



Erection BOM and Scope Details

PROJECT	STANDYBY SULPHUR RECOVERY UNIT (SRU) AT IOCL PARADIP REFINERY
CUSTOMER	M/s IOCL PARADIP REFINERY, ODISHA, INDIA
CONSULTANT	M/s TECHNIP INDIA LIMITED, CHENNAI

02	19.06.2021	Generally revised as per discussion with projects team.				
01	03.06.2021	Revised based on progress in engineering as on date and to include specific requirements for activities during Plant Shutdown period				
00	20.03.2021	FIRST SUBMISSION				
Rev. No.	Date	Details of Revision				
PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RAMACHANDRAPURAM, HYDERABAD- 502032.	PREPARED Ch Mahesh	CHECKED K Rangamani	APPROVED Saroj Kumar	DATE 20.03.2021	DOC.NO. IOCL/SRU/EBOM	REV.NO. 02



Erection Inputs for BOP Equipment / Packages

Doc. No.: IOCL/SRU/EBOM

Doc Rev: 02

Project: STANDBY SRU PACKAGE, IOCL-PARADIP

Date: 19.06.2021

ERCTION BILL OF MATERIAL: BOP-ELECTRICAL

Definitions:

- i) **Erection Agency:** Contractor
- ii) **Vendor/ Supplier/ Manufacturer:** Supplier of materials/ Equipment/ Systems
- iii) **Customer:** IOCL
- iv) **Consultant:** IOCL consultant (Technip)

I. **Intent:** This document elaborates the details of Balance of Plant items pertaining to Electrical scope, to be erected and commissioned by Erection agency for Standby SRU Project, IOCL-Paradip Refinery.

The document contains following Sections and Annexures:

Section-1: Erection BoM for Electrical activities to be carried out during shutdown period. Section-1 contains following Annexures:

Annexure-1: Consists of items that are to be erected, tested and commissioned by Erection agency. These items are supplied by BHEL.

Annexure-2: Consists of items that are to be **supplied**, erected, tested and commissioned by Erection agency.

Section-2: Erection BoM for Electrical activities to be carried out post-shutdown. Section-2 contains following Annexures:

Annexure-3: Consists of items that are to be erected, tested and commissioned by Erection agency. These items are supplied by, BHEL.

Annexure-4: Consists of items that are to be **supplied**, erected, tested and commissioned by Erection agency.

II. General Notes for Erection and Commissioning Works (applicable for all Annexures):

- 1) Erection Agency shall provide all the required services for installation, erection and commissioning of all the Equipment/ Packages/ Systems in BOP area for successful/ satisfactory operation of the Plant including Receipt, Unloading, Storage & Handling of Material, Erection & Installation, Commissioning, Calibration & Testing, and Final Painting etc.
- 2) Manufacturer/ Supplier supervision is envisaged for following packages:
 - HT Switchgear
 - LT Switchgear
 - UPS System



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- PA System
- Telephone System
- CCTV

- 3) Erection Agency shall arrange all the tools and facilities required for calibration, erection and testing required for Erection & Commissioning activities.
- 4) Obtaining statutory approvals from IBR, PESO, TAC, Electrical Inspector or any other Governing Agencies shall be in Erection Agency's scope.
- 5) All lubricants and other consumables (including initial/ first fills) for the equipment / packages / systems (including lube oil etc.) have to be procured directly by the Erection Agency. All the lubricants and consumables required for Commissioning, Testing for the operation period specified in customer's specification/ contract shall be in Erection Agency's scope.
- 6) Marked-up "As-Built" documents/ drawings have to be prepared and provided by the Erection Agency to PE&SD after Erection & Commissioning to enable submission of contractual "As-Built" documentation.
- 7) Erection Agency shall ensure that Storage and Handling of equipment/ packages is carried out as per the recommendations of OEMs.
- 8) The Erection/Commissioning work shall be carried out in accordance with the specifications/ drawings furnished during detailed engineering.
- 9) Some of the items/ parts of the equipment/packages will be supplied loose to site as per OEM's standard practices. These loose items have to be assembled at site by Erection Agency as per the guidelines provided.
- 10) All the necessary procedures and protocols shall be followed by Erection Agency during Erection & Commissioning, Testing, Handing Over, etc. of equipment as per the procedures finalized with Customer/ Consultant.
- 11) Only general erection guidelines have been indicated in this document. The Erection & Procedures and requirements specified in the Customer's Technical Specifications/ Contract Documents shall be followed by the Erection Agency while executing the project. The responsibility for adhering to Customer's Technical Specifications/ Contractual requirements shall be with Erection Agency.
- 12) Erection agency shall carry out the plant cabling works in line with customer/consultant's Technical specifications and approved "Notes & Details for Plant Cable Laying System".
- 13) Erection agency shall carry out the plant earthing and lightning protection works in line with customer/consultant's Technical specifications and approved "Notes & Details for Plant Earthing & Lightning Protection System".
- 14) Erection agency shall carry out the plant illumination works in line with customer approved "Notes & Details for Illumination System".
- 15) Actual quantities of the items, that are to be supplied by Erection Agency, shall be as per BHEL instructions.



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Section-1

Erection BOM for Electrical Activities to be carried out during Shutdown

This section consists of following two Annexures:

Annexure-1:

Consists of items that are to be erected, tested and commissioned by Erection agency. These items are supplied by BHEL.

Annexure-2:

Consists of items that are to be **supplied**, erected, tested and commissioned by Erection agency.

Annexure-1 (under Section-1)

(Items that are to be erected, tested and commissioned by Erection agency. These items are supplied by BHEL.)

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
1.0	HT SWITCHGEAR MODIFICATION					
1.1.	Modification of 2 Panels in 6.6kV Switchgear	Nos.	2	--	100	<ol style="list-style-type: none">1. No new panels are envisaged. Modification works to be carried out in 2 Panels as per contract.2. These panels are to be interfaced with existing PMS system. Please refer Note-3 below.



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Notes:

1. HT Switchgear vendor scope includes the following:
 - Supervisory services for erection and commissioning.
 - Installation of HT Switchgear components, testing of the panel and necessary internal wiring under the supervision of customer and BHEL.
2. Commissioning of HT Switchgear for successful/ satisfactory operation of the plant is in Erection Agency scope.
3. Interface of the HT panels is envisaged with PMS as per contract. Necessary support shall be provided by Erection Agency for completion of the job.
4. Required testing equipment shall be supplied/ arranged by Erection Agency during testing and commissioning.

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
2.0	LT SWITCHGEAR					
2.1	LT Switchgear Extension					
2.1.1	Extension Panels in 331S-PMCC-406	Nos.	7	850 x 1000 x 2450 mm	400	7 Panels includes 1 Dummy Panel.
	Extension Panels in 331S-MCC-403	Nos.	1	850 x 1000 x 2450 mm	400	
	Extension Panels in 331S-MCC-401	Nos.	2	850 x 1000 x 2450 mm	400	
	Extension Panels in 331S-MLDB-3	Nos.	1	750 x 500 x 2450 mm	350	
	Extension Panels in 331S-ACDB-1	Nos.	1	750 x 500 x 2450 mm	350	
2.1.2	Extension Panels in 811-INST-UPS-002	Nos.	1	--	--	6 Feeders need to be added.
2.2	LT Switchgear/ UPS DB Modification					
2.2.1	Non DCS Field 110V UPS SUBDB(Wall Mounted) :1000 x 500 x 1000 mm	Nos.	2	--	--	Vacant Module needs to be modified to required rating feeder.
2.2.2	240V UPS PDB(Wall Mounted) for CCTV : 1000 x 500 x 1000 mm	Nos.	1			For CCTV
2.2.3	240V Non UPS DB/PDB (Wall Mounted) : 800 x 500 x 1000 mm	Nos.	2			
2.2.4	Addition of 63A/100A feeder in existing UPS	Nos.	6			
2.2.5	STP Serial Communication Cables within Conduits (Refer Note-3 below)	m	1100	--	80	1. Cable weight indicated in kg/km



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2. Quantity of this item is covered in section 1, D10 of price bid format

Notes:

1. LT Switchgear vendor scope is limited to following activities:
 - Modification of modules, installation of components and necessary internal wiring.
 - Supervisory services for installation, erection, testing and commissioning.
2. Installation and alignment of new panels, joining of new panels with existing panels, inter panel wiring and connections, erection, testing and commissioning of LT switchgear for successful/satisfactory operation of the plant is in Erection Agency scope.
3. Laying of STP serial communication cables in conduits between above Extension panels and existing Data Concentrator is in Erection Agency scope. However, services of OEM of Intelligent Motor Controllers (IMCs) are considered for hooking up of IMCs in new feeders in above Extension Panels with existing Data Concentrator, termination of communication cables, testing, commissioning, modification (if required) and necessary configuration of Existing Data Concentrator System.
4. Required testing equipment shall be supplied/ arranged by Erection Agency during testing and commissioning.

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
4.0	LT POWER CABLES					
4.1	2C x 95 Cu XLPE	Meter	1200	--	2475	Cable weight indicated in kg/km
4.2	1C x 120 Cu XLPE UNARM	Meter	500	--	1400	Cable weight indicated in kg/km
4.3	1C x 35 Cu XLPE UNARM	Meter	250	--	525	Cable weight indicated in kg/km
4.4	1C x 10 Cu XLPE UNARM	Meter	250	--	245	Cable weight indicated in kg/km
4.5	3.5C x 70 Cu XLPE	Meter	300	--	3110	Cable weight indicated in kg/km

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
6.0	PRE-FABRICATED CABLE TRAYS AND ACCESSORIES (GI)					
6.1	Ladder type cable tray, W=600mm	Sets	50	3.0 x 0.6 x 0.1	45	Each cable tray length 3 meter



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						including coupler plate and nut bolts.
6.3	300mm(W) Perforated type cable tray	Sets	100	2.5 x 0.3 x 0.075	30	Each cable tray length 2.5 meter including coupler plate and nut bolts
6.4	150mm (W) Perforated type cable tray	Sets	200	2.5 x 0.15 x 0.05	20	Each cable tray length 2.5 meter including coupler plate and nut bolts

Notes:

1. Above cable trays are envisaged within SS-331S & SRR-811 only.

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
7.0 PLANT EARTHING AND PLANT LIGHTNING PROTECTION MATERIALS						
7.3	50 x 6 mm GI Strip	Meter	150	--	2 kg/m	For HT & LT Panel Earthing
7.7	Copper Pipe Electrodes (65mm dia 3 m length)	Nos.	4	--	--	For electronics equipment earthing. Earthing with treated pits. Material (charcoal & salt etc.) required for treated earth shall be supplied by erection agency.
7.8	Copper Pipe Electrodes (65mm dia 6 m length)	Nos.	4	--	--	
Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
14.0 UPS SYSTEM ALONG WITH UPSDB FOR FDA SYSTEM						
14.1	UPS System along with UPS DB/ UPS Battery Isolation Boxes	Set/ Nos	1/2	3000 x 750 x 2110 mm, 500 x 500 x 650 mm	200/ 60	
14.2	UPS Battery Bank	Set	1	4500 x 750 x 1750 mm	500	

Notes:

1. Erection agency has to arrange Discharge Resistor bank, if applicable, to carry out discharge test on Battery banks.



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Annexure-2 (Under Section-1)

Items that are to be supplied erected, tested and commissioned by Erection agency.

Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
1.0	CABLE GLANDS PACKAGE					
1.1	30.5-33 Gland	No.	20	NA	0.15	<p>1. Glands shall be single compression nickel-plated brass type.</p> <p>2. In price bid format, supply of these items is considered as a part of cabling work.</p>
Sl. No.	Equipment/ Package Description	Unit of Qty.	Qty.	Dimension (Each) L x B x H (M)	Weight (Each) (kg)	Remarks
2.0	CABLE LUGS PACKAGE					In price bid format, supply of these items is considered as a part of cabling work.
2.1	95 SQ. MM Tinned Copper Lug	No.	40	--	0.15	
2.2	70 SQ. MM Tinned Copper Lug	No.	18	--	0.15	
2.3	35 SQ. MM Tinned Copper Lug	No.	10	--	0.15	
2.4	120 SQ. MM Tinned Copper Lug	No.	4	--	0.2	
2.5	10 SQ. MM Tinned Copper Lug	No.	10	--	0.15	



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Section-2

Erection BOM for Electrical Activities to be carried out Post-Shutdown

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Annexure-3:

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Annexure-4:

Consists of items that are to be **supplied**, erected, tested and commissioned by Erection agency.

Annexure-3 (Under Section-2)

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty	Qty.	Dimension (each) L x B x H (M)	Weight (each) kg	Remarks
3.0	6.6kV HT XLPE ALUMINIUM CONDUCTOR ARMOURED CABLES					
3.1	6.6kV (UE) 3C x 240 Al	Meter	1,600	--	6600	Cable weight indicated in kg/km
4.0	LT POWER CABLES					
4.4	1C x 10 Cu XLPE UNARM	Meter	1,500	--	245	Cable weight indicated in kg/km
4.3	1C x 35 Cu XLPE UNARM	Meter	1,500	--	525	Cable weight indicated in kg/km
4.2	1C x 120 Cu XLPE UNARM	Meter	750	--	1400	Cable weight indicated in kg/km
4.7	3.5C x 50 Al XLPE	Meter	3,000	--	1240	Cable weight indicated in kg/km
4.8	3.5C x 95 Al XLPE	Meter	12,500	--	1900	Cable weight indicated in kg/km
4.9	3.5C x 120 Al XLPE	Meter	3,000	--	2400	Cable weight indicated in kg/km



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4.10	3C x 2.5 Cu XLPE	Meter	20,000	--	460	Cable weight indicated in kg/km
4.11	3C x 4 Cu XLPE	Meter	4,000	--	530	Cable weight indicated in kg/km
4.12	3C x 6 Cu XLPE	Meter	4,000	--	680	Cable weight indicated in kg/km
4.13	3C x 10 Cu XLPE	Meter	2,000	--	865	Cable weight indicated in kg/km
4.14	3C x 16 Cu XLPE	Meter	5,500	--	1040	Cable weight indicated in kg/km
4.15	3C x 35 Al XLPE	Meter	2,000	--	900	Cable weight indicated in kg/km
4.16	3C x 50 Al XLPE	Meter	6500	--	1100	Cable weight indicated in kg/km
4.17	3C x 70 Al XLPE	Meter	7,000	--	1425	Cable weight indicated in kg/km
4.18	3C x 95 Al XLPE	Meter	2,000	--	1750	Cable weight indicated in kg/km
4.19	4C x 50 Cu XLPE	Meter	500	--	2510	Cable weight indicated in kg/km
4.20	4C x 25 Al XLPE	Meter	3,200	--	940	Cable weight indicated in kg/km
4.21	4C x 35 Al XLPE	Meter	3,500	--	1050	Cable weight indicated in kg/km
4.22	4C x 95 Al XLPE	Meter	2,000	--	2100	Cable weight indicated in kg/km
4.23	4C x 120 Al XLPE	Meter	1,800	--	2600	Cable weight indicated in kg/km
4.24	4C x 150 Al XLPE	Meter	1,800	--	3000	Cable weight indicated in kg/km
4.25	4C x 185 Al XLPE	Meter	6,000	--	3650	Cable weight indicated in kg/km
5.0	HT CABLE TERMINATING KITS					
5.1	6.6kV (UE) 3C x 240 Terminating Kit	No.	4	--	1	
*	CABLE GLANDS PACKAGE					
1	13-18 Gland	No.	600	--	400 (Total)	* In price bid format, E&C of these items is considered as a part of cabling work.
2	18.5-20 Gland	No.	150	--		
3	20.5-23 Gland	No.	100	--		
4	23.5-26 Gland	No.	50	--		
5	26.5-30 Gland	No.	175	--		
6	30.5-33 Gland	No.	75	--		
7	33.5-37 Gland	No.	75	--		



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	37.5-41 Gland	No.	50	--		
**	CABLE LUGS PACKAGE (Tinned Copper)					
1	2.5 sq.mm Tinned Copper Lug	No.	20000	--	300 (Total)	<p>1. Lugs for power cables shall be of compression type whereas lugs for control/signal cables shall be of crimping type. Individual termination up to wire level shall be considered.</p> <p>** In price bid format, E&C of these items is considered as a part of cabling work.</p>
2	4 sq.mm Tinned Copper Lug	No.	500	--		
3	6 sq.mm Tinned Copper Lug	No.	700	--		
4	10 sq.mm Tinned Copper Lug	No.	800	--		
5	16 sq.mm Tinned Copper Lug	No.	600	--		
6	25 sq.mm Tinned Copper Lug	No.	1200	--		
7	35 sq.mm Tinned Copper Lug	No.	500	--		
8	50 sq.mm Tinned Copper Lug	No.	250	--		
9	70 sq.mm Tinned Copper Lug	No.	100	--		
10	95 sq.mm Tinned Copper Lug	No.	80	--		
11	120 sq.mm Tinned Copper Lug	No.	150	--		
12	150 sq.mm Tinned Copper Lug	No.	50	--		
13	180 sq.mm Tinned Copper Lug	No.	50	--		
14	240 sq.mm Tinned Copper Lug	No.	60	--		
Price bid ref. Sl. No.	CONTROL CABLE (TWISTED PAIR OVERALL SHIELDED CABLE)					
D 2, Section 1	8P x 2.5 sq.mm cable	Meter	14000	--	1600	Cable weight indicated in kg/km
D 2, Section 1	6P x 2.5 sq.mm cable	Meter	2000	--	1400	Cable weight indicated in kg/km



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1. For Aluminium cable, Aluminium Lug shall be used. For Copper cable, Tinned copper lug shall be used. When Aluminium lug is connected to copper bus or when Copper cable lug is connected to Aluminium bus, Bimetallic strip shall be used between lug and bus. Bimetallic strips are supplied along with the above lugs.
2. The glanding, termination and connection of cables shall be done strictly in accordance with the manufacturer's instruction, drawings and/or as directed by the Purchaser.
3. The work shall include all clamping, fitting, fixing, soldering, tapping, compound filling, cable jointing, crimping, shorting and grounding as required for the complete job.
4. Control cable cores entering control panel/switchgear/MCC etc. shall be neatly bunched and served with PVC perforated tape to keep it in position at the terminal block.
5. The contractor shall put ferrules on all control cable cores in all junction boxes and at all terminations. The ferruling shall be Cross-Ferruling. The ferrules shall carry terminal numbers as per drawings. All ferrules shall be coloured, plastic & interlocked type.
6. Spare cores shall also be similarly ferruled, crimped with lug and taped on the ends. Spare cores shall be ferruled with individual cable number.
7. Termination & Connection shall be carried out in such a manner as to avoid strain on the terminals. Cables shall be marked with cable numbers as per applicable drawing.
8. All cable entry points shall be properly sealed and made vermin and dustproof. Unused opening, if any, shall be effectively closed. Sealing work shall be carried out with approved sealing compound.

Price bid ref. Sl. No.	PRE FABRICATED CABLE TRAYS AND ACCESSORIES (GI & FRP) AND CABLE DUCTS (GI & FRP)					
	Cable Trays material mentioned at Sl. No 7.1 to 7.12 are of GI type and cable trays materials mentioned at Sl. No 7.13 to 7.18 are of FRP cable tray and Cable ducts mentioned against Sl. No. 7.19 to 7.20 are GI type Epoxy coated and Cable ducts mentioned against Sl. No. 7.21 to 7.26 are FRP cable Ducts.					
6.1	Ladder type cable tray, W=600mm.	Sets	80	3.0 x 0.6 x 0.1	45	Each cable tray length 3 Mtr including coupler plate and Nut bolts.
	Horizontal Bends of 900mm bending radius for ladder type cable tray, W=600mm	Sets	8	--	35	Part of Cable Tray works
	Vertical UPs of 900mm bending radius for ladder type cable tray, W=600mm	Sets	8	--	25	Part of Cable Tray works



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	Vertical downs of 900mm bending radius for ladder type cable tray, W=600mm	Sets	8	--	25	
6.2	Ladder type cable tray, W=300mm.	Sets	100	3.0 x 0.3 x 0.1	40	Each cable tray length 3 Mtr including coupler plate and Nut &bolts.
	Cover along with accessories for 300mm width ladder type cable tray	Sets	50	3.0 x 0.3 x 0.05	20	1. Each cable tray cover length 3 Mtr including clamp strips and Nut & bolts 2. Part of Cable Tray works
6.3	300mm(W) Perforated type cable tray	Sets	450	2.5 x 0.3 x 0.075	30	Each cable tray length 2.5 Mtr including coupler plate and Nut& bolts
	Cover for Perforated type Cable Tray, W=300mm	Sets	150	2.5 x 0.3 x 0.05	25	1. Each cable tray cover length 2.5 Mtr including clamp strips and Nut & bolts 2. Part of Cable Tray works
6.4	150mm (W) Perforated type cable tray.	Sets	300	2.5 x 0.15 x 0.05	20	Each cable tray length 2.5 Mtr including coupler plate and Nut &bolts
6.5	50mm(W) Perforated type cable tray	Sets	400	2.5 x 0.05 x 0.03	20	Each cable tray length 2.5 Mtr including coupler plate and Nut &bolts
	Cover for Perforated type Cable Tray, W=150mm	Sets	200	2.5 x 0.15 x 0.05	15	1. Each cable tray cover length 2.5 Mtr including clamp strips and Nut & bolts 2. Part of Cable Tray works
	Cover for Perforated type Cable Tray, W=50mm	Sets	300	2.5 x 0.05 x 0.03	7.5	1. Each cable tray cover length 2.5 Mtr including clamp strips and Nut & bolts 2. Part of Cable Tray works
6.6	300mm(W) Perforated FRP Cable	Sets	400	3 x 0.3 x 0.075	100	Each cable tray length 3 Mtr



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	Tray & Cps					including coupler plate and Nut &bolts.
6.7	150mm(W) Perforated FRP Cable Tray & Cps	Sets	600	3 x 0.15 x 0.05	40	Each cable tray length 3 Mtr including coupler plate and Nut &bolts.
6.8	50mm(W) Perforated FRP Cable Tray & Cps	Sets	400	3 x 0.05 x 0.04	30	Each cable tray length 3 Mtr including coupler plate and Nut &bolts.
6.9	Cover For 300mm(W) Perforated FRP C.T	Sets	500	--	50	Each cable tray cover length 3 Mtr including clamp strips and Nut&bolts
6.10	Cover For 150mm(W) Perforated FRP C.T	Sets	600	--	15	Each cable tray cover length 3 Mtr including clamp strips and Nut&bolts
6.11	Cover For 50mm(W) Perforated FRP C.T	Sets	500	--	15	Each cable tray cover length 3 Mtr including clamp strips and Nut&bolts
6.12	1000 MM WIDTH, 400 MM Height & 5 mm Thick,2500mm length GI Cable duct with cover , Jointing plates and other accessories	Sets	230	2.5 x 1.0 x 0.4	50	Cable ducts are bolted type and to be assembled at site.
6.13	800 MM WIDTH, 300 MM Height & 5 mm Thick,2500mm length GI Cable duct with cover , Jointing plates and other accessories	Sets	280	2.5 x 0.8 x 0.4	40	Cable ducts are bolted type and to be assembled at site.
6.14	400 MM WIDTH, 200 MM Height & 5 mm Thick,2500mm length FRP Cable duct with cover , Jointing plates and other accessories	Sets	1100	2.5 x 0.4 x 0.2	30	Cable ducts are bolted type and to be assembled at site.
6.15	800 MM WIDTH, 200 MM Height & 5 mm Thick,2500mm length FRP Cable duct with cover , Jointing plates	Sets	110	2.5 x 0.8 x 0.3	100	Cable ducts are bolted type and to be assembled at site.



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	and other accessories					
6.16	1000 MM WIDTH, 200 MM Height & 5 mm Thick, 2500mm length FRP Cable duct with cover , Jointing plates and other accessories	Sets	210	2.5 x 0.1 x 0.2	80	Cable ducts are bolted type and to be assembled at site.
	1000MM width Horizontal Duct Elbow	Sets	10	--	30	1. Cable ducts are bolted type and to be assembled at site. 2. Part of cable tray
	800MM width Horizontal Duct Elbow	Sets	20	--	30	1. Cable ducts are bolted type and to be assembled at site. 2. Part of cable tray
	400MM width Horizontal Duct Elbow	Sets	25	--	20	1. Cable ducts are bolted type and to be assembled at site. 2. Part of cable tray

Notes for Cable Trays:

- i) Erection agency shall consider supply of Red Oxide Zinc Chromate Primer for site painting of all Structural Steels (required for cable Tray Supports) in the Erection contractor's scope. Final painting shall be done with two coats of approved bituminous aluminium paint & same to be considered in erection contractor scope.
- ii) Cable Trays shall be numbered as per layout drawing before laying of cables. Cabling Shall be done as per Cable Laying Notes & Details.
- iii) All cables shall be provided with minimum of 2 mm thick, 20mm wide and of enough length Stain less steel as cable identification tags indicating cable designation in accordance with the cable schedule. The cable tags shall be provided at the ends, every 30mtrs and when the cable changes its direction/elevation. The tags shall be of stainless steel with the number punched on it and securely attached to the cable by not less than two turns of 16 SWG GI wire.
- iv) The cable trays shall be supported in general at a span of 1.5mtrs horizontally and at a distance of 1mtr vertically.
- v) Cable Tray covers shall be provided for the top most & bottom most cable trays and outermost trays of vertical droppers in outdoor area.
- vi) For buried cable, the marker shall project at least 150mm above ground and shall be spaced at an interval of 30 mtrs and at every change of direction.
- vii) All the cables shall be clamped to the cable trays/support structure with the help of clamps. All power cables shall be clamped individually and control cables shall be clamped in groups of 3 or 4 cables. Clamps for multicore cables shall be fabricated out of 25x3 mm aluminium/G.I flats. Single core power cables shall be laid in trefoil formation and suitably clamped with 25mm wide 8 SWG aluminium strips.
- ix) All Sharp edges and Burr shall be removed.
- x) Cables to be strapped to tray at interval not greater than 300mm.



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xi) Cable ducts supplied for the project are of G.I & FRP type. Cable ducts shall be laid on the main pipe rack hard chrome plated nuts and bolts. Accessories such as nuts and bolts for cable ducts is contractor/vendor scope only.

xii) Fire proof shall be done on cable ducts and FRP cable trays using flexible ceramic fibre blanket system (in compliance to OISD STD 164).

7.0 PLANT EARTHING AND PLANT LIGHTNING PROTECTION MATERIALS						
7.1	50x10mm GI Strip Below ground	m	100	--	--	For risers
7.2	75 x 10 mm GI Strip Below ground	m	100	--	--	For risers
7.3	50 x 6 mm GI Strip	m	1500	--	2 kg/m	For earthing of LVSegr/MCC/ Motor above 90kW including HT Motors/MLDB/Lighting trafo/ Flood Light masts/T.G. pedestal/Masts/Stack/MV cable Boxes/Pipe & cable racks
7.4	35 x 6mm GI Strips	m	800	--	2 kg/m	For earthing of Lighting DB/Structure,Columns/Storage Tanks/Stair Case/loading racks/Heat Exchangers/Vessels
7.5	25 x 3mm GI Strips	m	500	--	0.2 kg/m	Down and roof conductors Lighting fixtures/Single phase Receptacles/ Power & Lighting conduits
7.6	8SWG GI wire ,solid	m	3000	--	1 kg/m	For earthing of Motors up to 3.7KW, All push button stations, small equipments and instrument, Hand Rails/ Junction Boxes/Limit Switches
	5/8" Dia GI Wire rope	m	150	--	--	1. For earthing of Three Phase Receptacles, Welding Outlets ,Lighting Transformer Neutral , Lighting Transformer, MLDB 2. Part of equipment earthing
	3/8" Dia GI Wire rope	m	150	--	--	1. For earthing of Motors from



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							5.5KW to 30KW & Welding Receptacles, Lighting, Power & Instrument Panels/street lighting poles , Lighting Fixtures, Single Phase Receptacles, Power & Lighting Conduits. 2. Part of equipment earthing
7.7	Copper Pipe Electrodes (65mm dia 3 m length)	Nos.	10	--	--	--	For electronics equipment Earthing with treated pits. Material (charcoal & salt etc.) required for treated earth shall be supplied by erection agency
7.8	65MM NB 6 m length GI Pipe electrode Medium Class-B	Nos.	20	--	--	--	For Treated earth pits for Machine Neutral Earthing & Untreated earth Pits for Machine Body Earthing. Material (charcoal & salt etc.) required for treated earth shall be supplied by erection agency
7.9	Vertical Air Termination Rod for lightning protection.	Nos.	5	1.2 x 0.3	25		Above ground installation
	Notes: Erection agency/Site shall carry out the plant earthing & lightning protection works in line with customer/consultant's technical specifications i.e. "Notes and Details for Plant Earthing & Lightning Protection System".						
8.0	PLANT ILLUMINATION PACKAGE						
8.1	Twin cluster LED obstruction light	Nos	15	--	1		
8.2	Industrial DC LED Well Glass fixture (35-45W approx) suitable for DC Supply	Nos	25	--	3.5		
8.3	Flame proof DC LED Well Glass fixture (35-45W approx) suitable for DC Supply	Nos	50	--	4		



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8.4	LED Well Glass fixture (45W Approx, 230VAC)	Nos	200	--	3.5	
8.5	Flame proof LED Well Glass fixture (45W Approx, 230VAC)	Nos	500	--	4	
8.6	LED Flood lighting Fixture (100W approx)	Nos	2	--	4	
8.7	Flameproof LED Flood lighting Fixture (100W approx)	Nos	4	--	7.5	
8.8	LED Flood lighting Fixture (200W approx)	Nos	2	--	10	
8.8	LED Flame proof Flood lighting Fixture (200W approx)	Nos	10	--	12	
8.9	11meter Steel tubular pole	Nos	4	--	180	
8.10	2 meter 50NB GI pole for Platform lighting	Nos	575	--	12	
	Cable clamps	Nos	50000	--	.05	Part of Illumination cabling
8.11	4 way 200x150x100mm rectangular sheet steel weather proof JB (IP55)	Nos	220	--	2	
8.12	Flame proof Cast light alloy JB (200x150x100mm)	Nos	560	--	3	
8.13	Industrial metal clad type 1Ph, 20A Socket with 20A interlocked rotary switch & Plug	Nos	15	--	1.5	
8.14	Flameproof 1ph, 20A Socket with interlocked rotary switch & Plug	Nos	35	--	3	
8.15	Industrial metal clad type 3Ph, 63A (5pin) receptacle with interlocked rotary switch & Plug, weather proof (IP55) outdoor type	Nos	5	--	3	
8.16	Flameproof 3ph, 63A (5pin) Receptacle (Indoor type) with	Nos	15	--	5	



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	interlocked rotary switch & Plug						
8.17	Flameproof 3-Pph, 250A (5-pin) Receptacle (Outdoor type) with interlocked rotary switch & Plug	Nos	1	--		7	
8.18	Weatherproof 3-Ph, 250A (5-pin) Receptacle (Outdoor type) with interlocked rotary switch & Plug	Nos	1	--		2	
8.19	24V socket module with FLP Hand lamp	Nos	4	--		10	
8.20	18 way AC Outdoor Lighting Panel	Nos	2	1000 x 200 x 1000 mm	110		
8.21	12 way AC Outdoor Lighting Panel	Nos	2	1000 x 200 x 1000 mm	100		
8.22	6 way DC Outdoor Lighting Panel	Nos	2	1000 x 200 x 1000 mm	80		
8.23	FLP 12 way AC Lighting/Power Panel	Nos	10	800 x 200 x 800 mm	90		
8.24	Flameproof 6 way DC Lighting Panel	Nos	3	700 x 200 x 700 mm	60		
8.25	415V AC Wall Mounted DB	Nos	1	650 x 200 x 750 mm	50		
8.26	230V AC UPS Wall Mounted DB	Nos	2	500 x 200 x 500 mm	50		
8.27	110V AC UPS Wall Mounted DB	Nos	1	500 x 200 x 500 mm	50		



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Notes:

- 1) Fixtures, Accessories of lighting panel/JB like cable glands, gland plate etc. will be supplied to site in loose parts as per standard packing and practice of OEM. Assembly and erection of the fixtures shall be carried out by Erection Agency.
- 2) In case of non-integral fixtures, control gear box shall be separately mounted (which also acts as JB for looping in and looping out). However, in case the fixtures are of integral type, separate JB shall be considered for loop in and loop out.
- 3) Erection of all illumination items (including cutting/ threading/welding etc. of conduit/pipe/ISMC/ISA/Metsec etc.) shall be carried out at site by Erection Agency as per the installation requirements.
- 4) All the required erection consumables (like rawl plugs, screws, check nuts, nuts & bolts, locking wire, insulation tape, sealing compound/plugs, washers etc.) which are not covered in above list but required for successful completion of the work shall be in the scope of Erection Agency.
- 5) Pipes & accessories of poles will be supplied in loose condition. Assembling and Erection of these poles shall be carried out by Erection Agency.
- 6) All the necessary civil works including foundations etc. as well as structural works required for installation of these poles shall be in Erection Agency's scope.
- 7) Erection agency to ensure the completion of foundations for lighting poles before commencement of paving work in related areas.

9.0 CCTV SYSTEM

9.1	CCTV Cameras (Weatherproof)	Nos.	3	--	5	Network Switches, Media Converters, LIUs, Adaptors, along with Patch Cords etc. are part of CCTV Cabinet. Refer Notes below for further details reg. CCTV System.
9.2	CCTV Cameras (Ex-Proof)	Nos.	6	--	7	
9.3	CCTV Rack/Cabinet	Nos.	1	0.6 x 0.6 x 1.5	200	
9.4	Network Switches	Nos.	1	--	Part of CCTV Cabinet	
9.5	Media Converters, LIUs, Adaptors, along with Patch Cords etc.	Lot	1	--		
9.6	Junction Boxes (Weatherproof)	Nos.	3	--	50	
9.7	Junction Boxes (Ex-proof)	Nos.	6	--	100	
D 9, Sec 1	FO Cable and HDPE Duct	m	6000	--		
4.10	Power Cable (3C X 2.5 sq.mm)	m	1000	--		
D 10, Sec 1	Cat-6 Cable	m	100	--		
9.8	Poles	Nos.	3	--	150	



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Erection Agency may note the following:

1. Existing CCTV system is in SS-331-S to which new field telecom equipment like CCTV cameras associated with new SRU & TGTU-2 shall be interfaced. Additional hardware if any required in existing system shall be provided to interface and integrate new CCTV System equipment of new SRU & TGTU-2 with existing one. All required hardware and software modification/ upgradation in existing CCTV system at **SS-331S & Main Control Room** for interfacing and integration of new cameras inside the battery limit shall be done by CCTV System Vendor of SRU & TGTU-2 package. Required support shall be extended to CCTV Vendor by Erection Agency to complete the system in all respects.
2. Supply of Cables mentioned above is by BHEL/ CCTV System vendor. Laying, glanding, ferruling, identification, termination/ splicing of all type of cables required between CCTV cabinet and existing CCTV network, CCTV Cabinet and PDB and for integration of CCTV cameras inside the battery limit with existing CCTV system are in the scope of Erection Agency.
3. Supply of mounting poles shall be done by BHEL/ CCTV System vendor. Erection and installation of mounting poles including civil works and provision of permanent water connection near the cameras and hook up with CCTV cameras for cameras inside the battery limit is by Erection Agency.
4. Engage OEM of CCTV system at site, liaison with existing CCTV System OEM, perform adequacy check and augmentation of CCTV system, modification/ upgradation of hardware & software of existing CCTV system, interface and integration, testing and commissioning of augmented CCTV system with CCTV cameras inside the battery limit shall be in CCTV System Vendor of SRU & TGTU-2 package. Testing & Commissioning of CCTV System by CCTV System vendor.

10.0 PLANT COMMUNICATION SYSTEM (PA SYSTEM & TELEPHONE)						
10.1	PA SYSTEM					
10.1.1	Modification of Existing PA System Cabinet for connection New Field Call Stations (UK0 Adapters, Power Supply Modules etc.)	Lot	1	--	--	Refer Notes below for further details regarding PA System.
10.1.2	Flame proof Field call station with flameproof loudspeakers 25W (Ex FCS + FLP loudspeaker)	Nos.	15	0.6 x 0.5 x 0.5	50	
10.1.3	Flashing Beacon lamps (Ex- proof type)	Nos.	8	--	2	
10.1.4	Acoustic hood	Nos.	15			
10.1.5	PA System Junction boxes, Flame	Nos.	2	0.4 x 0.37 x 0.165	20	



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proof type						
Erection material like cable glands(weatherproof & Ex-proof), lugs, ferrules, etc. for indoor & outdoor installation of PA System (for Complete system as offered as well as free issued items)	Lot	1	--	100		
10.1.6 50 pair x 0.9 mm Dia, Twisted Pair, Overall Screen, Armoured Communication cable (Non-Jelly filled)	m	1500	--	15 kg/m		
10.1.7 5 pair x 0.9 mm Dia, Twisted Pair, Overall Screen, Armoured Communication cable (Non-Jelly filled)	m	2000	--	10 kg/m		
10.1.8 2 pair x 1.5 sq.mm Dia, Armoured Communication cable (Non-Jelly filled)	150	meters	--	5 kg/m		

Erection Agency may note the following:

1. Existing PA System is located in SS-331-S to which new field telecom equipment like FCS, Beacons associated to new SRU & TGTU-2 shall be interfaced. Additional hardware if any required in existing system shall be provided to interface & integrate new PA System equipment of new SRU & TGTU-2 with existing one. The new FCS along with required hardware is to be connected with existing PA/GA system and augmentation/modification/up gradation in the existing PA/GA system is in the scope of PA System vendor of SRU & TGTU-2.
2. Supply of Cables mentioned above is by PA System vendor. Laying, glanding, ferruling, identification, termination/ splicing of all type of cables required between new FCS at field and PA System cabinet is in the scope of Erection Agency.
3. Engage OEM of PA system at site, liaison with existing PA System OEM, perform adequacy check and augmentation of PA system, modification/ upgradation of hardware & software of existing PA system, interface and integration, testing and commissioning of augmented PA system with new FCS inside the battery limit shall be in the scope of PA System vendor of SRU & TGTU-2.
4. Testing & Commissioning of PA System is in the scope of PA System vendor of SRU & TGTU-2.

10.2

TELEPHONE SYSTEM



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10.2.1	Modification of Existing Telephone System Exchange (24 Analog media module, Line Cards etc.)	Lot	1	--	--	• 24 Analog media module, Line Cards etc. • Refer Notes below for further details
10.2.2	Ex-proof Telephone Equipment	Nos.	3	--	50	
10.2.3	Weather proof Telephone, Wall mounting	Nos.	3		3	
10.2.4	Flashing Beacon lamps (Ex- proof type)	Nos.	2	--	2	
10.2.5	Acoustic Hood/Canopy (FRP) suitable for Weather proof & Ex-proof Telephones mounted in outdoor environment	Nos.	4	--	10	
10.2.6	Telephone System Junction boxes, Wp-proof type	Nos.	2	0.4 x 0.37 x 0.165	5	
	Erection material like cable glands(weatherproof & Ex-proof), lugs, ferrules, etc. for indoor & outdoor installation of PA System (for Complete system as offered as well as free issued items)	Lot	1	--	100	
10.2.7	10 pair x 0.9 mm Dia, Twisted Pair, Overall Screen, Armoured Communication cable (Jelly filled)	m	1500	--	15 kg/m	
10.2.8	2 pair x 0.9 mm Dia, Twisted Pair, Overall Screen, Armoured Communication cable (Jelly filled)	m	500	--	10 kg/m	
10.2.9	Main distribution for connection of Telephone sets to Main Telephone System Exchange	1			25	



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Erection Agency may note the following:

1. The new Telephone equipment along with required hardware is to be connected with existing Telephone system and augmentation/ modification/ upgradation in the existing Telephone system is in the scope of Telephone system vendor of SRU & TGTU-2.
2. Required software and hardware modification/ upgradation in existing AVAYA telephone system/ network in SS-331-S for addition of new telephones shall be done by Telephone System vendor. All necessary power distribution (including UPS power) for new Telephones & associated additional hardware shall be in scope of Telephone system vendor of SRU & TGTU-2.
3. Supply of Cables mentioned above is by PE&SD/ Telephone System vendor. Laying, glanding, ferruling, identification, termination/ splicing of all type of cables required between new Telephones and Telephone System cabinet is in the scope of Erection Agency.
4. Engage OEM of Telephone system at site, liaison with existing telephone system OEM, perform adequacy check and augmentation of Telephone system, modification/ upgradation of hardware & software of existing telephone system, interface and integration, testing and commissioning of augmented telephone system with new telephones inside the battery limit shall be in the scope of Telephone system vendor of SRU & TGTU-2.
5. Testing & Commissioning of Telephone System is in the scope of Telephone system vendor of SRU & TGTU-2.

STRUCTURAL STEEL							
B 5, Section 1	Structural steel (MS angle iron- 50x50x6, 75x75x6 mm for panel base frame & its site fabrication, STR STL 6MM (1500x5000X6), ISMC MS CHANNEL (100x50), ISA 65x65x6 mm Runner angles (Mild steel), ISA 50x50x6 mm Runner angles (Mild steel)	Lot Lot Lot	1 1 1	-- -- --		50MT	Painting shall be in erection agency scope and same shall be carried out as per contract standards.
Notes: Structural steel is for cable tray supports in the cellar/ trenches/ vertical raceways, cross channels in floor cut outs for supporting panels, for the field mounted JBs/ PB Stations etc.							
11.0 CONVENTIONAL FIRE PROOF SEALING MATERIALS							
11.1	Fire Break Coatings for HT/ LT Power Cables	sq.m	150	--	--		Spray type liquid on cables
11.2	Fire proof materials required for	sq.m	80	--	--		Mortar seal



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	sealing of cable entry through conduits/trenches & through panels					
11.3	Ceramic Fibre Mattress GI cable Ducts	sq.m	2250	--	--	Please refer G.I Cable duct BOQ item Sl. No. 7.19 & 7.20
11.4	Ceramic Fibre Mattress for below mentioned FRP cable trays & ducts	sq.m	2000	--	--	P Please refer G.I Cable duct BOQ item Sl. No. 7.21,7.22 & 7.23
12.0	ELECTRICAL INSULATING MATS					
12.1	Insulating Mat for voltage Grade upto 3.3kV (Class-A, Category-III)	Nos.	5	10 x 1 x 0.002	5	
13.0	LCS (LOCAL CONTROL STATION) PACKAGE					
13.1	Local Control Station (LCS)	Nos.	30	400 x 200 x 400	25	

Annexure-4 (Under Section-2)

(Items that are to be supplied erected, tested and commissioned by Erection agency.)

Erection and Commissioning Consumables: The consumables required for Electrical Equipment/ Items shall be included in Erection Agency's scope (The consumables shall be of Industrial Grade and suitable for use in refineries). The following are typical erection consumables that are envisaged in this project:

Price bid ref. Sl. No.	Equipment/ Package Description	Unit of Qty	Qty.	Dimension (each) L x B x H (M)	Weight (each) kg	Remarks
B 1, Sec 2	6 mm thick chequered plate for covering cutouts in Switchgear room	sq.m	50	--	--	Refer Switchgear Room Layout. Support structure for complete chequered plates shall be erected by Erection agency.



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B 2, Sec 2	Cable Tags Aluminium Strips	Lot	1	2mm thick, 75mm long, 15mm width	--	At entry, exit and at every 30 M of cable run length
	Cable Markers	Lot	1			1. At every 3 m of cable length 2. Part of cabling
	Clamps for multicore cables – Aluminium Flats	Lot	1	--	--	
	Erection Hardware like Nuts, Bolts, Washers etc.	Sets	1	--	--	
B 3, B 4, B 5, B 6, B 7, B 8 Sec 2	Safety Items including the following: Danger boards, Do not switch on boards, Man on work boards Display charts First aid boxes near LT & HT panels Shock hazard charts Safety hand gloves Exit Signs	Sets	1	--	--	
	3mm dia Nylon Cord (Required for tying cables to trays, at every 5 m)	Lot	1	--	--	Supply of this item is Part of cabling E&C
B 9 Sec 2	GI Conduits of 50 mm diameter, medium duty, min 75 microns galvanizing thickness	m	200	--	--	As per Cable Tray/ Trench Layouts. Along with accessories like bends, couplers.
B 10 Sec 2	GI Conduits of 100 mm diameter, medium duty, min 75 microns galvanizing thickness	m	300	--	--	As per Cable Tray/ Trench Layouts. Along with accessories like bends, couplers.
B 11 Sec 2	GI Conduits of 150 mm diameter, medium duty, min 75 microns galvanizing thickness	m	50	--	--	As per Cable Tray/ Trench Layouts. Along with accessories like bends, couplers.
B 12 Sec 2	RCC Hume Pipes (150 NB as per IS: 458) for cables at Road Crossings - Standard length 2.5 m	Nos.	20	--	--	As per Cable Tray/ Trench Layouts.



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B 13 Sec 2	RCC Hume Pipes (200 NB as per IS: 458) for cables at Road Crossings - Standard length 2.5 m	Nos.	5	--	--	As per Cable Tray/Trench Layouts.
B 14 Sec 2	PVC Conduits Class-3 of 300 mm diameter	m	10	--	--	As per Cable Tray/ Trench Layouts.
B 15 Sec 2	PVC Conduits Class-3 of 200 mm diameter	m	100	--	--	As per Cable Tray/ Trench Layouts.
B 16 Sec 2	PVC Conduits Class-3 of 150 mm diameter	m	50	--	--	As per Cable Tray/ Trench Layouts.
B 17 Sec 2	PVC Conduits Class-3 of 100 mm diameter	m	50	--	--	As per Cable Tray/ Trench Layouts.
	Framed Single Line Diagram	Nos.	1	--	--	To be arranged at site

ATTENTION:

Notes regarding Erection of Cables, Cable Trays and Accessories:

- The termination and connection of cables shall be carried out strictly in accordance with the manufacturer's instruction, drawings and / or directed by the Purchaser. The work shall include all clamping, fitting, fixing, soldering, tapping, compound filling, cable jointing, crimping, shorting and grounding as required for the complete job. Cables shall be checked for insulation resistance before and after jointing. All erection consumables shall be in Erection Agency's scope. Termination & Connection shall be carried out in such a manner as to avoid strain on the terminals. Cables shall be marked with cable numbers as per applicable drawing.
- Cable Glands and Lugs are being supplied along with corresponding equipment like Motors, LT Switchgear, Junction Boxes, Push Button Stations, and Transformers etc. However, one lot of Glands and Lugs are being supplied to take care of shortages/mismatches at site.
- Control cable cores entering panel/switchgear/MCC etc. shall be neatly bunched and served with PVC perforated tape to keep in position at the terminal block.



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- d) Ferrules shall be installed on all control cable cores in all junction boxes and at all terminations. The ferruling shall be Cross-Ferruling. The ferrules shall carry terminal numbers as per drawings. All ferrules shall be coloured, plastic & interlocked type. Spare cores shall also be similarly ferruled, crimped with lug and aped on the ends. Spare cores shall be ferruled with individual cable number.
- e) "Structural Steels for support" materials are supplied to make supports for cable trays (in the buried RCC trenches, Overhead tray arrangement on pipe racks and Cable Tray arrangement in Cellars & other arrangements as applicable for the project. These are also required for making of frames for PB stations, junction boxes as per the project requirements. Drilling of holes in ISA 65 x 65 x 6 for bolting of cable trays shall be done by Erection Agency. The holes in the Cable Trays shall be provided by the Cable Tray vendor, however in case of requirement of any additional holes to be drilled for Cable Trays for the purpose of Cable Tray Erection, same shall be done by the Erection Agency. Erection Agency shall ensure that all steel structure used for electrical installation shall be painted with one coat of Red Oxide Zinc Chromate Primer of approved shade for indoor installations. Final painting shall be done with two coats of approved bituminous aluminium paint & same to be considered in erection contractor scope. Supply of Red Oxide Zinc Chromate Primer for site painting of all Structural Steels (required for cable Tray Supports) shall be in the Erection contractor's scope. Erection Agency shall ensure that after welding and drilling (if any) of the steels bracket, above mentioned paint of approved shade shall be applied. Site shall carry out the structural steel works in line with customer/consultant's technical specifications "Notes & Details for Plant cable Laying System".