

E&I Works

Scope of Work

FIDIC RED BOOK

SPECIFICATION SECTION

1. E&I WORKS

1.1 General

This section covers the supply, installation, testing, commissioning and handover of all Electrical and Instrumentation works as shown on the Drawings and as specified herein.

1.2 Scope

The E&I Works comprise but are not limited to:

- Electrical Power Distribution
- Lighting and Small Power
- Cable Trays, Conduits and Cables
- Earthing and Lightning Protection
- Instrumentation and Control Systems
- Field Instruments and Control Valves
- Junction Boxes and Termination Panels
- Fire & Gas Detection Systems
- Communication and PA Systems
- Testing, Pre-commissioning and Commissioning

1.3 Standards

All materials and workmanship shall conform to the applicable Codes, Standards and Specifications as specified herein.

SCOPE OF WORK

ELECTRICAL & INSTRUMENTATION WORKS

FIDIC Red Book (2017 Edition) Construction Contract

Contract Title	[PROJECT NAME] — Electrical & Instrumentation Works
Employer	[EMPLOYER NAME]
Engineer	[ENGINEER / ENGINEER'S REPRESENTATIVE NAME]
Contractor	[CONTRACTOR NAME]
Contract Reference	[CONTRACT NO.]
Revision	Rev 0 — For Tender
Date	May 2026
FIDIC Conditions	Conditions of Contract for Construction (Red Book), 2017 Edition

1. PURPOSE AND OVERVIEW

This Scope of Work ("SOW") defines the Contractor's obligations for the design verification, procurement, supply, installation, testing, pre-commissioning and commissioning of all Electrical and Instrumentation ("E&I") works required under the Contract. It shall be read in conjunction with the Conditions of Contract (FIDIC Red Book 2017), the Employer's Requirements, the Contract Drawings, the Technical Specifications, and the Bill of Quantities / Unit Rate Schedules forming part of the Contract.

The Unit Rate Schedules attached to the Contract ("URS") cover the following principal scopes, each of which is addressed in this SOW:

- EA — High Voltage (HV) and Low Voltage (LV) Electrical Cable Works
- IA — Instrumentation Signal, Fibre Optic and Specialist Cable Works
- TA — Telecommunication Cable Works
- Earthing and Bonding
- Cable Tray, Cable Ladder and Conduit Support Systems
- General Equipment, Lighting, Heat Tracing, Labelling and Tagging

2. FIDIC CONTRACT FRAMEWORK

The Contract is executed under the FIDIC Conditions of Contract for Construction (the "Red Book"), 2017 Edition. The following clauses are of particular relevance to this Scope of Work:

FIDIC Clause	Relevance to E&I Works
Clause 1 — Definitions	Defines Works, Contractor's Documents, Engineer, Taking-Over
Clause 4 — Contractor	Contractor's General Obligations, including design responsibility, workmanship and temporary works
Clause 5 — Design	Contractor's Documents, Technical Standards, design review and approval by Engineer
Clause 7 — Plant, Materials & Workmanship	Inspection and testing of plant and materials, rejection of defective items

Clause 9 — Tests on Completion	Testing and commissioning obligations prior to Taking-Over Certificate
Clause 11 — Defects after Taking Over	Defects Notification Period obligations for E&I systems
Clause 12 — Measurement & Evaluation	Measurement of Works using URS unit rates and agreed quantities
Clause 13 — Variations & Adjustments	Valuation of variations using URS rates where applicable

Where this SOW is silent on a matter, the Conditions of Contract and the Technical Specifications shall govern. In case of conflict, the order of precedence set out in Sub-Clause 1.5 [Priority of Documents] shall apply.

3. DETAILED SCOPE OF WORKS

3.1 High Voltage (HV) Cable Works [WBS: 800–802]

The Contractor shall supply and install all High Voltage cables, terminations and cable glands as specified in URS items E01-800 through E01-802, including but not limited to:

3.1.1 HV Cable Supply & Installation (URS 800)

- Single-core 11 kV cables: 400, 500, 630 and 800 mm²
- Single-core 33 kV cables: 185, 400, 500, 630 and 800 mm²
- Three-core multi-core 11 kV cables: 25, 35, 45, 70, 95, 120 and 150 mm²
- All cables shall be supplied on drums, installed on the approved cable support system, and shall include all necessary fixing, clamping, cleating, fire stops, identification markers and cable tags in accordance with the Project Specification.

3.1.2 HV Cable Terminations (URS 801)

- Termination and testing of all HV cables, including supply and installation of proprietary heat-shrink or cold-shrink termination kits for each conductor size and voltage class.
- Works shall include ferrule crimping, insulation system restoration, metallic screen bonding, earthing tail connection and dielectric withstand testing.

3.1.3 HV Cable Glands (URS 802)

- Supply and installation of HV cable glands suitable for the cable outer diameter and the equipment enclosure classification (IP rating and Ex rating where applicable).
- Glands shall incorporate an armour clamp, inner seal, outer seal, and earth continuity facility.

3.2 Low Voltage (LV) Cable Works [WBS: 803–805]

The Contractor shall supply and install all Low Voltage cables, terminations and cable glands as specified in URS items 803 through 805. LV works encompass the following cable families:

3.2.1 LV Cable Categories

- LV Power Cables — Single Core: 1 mm² to 630 mm²
- LV Control Cables — 2, 3, 4, 8, 10, 12 and 20 Core: 1 mm² to 630 mm² (as applicable to core count)
- LV Power & Lighting Cables — 2, 3 and 4 Core: 1.5 mm² to 185 mm²
- LV Power Cables for VSD Motors — 3 Core: 4 mm² to 185 mm² (screened, low-capacitance type)
- LV Fire Resistant Power Cables — 2, 3 and 4 Core: 2 mm² to 16 mm² (BS 6387 or equivalent)

3.2.2 LV Cable Installation Requirements

- All cables shall be installed on the approved cable support system with adequate segregation between HV, LV power and instrumentation cables.

- Cables shall be installed with the minimum bending radii specified by the manufacturer.
- Cables in hazardous areas shall be of the type and rating approved for the applicable Zone classification.
- All cables shall be identified with permanent cable tags at each end, at all tray intersections, and at intervals not exceeding 10 m in concealed runs.

3.2.3 LV Cable Terminations & Glands (URS 804, 805)

- Termination and testing of all LV cables, including supply and installation of lugs, ferrules, heat-shrink sleeves and insulating boots as required.
- Cable glands suitable for the cable outer diameter and equipment enclosure rating, including armour clamp and earth bonding facility.

3.3 Instrumentation Cable Works [WBS: 820–837]

The Contractor shall supply and install all instrumentation cables, terminations and cable glands as specified in URS items IA-820 through IA-837.

3.3.1 Instrument Signal Cables (URS 820, 826, 832)

- Individually screened, overall screened multi-pair signal cables (types A81, A85, A87, A91/A through A97/A) for analogue 4–20 mA, HART and thermocouple signals.
- Cables shall be of the twisted-pair construction with drain wire and shall be rated for the applicable hazardous area zone where installed.

3.3.2 Instrumentation Electrical Cables (URS 821, 827, 833)

- Multi-core electrical cables (types C10, C11, C21, C21A) for solenoid valves, switches and discrete I/O.

3.3.3 Fibre Optic Cables (URS 822, 828, 834)

- Single-mode fibre optic cables: 6, 10, 48 and 96 FO core (10-micron) for field networks and high-speed data links.
- Termination shall include OTDR testing, splice loss records and end-to-end attenuation certificates.

3.3.4 Generator Interface & Gas Detector Cables (URS 823, 829, 835)

- Multi-core, multi-pair cables (types K06, K08, K10, K26) for generator interface and fixed gas detection systems.

3.3.5 Vibration Probe Cables (URS 824, 830, 836)

- Low-capacitance coaxial or multi-pair cables (types K13, K15) for proximity probes, accelerometers and Bently Nevada-type monitoring systems.

3.3.6 Vendor Cables (URS 825, 831, 837)

- Supply and installation of special vendor-furnished cables as identified in Vendor Data Packages. The Contractor shall obtain and review all Vendor Cable Schedules and incorporate them into the overall cable schedule.

3.4 Telecommunications Cable Works [WBS: 850–852]

- Supply and installation of CAT 6 structured cabling (4×2×0.5 mm²) for LAN, telephone, CCTV and intercom systems.
- Supply and installation of Vendor Communication cables as specified.
- Termination and testing shall include continuity testing, wire mapping, insertion loss, return loss and NEXT in accordance with TIA/EIA-568 or equivalent standard.

3.5 Earthing and Bonding [WBS: 860]

- Supply and installation of earthing cables (single core, 6 mm² to 240 mm²) on the cable support system.

- Earthing cable terminations, including recovery, straightening, testing, marking and fitting of crimp lugs.
- Earthing cable glands.
- Supply and installation of crimped earth branch connections (50/50, 70/50, 70/70 and 240/240 mm²).
- All earthing works shall comply with IEC 60364 and the Project Earthing Philosophy.

3.6 Cable Tray, Cable Ladder and Conduit Support Systems [WBS: 870, 880]

3.6.1 Galvanised Cable Tray & Ladder (WBS E02-870)

- Supply and installation of hot-dip galvanised cable tray (75 mm to 900 mm wide), including tees, crosses, 45° and 90° bends, risers, stop ends, reducers, offsets, earth continuity bonding straps, and all associated supports, Unistrut, brackets, fasteners and fixtures.
- Supply and installation of galvanised cable tray and ladder covers as specified.

3.6.2 Stainless Steel Cable Tray & Ladder (WBS E03-870)

- Supply and installation of 316L stainless steel cable tray, ladder, covers, tees, bends and risers (75 mm to 900 mm wide) in areas exposed to corrosive atmospheres or as specified in the Project Specification.
- Supply and installation of cable ladder vertically on equipment, vessels and tanks where specified.

3.6.3 Conduits (WBS E02-880)

- Supply and installation of galvanised rigid conduit (20 mm to 150 mm diameter) with all necessary supports, brackets, bushings, locknuts, reducers, pull boxes and weatherproof fittings.

3.7 General Equipment, Lighting, Heat Tracing and Ancillaries [WBS: 890]

3.7.1 General Equipment Installation

- Installation of mounting plates, supports, stands and brackets for: RCU/Safety Switches, Junction Boxes (Control, Lighting and Power), Socket Outlets (single and three phase), CCTV Cameras and Monitors, UHF/VSAT Antennas, Isolators, Control Stations, Earth Bars and Earth Connection Points, CCTV Cabinets and UHF Cabinets.

3.7.2 Lighting

- Supply and installation of all external and area lighting: handrail-mounted fittings, pole-mounted fittings, support-mounted fittings, floodlights, emergency lighting, and 3-metre and 6-metre light poles, complete with all wiring, conduit, fittings and controls.

3.7.3 Earth Marshalling Bars

- Supply and installation of copper earth marshalling bars: 50×6 mm and 75×6 mm sections.

3.7.4 Heat Tracing System

- Supply and installation of self-regulating heater cable and all associated components: thermostats, thermostat support brackets, end-termination junction boxes, power connection junction boxes, tee splice junction boxes, termination kits, fibre-glass fixing tape and caution labels.
- The Contractor shall identify the specific heat tracing type in accordance with the Project Specification and submit material submittals for Engineer approval prior to procurement.

3.7.5 Labels and Tags

- Supply and installation of all equipment tags, instrument tags, cable tags, caution labels and hazardous area warning labels in accordance with the Project Labelling and Tagging Specification.

4. CONTRACTOR'S OBLIGATIONS

In addition to the general obligations under the Conditions of Contract, the Contractor shall:

1. Prepare and submit a Master Cable Schedule within [28] days of the Commencement Date, listing all cables by reference number, type, origin, destination, route and length.

2. Prepare and submit Installation Method Statements for HV cable pulling, HV termination, fibre optic splicing and heat tracing installation for Engineer review and comment.
3. Prepare and maintain as-built records throughout installation, recording actual cable routes, drum numbers, joint locations and installed lengths.
4. Carry out all inspections and tests in accordance with Section 6 of this SOW and submit test records to the Engineer within [5] working days of completion of each test.
5. Obtain all permits required for HV live working or HV switching operations and comply with the Employer's Permit-to-Work system at all times.
6. Ensure that all E&I personnel working on HV systems hold the relevant certifications/licences required by the applicable national authority.
7. Coordinate with equipment Vendors to obtain and incorporate Vendor Cable Schedules, wiring diagrams and loop drawings prior to commencement of cabling works.
8. Prepare and submit a pre-commissioning and commissioning procedure, including a loop test schedule, for Engineer approval prior to commencement of commissioning.
9. Provide all temporary power, tools, instruments, consumables and labour necessary to complete the Works.
10. Comply with the Employer's HSE requirements and all applicable national electrical safety regulations.

5. ENGINEER'S ROLE AND APPROVALS

The Engineer (as defined under Sub-Clause 3.1) shall fulfil the following functions in respect of the E&I Works:

- Review and comment on Contractor's Documents (Method Statements, Material Submittals, ITP) in accordance with Sub-Clause 5.2.
- Witness or audit inspections and tests as notified by the Contractor per Sub-Clause 7.3.
- Issue Engineer's Instructions for variations in accordance with Sub-Clause 13.3.
- Certify measurements of completed work in accordance with Sub-Clause 12.1.
- Determine Contractor's claims arising from this Scope in accordance with Sub-Clause 20.1.

The Contractor shall give the Engineer not less than [5] working days' notice of any witness-point inspections or tests.

6. INSPECTION, TESTING AND PRE-COMMISSIONING

6.1 Inspection and Test Plan

The Contractor shall prepare and submit an Inspection and Test Plan (ITP) for Engineer review prior to commencement of works. The ITP shall identify all hold points, witness points and review points, and shall reference the applicable test procedure and acceptance criteria for each activity.

6.2 Minimum Testing Requirements

Test Activity	Scope	Applicable Standard
HV Cable Dielectric Test	All HV cables prior to energisation — AC or DC hi-pot at specified voltage	IEC 60502 / IEC 60840
HV Cable Sheath Test	All HV cable sheaths after installation — DC voltage injection	IEC 60229
LV Cable Insulation Resistance	All LV power and control cables using 500 V or 1000 V megger	IEC 60364-6
Loop Impedance / Continuity	All LV power circuits — protective conductor continuity and loop impedance	IEC 60364-6

Fibre Optic OTDR Test	All fibre optic cables — optical time domain reflectometry, splice loss and end-to-end attenuation	IEC 61300-3-35
Instrument Loop Test	All instrument loops — calibration verification and loop check with control system	ISA 5.1 / Project ITP
Earth Resistance Test	All earthing electrode systems — fall-of-potential method	IEC 62305
Conduit & Tray Continuity	Earth continuity of all metallic containment	IEC 60364-5-54
Heat Tracing Test	Continuity, insulation resistance and power output measurement	IEEE 515

6.3 Tests on Completion

Prior to issue of the Taking-Over Certificate in accordance with Sub-Clause 10.1, the Contractor shall complete and demonstrate to the Engineer the following:

- Satisfactory completion of all items in the ITP with no outstanding hold points.
- Energisation of all HV and LV systems, verified against single-line diagrams.
- Functional loop tests for 100% of all instrumentation loops.
- Functional checks of all lighting circuits, emergency lighting and heat tracing systems.
- As-built cable schedules, drum records and test dossier submitted and accepted by the Engineer.

7. EXCLUSIONS FROM SCOPE

The following items are explicitly excluded from the Contractor's Scope of Work under this SOW (unless instructed as a Variation):

- Supply of HV and LV switchgear, transformers, motor control centres and UPS systems (Employer-furnished equipment).
- Supply of control system hardware (DCS/PLC/SCADA) and associated panel wiring (separate Contract).
- Civil works, excavation, cable trenching, duct installation and backfill (Civil Contractor's scope).
- Commissioning of rotating equipment and process systems.
- HV energisation and switching by the Employer's Distribution Network Operator.
- Supply of Vendor-furnished skid-mounted E&I systems (except for field terminations and loop testing).

8. MEASUREMENT AND PAYMENT

Works shall be measured and valued in accordance with Sub-Clause 12.1 and the Unit Rate Schedules (URS) appended to the Contract. The following measurement rules shall apply:

- HV and LV cables (URS 800–805, 803–805): measured in linear metres (m) of cable installed, measured along the cable route including vertical runs. No deduction shall be made for fittings or glands.
- Terminations and glands (URS 801, 802, 804, 805): measured per number (no) of completed terminations and glands, inclusive of all materials, consumables and testing.
- Cable tray and ladder (URS 870): measured in linear metres (m) of tray/ladder installed, measured along the centreline. Tees, bends and risers are measured per number (no) as separate items.
- Conduit (URS 880): measured in linear metres (m) of conduit installed along the route.
- General equipment items (URS 890): measured per number (no) of items installed, complete with all specified accessories.
- Earthing cables (URS 860): measured in linear metres (m) installed; terminations and glands per number (no).

The composite unit rates in the URS are deemed to include the full cost of: supply of all materials (unless Employer-furnished), off-loading, storage, installation, testing, documentation and all other ancillary items necessary to complete the Works in accordance with the Contract.

9. CONTRACTOR'S DOCUMENTS

The Contractor shall prepare and submit the following documents in accordance with Sub-Clause 5.2 and the Document Submission Schedule:

Document	Due (from Commencement)	Review Period (days)
Master Cable Schedule (Preliminary)	Day 28	21
Material Submittal — HV Cables & Accessories	Day 28	21
Material Submittal — LV Cables & Accessories	Day 35	14
Material Submittal — Instrument Cables	Day 35	14
Material Submittal — Cable Tray, Ladder & Conduit	Day 42	14
Installation Method Statement — HV Cable	Day 42	21
Installation Method Statement — Fibre Optic	Day 42	21
Inspection and Test Plan (ITP)	Day 49	21
Pre-commissioning Procedure	As agreed	21
Master Cable Schedule (As-Built)	Prior to Taking-Over	14
Test Dossier (Completed)	Prior to Taking-Over	14

10. APPLICABLE STANDARDS AND REGULATIONS

All E&I Works shall be carried out in accordance with the latest editions of the following standards, unless otherwise specified:

- IEC 60502 — Power cables with extruded insulation (1 kV to 30 kV)
- IEC 60840 — Power cables with extruded insulation (above 30 kV)
- IEC 60364 — Low voltage electrical installations (all parts)
- IEC 61386 — Conduit systems for cable management
- IEC 61537 — Cable management — Cable tray and cable ladder systems
- IEC 62305 — Protection against lightning and earthing
- IEC 60079 — Explosive atmospheres (all applicable parts)
- IEC 61300 — Fibre optic interconnecting devices and passive components
- IEEE 515 — Testing, design, installation and maintenance of electrical resistance heat tracing
- ISA 5.1 — Instrumentation Symbols and Identification
- ANSI/TIA-568 — Balanced twisted-pair cabling
- BS 6387 — Performance requirements for cables required to maintain circuit integrity under fire conditions
- Project-specific Technical Specifications and Employer's Requirements

11. HEALTH, SAFETY AND ENVIRONMENT

The Contractor shall comply in full with Sub-Clause 4.8 [Health and Safety] and the Employer's HSE Plan. Specific requirements for E&I Works include:

- All HV works shall be carried out under a Permit-to-Work issued by the Employer's Authorised Person.

- A Task Risk Assessment (TRA) shall be prepared and approved before commencement of each high-risk activity (cable pulling, HV termination, confined space cable installation, working at height on cable ladders).
- Hazardous area classification drawings shall be reviewed and approved before any tools, equipment or cables are selected for installation in classified zones.
- All electrical test equipment shall be calibrated and have a current calibration certificate.
- Manual handling assessments shall be performed for all cable drum handling operations.

APPENDIX A — UNIT RATE SCHEDULE CROSS-REFERENCE

The table below cross-references the URS Work Breakdown Structure (WBS) codes to the sections of this SOW:

WBS Code	Description	SOW Section
800–802	HV Cable Supply, Termination & Glands	Section 3.1
803–805	LV Cable Supply, Termination & Glands	Section 3.2
820–825	Instrumentation Cable Supply	Section 3.3
826–831	Instrumentation Cable Termination	Section 3.3
832–837	Instrumentation Cable Glands	Section 3.3
850–852	Telecommunications Cables	Section 3.4
860	Earthing Cables	Section 3.5
E02-870	Galvanised Cable Tray & Ladder	Section 3.6
E03-870	Stainless Steel Cable Tray & Ladder	Section 3.6
E02-880	Conduits	Section 3.6
890	General Equipment, Lighting, Heat Tracing, Labels	Section 3.7

— END OF SCOPE OF WORK —