                 |                   | Procurement      | Construction | Start-Up & | Project |                                                                                                                                                               |
|    |                                                                                  |         | shown. The actual routing of the conduit is performed at the jobsite by crafts. |                   |                  |              |            |         |                                                                                                                                                               |
| 38 | Relay, Transducer, Meter and Transformer Setting Diagram(s) / Relay Coordination | MS Word | Settings for relays including timers.                                           | D                 |                  |              | Y          |         | Output of the design software could be used to generate document                                                                                              |
| 39 | Lightning Protection and Details                                                 | 2D      | Layout drawing showing the area protected by the lightning protection design.   | D                 |                  | Y            |            |         |                                                                                                                                                               |
| 40 | Phasing Diagrams                                                                 | 2D      | Portrays the phase arrangement of the electrical system in 3D line format       | D                 |                  | Y            | Y          |         | This drawing is produced to ensure that the proper line phasing, including phase shifts through transformers, is maintained throughout the electrical system. |
| 41 | Plan and Profile                                                                 | 2D      | Shows plan and profile of transmission lines.                                   | D                 |                  | Y            | Y          |         |                                                                                                                                                               |

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|    |                                                     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   | Required for     |              |            |         |          |
|    |                                                     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   | Procurement      | Construction | Start-Up & | Project |          |
| 42 | Raceways and Containment Details (Plan and Section) | 2D   | Shows installation and material requirements for electrical containment, including bus ducts, cable tray, conduit, and ductbanks/manholes. Provides raceway sizes and arrangements. Cable trays with section numbers are shown dimensionally and drawn to scale. All scheduled conduits are shown diagrammatically. The conduit from/to locations are shown. The actual routing of the conduit is performed at the jobsite by Field Engineering and/or craft workers. | D                 |                  | Y            |            |         |          |