Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)
Transmission Business Group
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CORRIGENDUM - 02 TO NIT NO-91323

Dated 30-05-2025

Subject: Corrigendum-02 to Tender enquiry for Pre-Bid Tie up with the GIS OEM for Supply & Services of 220KV GIS PACKAGE for BINA PETCHEM AND REFINERY EXPANSION PROJECT (BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL).

Project	: 220kV GIS for Bina Petchem of BPCL
Equipment / Item	: Supply & Services of 220kV GIS & Its associated equipment
Enquiry No/Date	: Enquiry No._61Q2600057 Dated 17-05-2025
BHEL NIT NO	: 91323
Original Tender due date	**: 27-05-2025**
Extended due date	**: 10-06-2025**

This Corrigendum is issued by BHEL TBG against above mentioned NIT/ enquiry for issuance of Technical Corrigendum Rev-01 along with Technical clarifications (enclosed). Due to change in BOQ, Revised price bid format (unpriced) is also enclosed and same need to be followed for bid submission.

All other terms and conditions for this tender enquiry shall remain unchanged.

Bidder to ensure submission of offer on or before due date.

Note: Tender ID on CPP Portal is **2025_BHEL_48555_1.**

Thanking you

-------Sd/------
Gaurav Agarwal
BHEL TBG, NOIDA

Ref. No. **Technical Corrigendum-01**

Project: **Pre-Bid Tie up for,**
220kV GIS Package of BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP) of M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

Date: **29.05.2025**

Sl. No.	Volume/ Section/ Clause	Volume/ Section/ Clause as Existing	Volume/ Section/ Clause as Amended/ Added in Technical Corrigendum-01
1	Technical Specification	New addition	Technical Amendment Rev01 is attached, which shall be applicable on Technical Specification of 220kV GIS.
2	Technical Specification	New addition	Technical Amendment Rev02 is attached, which shall be applicable on Technical Specification of 220kV GIS.
3	Technical Specification	Section 1.3/ Section-1/ Technical Specification	Section 1.3 (ELECTRICAL Engineering Design Basis REV00) is revised as Section 1.3 (ELECTRICAL Engineering Design Basis REV00).
4	Technical Specification	Section 1.4/ Section-1/ Technical Specification	Section 1.4 (Layout & SLD) is revised as Section 1.4 (Layout & SLD with updated & latest version).
5	Technical Specification	Section 1.5/ Section-1/ Technical Specification	Section 1.5 (Annexure- BOQ REV00) is revised as Section 1.5 (Annexure- 220kV GIS BOQ REV01).
6	Technical Specification	Section 2.2/ Section-2/ Technical Specification	Section 2.2 (Datasheet for EHV GIS) is revised as Section 2.2 (Datasheet for EHV GIS with updated & latest version).
7	Technical Specification	Section 3.3/ Section-3/ Technical Specification	Section 3.3 (Document Requirements) is revised as Section 3.3 (Document Requirements with updated & latest version).
8	Technical Specification	Section 3.4/ Section-3/ Technical Specification	Section 3.4 (3D Modelling) is revised as Section 3.4 (3D Modelling with updated & latest version).
9	Technical Specification	Section 4.2/ Section-4/ Technical Specification	Section 4.2 (GTP Manufactureres Data Sheet) is revised as Section 4.2 (GTP Manufactureres Data Sheet with updated & latest version).
10			Pre-bid clarifications from bidders are also attached.

Note:
1. The changes/ revision are marked/ highlighted in yellow.
2. Amendment/ addendum/ clarification/ corrigendum issued herein shall form part of Technical Specification.
Bidders to please note that amendment/addendum/ clarification/ corrigendum issued shall supersede the respective Volume/ Section/ Clause of Technical Specification Document to the extent for the Volume/ Section/ Clause or part thereof the amendment is issued.

TECHNICAL AMENDMENT-01 FOR 220KV GIS PKG

(Document No : B957-000-16-50-TA-0020-01)

Click on the Document Title to go to that section of the document

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TECHNICAL AMENDMENT NO: 01

TO

BIDDING DOCUMENT NO.: B957-000-16-50-EB-T-0020

220KV SWITCHYARD AND GIS PACKAGE

PROJECT: OVERALL PROJECT MANAGEMENT AS MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BREP)

A	24.03.2025	Issued as Technical Amendment-1	SK	RSR	HK
REVISION	**DATE**	**PURPOSE**	**PERFORMER**	**REVIEWER**	**APPROVER**

SUBJECT : **Technical Amendment No.: 01**

BIDDING DOCUMENT NO. : **B957-000-16-50-EB-T-0020**

The terms, conditions and specifications of Bidding Document stand modified to the extent indicated under column "MODIFICATIONS/ADDITION/DELETION". Corresponding implications of the same, else-where in the bid package shall be taken care appropriately. All other terms & conditions, stipulations and specifications of Bidding Document shall remain unaltered.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
1.	Engineering Design Basis (Electrical), doc. No. B857-999-16-50-EDB-1001 Rev. 0	703 of 3017		Engineering Design Basis-Electrical	**Modification:** Following document in rev.0 shall be replaced with rev.1 document. (doc. No. B857-999-16-50-EDB-1001 Rev.1)
2.	Scope of work & Job Specification (ELECTRICAL), doc. no. B957-000-16-50-SP-0020 Rev. A)	44 of 3017	New clause 1.6 (ix)	New clause	**Addition:** The following new clause shall be added as "In case of any conflict/ discrepancy amongst various documents, the order of precedence shall as be as follows: - Statutory regulations - Design Basis/ Engineering Design Guidelines - This specification/ Scope of Work document - Standard specifications, data sheets, drawings, installation standards etc. (Details shown in drawings attached with the tender shall govern, in case of mismatch between the drawings and installation standards)"
3.	"do"	44 of 3017	cl. no. 2	Power system description	**Modification:** The statement shall be read "To meet the power requirement of Petrochemical complex in BPREP Project in BPCL Bina Refinery, power will be received at 220kV from state electricity board through double circuit (DCDS) overhead line at 220kV from MPPTCL substation located at 21 KM. These lines shall be ……."
4.	"do"	45 of 3017	2- second paragraph	Rating of transformers	**Modification:** Second line in second paragraph shall be read as "…...220/66kV power transformers……"

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
5.	"do"	45 of 3017	2- fourth paragraph	Changeover scheme in PMCC, EPMC	**Modification:** Paragraph shall be read as "MV motors upto 132kW will be fed from PMCC. Manual changeover facility shall be provided in PMCC whereas EPMCC shall be provided with Auto changeover facility. Mechanical interlock shall be provided for LDB & ELDB"
6.	"do"	45 of 3017	2- eighth paragraph	Lighting transformer-normal	**Modification:** Second line of the paragraph shall be read as "…… incoming supplies of both incomers shall be fed through 415V/415V lighting transformers……."
7.	"do"	48 of 3017	3.3 (II)	Local control cubicle	**Modification:** Following statement shall be read as "220kV, 2000 Amps, 50kA (3 sec), Double bus gas insulated switchgear with separate free standing local control cubicle and separate control and relay panel……."
8.	"do"	48 of 3017	3.3 (V)	Grid transformers	**Modification:** Following statement shall be read as "3 Number of 220/66 kV, 160/200 MVA, ONAN/ ONAF, YNyn0, Z= **min. 17%** (-0% to +10%), Oil filled transformer with OLTC and RTCC……"
9.	"do"	49 of 3017	3.3 (VIII)	66kV Gas insulated Isolating breaker panels	**Modification:** Following statement shall be read as "24 Nos. of 66 kV, 630 Amps, 40 kA (3 Sec), Gas insulated Isolating Breaker Panel with SF6 circuit breaker with Local Control Cubicle and separate control and relay panel complete with disconnector, earth switch, power cable termination kits, surge arrestor, numerical relay, metering and protection as per enclosed specification and datasheet. This panels shall also include supply of transformer differential relays for both ends. Note that Internal Arc Classification (IAC) rating of switchboard shall be 40 kA for 3 sec. Scope shall also include supply of cables between 66kV GIS IBP and associated CRP Panel for a distance of 100 meter (max.) between 66kV GIS IBP and CRP Panel. Also refer attached Annexure-1 for MRS package interface scope associated with 66kV IBP.
10.	"do"	49 of 3017	3.3 (IX)	33kV Gas insulated Isolating breaker panels	**Modification:** Following statement shall be read as "2 Nos. of 33 kV, 800 Amps, 40 kA (1 Sec), Gas insulated Isolating Breaker Panel with SF6 circuit breaker complete with power cable termination kits, numerical relay, metering and protection as per enclosed specification and datasheet for installation in CT-01 substation (SS-106) in Petchem area. Note that Internal Arc Classification (IAC) rating of switchboard shall be 40 kA for 1 sec.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
11.	"do"	49 of 3017	3.3 (XI)	66/6.9kV transformer impedance	**Modification:** Following statement shall be read as "2 nos. 66/6.9kV, **20/25MVA**, Z=**13.5 (min.)** (-0% to +10%)……."
12.	"do"	49 of 3017	3.3 (XIII)	Bus duct rating	**Modification:** Following statement shall be read as "2 sets of 6.6kV, **min.** 2500A, 40kA (1sec.)……."
13.	"do"	49 of 3017	3.3 (XIV)	Switchboard rating	**Modification:** Following statement shall be read as "1 no. 6.6kV, **min.** 2500A, 40kA (1sec.)……."
14.	"do"	49 of 3017	3.3 (XV) & (XVI)	Energy efficiency level of distribution transformers	**Modification:** Second line of paragraph shall be read as "……. Minimum Energy efficiency level-2 as per IS:1180 (Part-1) table-6/Table-3 of GOI notification dtd. 08 Dec 2023, BEE star rating 2 for feeding substation normal loads"
15.	"do"	51 of 3017	3.3 (XXXIII)	Cable size	**Modification:** In the referred clause the cable size shall be read as "1RX1Cx630 sq.mm. Per phase min." **Second paragraph shall be read as** "Additionally, Contractor to provide 1 extra run of cable per incoming line laid (which should be able to connect to any of the phase R/Y/B) and should be made ready to connect including termination kits at both ends, i.e. at both the circuits of outside gantry and at both the 220kV GIS incomers. Both of these extra trefoil runs should be safe guarded and sealed for environmental protection as practiced in other outdoor substations" **Third paragraph shall be added as below** In addition to other testing requirements of IEC 60480, Contractor shall also do 1 hour AC voltage test of the 220kV cable insulation through kit as per IEC 60480. This test shall be done for all the 220kV cable laid between outdoor gantry to 220kV GIS, between 220kV GIS and 220/66kV Grid transformers, spare 220kV cable from gantry to 220kV GIS, any other 66kV cable in the scope of tender etc.
16.	"do"	51 of 3017	3.3 (XXXIV)	Cable size	**Modification:** In the referred clause the cable size shall be read as "1RX1Cx300 sq.mm. Per phase, Min." **Second paragraph shall be added as below** In addition to other testing requirements of IEC 60480, Contractor shall also do 1 hour AC voltage test of the 66kV cable insulation through kit as per IEC 60480. This test

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					shall be done for all the 66kV cable laid between 66kV GIS to primary of power transformer 66kV/6.9kV, any other 66kV cable in the scope of tender etc.
17.	"do"	51 of 3017	3.3 (XXXIV)	Power transformer	**Modification:** In the referred clause the rating of transformer shall be read as "min. 20/25MVA"
18.	"do"	51 of 3017	3.3 (XXXVIII)	Power factor at 6.6kV switchboard	**Modification:** In third line of the paragraph the word "0.95 (lag)" shall be read as "0.995 (lag)"
19.	"do"	51 of 3017	New point in 3.3 (XXXVIII)	New point for power factor compensation	**Addition:** Following statement shall be added at the end of the paragraph as "The power factor at 220kV grid metering point shall be min. 0.99. Contractor to provide required compensation for power factor based on the power system study and provide additional equipment in order to achieve the min. 0.99 PF at 220 kV Grid metering point. Further, for the below mentioned transformers PF at transformer secondary shall be maintained at 0.995 (by respective package contractors). Following are the details of downstream equipment: a) 20 nos. of 20/25 MVA transformers b) 2 nos. of 70 MVA transformers c) 1 no. 52 MVA transformer d) 1 no. 36 MVA transformer For bidding purpose, Bidder will give the optional price for supply, installation, testing and commissioning of 2x50% capacitor banks at 66kV level for maintaining the power factor of 0.99 at 220kV incoming supply. All required electrical equipments including 66kV GIS bays shall be included in this optional price."
20.	"do"	52 of 3017	3.3 (XLIII)	Lightning protection system	**Addition:** Following statement shall be added after the end of the paragraph "Lightning protection system shall include lightning protection study for the complete package."
21.	"do"	52 of 3017	3.3 (XLIV)	Lighting system	**Modification:** Last line of the paragraph shall be read as "……socket, etc as per design basis for the complete package including 220kV GIS substation, 220kV outdoor area, boundary wall, road etc."

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
22.	"do"	53 of 3017	3.3 (LVII)	Installation testing and commissioning at site by OEM	**Addition/Modification:** Following equipment shall be added as below: "* 220kV (E) cables including termination kits • 66kV (E) cables including termination kits • Power transformer including NIFPS"
23.	"do"	53 of 3017	3.3 (LX)	Training at site	**Modification:** Following statement "NIFPS of power transformer" shall be read as "NIFPS of Grid and Power transformer"
24.	"do"	54 of 3017	3.3 (LXII)	Training at vendor works	**Addition:** Following clause shall be added as "Providing training for OWNERS' s Engineers for each item at vendor works for the following equipment's is included in the Contractor's scope a) HV SWITCHGEAR INCLUDING NUMERICAL RELAY, SAS ETC – 8 days b) LV SWITCHGEAR INCLUDING INTELLIGENT MCC/SAS ETC – 5 days c) AC UPS – 4 days d) Battery Charger – 2 days e) Capacitor Bank / APFC – 2 days"
25.	"do"	58 of 3017	5.1 (I)	Tag number of various transformers	**Modification:** Tag numbers shall be read as "100-TR-011, 100-TR-012 & 100-TR-013".
26.	"do"	58 of 3017	5.1 (I)	Tag number of various transformers	**Deletion:** Tag number "100-TR-24" indicated shall be "Deleted"
27.	"do"	58 of 3017	5.1 (I)	Impedance of transformers	**Modification:** Impedance indicated in the table shall be read as "Z= min. 17% (-0% to +10% tolerance"
28.	"do"	63 of 3017	5.2 (I)	Tag number of various transformers	**Modification:** Tag numbers shall be read as "100-TR-021 & 100-TR-022".

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
29.	"do"	63 of 3017	5.2 (I)	Impedance of transformers	**Modification:** Impedance indicated in the table shall be read as "Z= min. 13.5% (-0% to +10% tolerance"
30.	"do"	66 of 3017	5.3 (IV)	Energy efficiency level	**Modification:** Fifth line of paragraph shall be read as "……. Minimum Energy efficiency level-2 as per IS:1180 (Part-1) table-6/Table-3 of GOI notification dtd. 08 Dec 2023, BEE star rating 2"
31.	"do"	71 of 3017	5.7 (I)	Tag number of various equipment	**Modification:** Tag numbers shall be read as "100-EHV-101, 100-LCCEV-101, 100-CRPEV-101, 100-HV-102, 100-LCCHV-102 & 100-CRPHV-102".
32.	"do"	72 of 3017	5.7.VII.5	Service continuity requirement	**Modification:** Adequate nos. of gas sectionalizer shall be provided in 220kV GIS & 66kV GIS for ensuring safety, ease of maintenance/repair& lower gas handling requirements during bus faults, regular maintenance/repair activities or extension work. Gas partitions shall be provided in GIS switchboard (220kV & 66kV) as per IEC-62271-203 as a minimum as below: A) MRE01: for fault in circuit breaker compartment B) MRE10: for future extension of GIS **C)** MRE11: for fault in GIS other than circuit breaker
33.	"do"	74 of 3017	5.7.VII.23	Service continuity requirement	**Modification:** Clause no. 5.7.VII.23 stands "Deleted". However, requirements mentioned in cl. No. 5.3.2 of 6-51-0066 & above sl. No. 32 of this Technical Amendment-01 shall be complied.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
34.	"do"	79 of 3017	5.7.XIII.2	Gas filling and evacuating cart	**Addition:** The following statement shall be added as "iii. SF6 topping system shall be provided for 220 kV GIS for filling/ topping up SF6 gas to panel under energized condition manually"
35.	"do"	81 of 3017	5.7.XIII.5	SF6 topping system	**Deletion:** The statement here stands "DELETED"
36.	"do"	82 of 3017	5.8 (I)	Tag number of various equipment	**Modification:** Tag numbers shall be read as "100-MV-211".
37.	"do"	82, 87 & 91 of 3017	5.8 (V), 5.9 (XXX) & 5.13 (XXXIV)	Type test reports for HV & MV switchboards and Breakers	**Modification:** Validity indicated in the following table for sl. No. 1 & 2 shall be modified as "Upto 10 years from the final bid opening date or design change whichever is earlier"
38.	"do"	83 of 3017	5.9 (V)	Auto changeover	**Deletion:** The clause stands "DELETED"
39.	"do"	84 of 3017	5.9 (VIII)	Auto/Manual changeover	**Deletion:** The clause stands "DELETED"
40.	"do"	87 of 3017	5.9 (XXXII)	Load of owner's feeders	**Modification:** Total load indicated against following sl. Nos shall be read as "S. no. 1 – ETP package – 2.5 MW S. no. 4 – Steam Block – 4 MW S. no. 5 – Polymer warehouse & Gantry – 5 MW * Total load of 15.5 MW of owner's load shall be considered in power transformer sizing. For owners feeders spare outgoing breaker feeders shall also be considered inline with Engineering design basis.".

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
41.	"do"	88 of 3017	5.12.3	Power factor	**Modification:** Clause no. 5.12.3 stands "Deleted". However, requirements mentioned in sl. No. 19 of this Technical Amendment-01 shall be complied.
42.	"do"	89 of 3017	5.13 (XIII)	Changeover scheme	**Modification:** In the paragraph wherever the word "PMCC" shall be read as "EPMCC"
43.	"do"	92 of 3017	5.13 (XXXVI)	Owners feeders	**Modification/Addition:** S.No. 3 shall be modified to SFU – 250 Amps with CBCT and ELR, Contactor : 4 Nos., PMCC-400kVA (100kVA each) S.No. 4 is added as below SFU-63 Amp: 3 Nos., EPMCC- 30kVA (10kVA each) Paragraph below table shall be modified to * Total Load of 770 KVA of owner's load shall be considered in Normal distribution transformer sizing. Total load of 160KVA of Owner's load shall be considered by Contractor for emergency distribution transformer sizing.
44.	"do"	96 & 99 of 3017	5.15 (XVI) & 5.16.XXVI I.3	Conformal coating	**Modification:** Following clause is Modified as below: "Conformal coating shall be done for all PCB, electronic equipments as per min. Class 3C2 (Harsh environment) of IEC 60721-3-3. Alternatively, it shall comply with ANSI/ ISA S71.04 class G3 or IEC 60068-2-60 for mixed flow gas test or ASTM B845. Supporting documents shall be provided for the same"
45.	"do"	98 of 3017	5.16 (VII)	Battery charger	**Modification:** The statement shall be read as "Battery charger shall be Thyristor based"
46.	"do"	101, 104 & 119 of 3017	5.18 (IX), 5.23 (V) & 6.9	Cable tags material	**Deletion:** The clause stands "DELETED"

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
47.	"do"	102 of 3017	5.18 (XI)	Fire alarm equipments	**Modification:** Quantity of following devices is modified/Added as below: "Intelligent addressable multi sensor detector – 306 nos. Response indicator – 136 nos. Electronic hooters – 10 nos. Linear beam detectors – 05 nos. Exit signs addressable (Single faced) – 14 nos. Relay module – 10 nos. Siren – 1 no."
48.	"do"	104 of 3017	5.22 (II.d)	Selector switch	**Modification:** The statement shall be replaced with the following "Selector switch (A-O-M) shall be provided, as required, as per P&ID & operational requirements"
49.	"do"	109 of 3017	New clause 5.25 (XXVI)	New clause	**Addition:** Following new clause shall be added as "All Earth electrodes shall be Maintenance free chemical earth electrode. Requirement of Maintenance Free Earth Pit is as below: i) The job includes excavation of hard/ soft/ rock soil for making augured hole for laying the earth electrode. Where machine drilling is not allowed as per site conditions, excavation shall be done manually. Augured hole shall be of minimum 125-150 mm dia. The augured hole is to be filled up completely with Earth enhancement compound. 3-metre-long Copper Bonded Steel Earth Electrode of minimum diameter 14mm (solid round) and minimum cross-sectional area 150 sq. mm. shall be driven into the pit. Copper shall be intrinsically bonded to steel. There should be minimum 250 µm radial copper coating with 99.9% copper content in line with IEC 62561-2. Earth pit Inspection chamber is to be constructed in such a way that it provides easy access for resistance measurement and connection/disconnection facility. The earth pit is to be connected with earth termination conductor i.e. GI earth strip through Stainless Steel Strip and Stainless-Steel Nuts/Bolts only. It shall meet all the specifications of IEC 62305, IEC 62561-2 & IEC 62561-7. ii) Earth Enhancement Compounds shall fulfill all the specifications as mentioned in IS 3043:2018 & IEC 62561-7.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					a) The material of the earthing enhancing compound shall be chemically inert to subsoil. It shall Not pollute the environment. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. The earthing enhancing compound shall not be corrosive to the earth electrodes being used. b) Resistivity of earthing enhancing compound shall be equal to or less than 0.12 Ω m. c) Earth enhancement compound shall be supplied in sealed moisture proof bags. The packaging unit of earthing enhancing compound shall clearly have the manufacturer's name or trademark, resistivity value and identifying symbol. d) It shall be a carbon-based material and shall be free from bentonite and other such hazardous substances. e) It shall not leach out any chemicals into the ground and shall be suitable for installation in dry form or slurry form. f) It shall not depend on continuous presence of water to maintain its conductivity. g) It shall have high conductivity, improves earth's absorbing power and humidity reaction capability. h) It shall have a long life and shall be permanent and maintenance free in its set form and maintains constant earth resistance with time. i)It shall not pollute the soil or local water table. It shall not be explosive and shall not cause burns, irritation to eyes, skin etc. In this regards 'Safety Data Sheet' shall be submitted. j) It shall not require periodic charging or any kind of treatment or maintenance. k) It shall be thermally stable for temperature range -10 deg C to +60 deg C ambient temperature. iii) Earth enhancing compounds shall be tested as per IEC 62561-7 and certified test reports shall be submitted.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					iv) The disconnection facility shall be provided for each individual earth electrode to check its earth resistance periodically. v) Individual Earth Pit resistance shall be in the range of 2 to 5 ohms or less. vi) Location of earth electrodes shall be marked by permanent markers for easy identification. Letter writing including earth pit no., earth pit resistance, maintenance date and due date shall be written on chamber with white or black paint of required letter size as decided by BPCL SIC/EIC. vii) All earth pits shall be interconnected. After connecting the earth strips to the earth electrodes, the earth pit entry point shall be sealed with bitumen compound. viii) All Earth Pits shall be provided with suitable Earth Pit Chamber and Earth Pit Covers. Earth Pit Cover shall be of Cast Iron material. Earth Pit Chamber/Cover shall be installed in such a way that they are not protruded from the ground level. They shall be in the same level as ground. Moreover, they shall give aesthetic look and shall not pose any kind of unsafe condition like tripping hazard, falling hazard etc. Earth Pit Number and Earth Pit Resistance shall be clearly written on Earth Pit Cover using suitable paint. ix) Refer Sketch B857-000-16-50-SK-0102 for typical earth electrode in test pit"
50.	"do"	109 of 3017	5.26 (XI)	Lighting cables	**Modification:** The clause shall be read as "Cables from lighting panel onwards to the outdoor lighting fixtures shall be 4C x 2.5mm2, copper conductor, stranded, XLPE insulated, armored FRLS cable"
51.	"do"	118 of 3017	6.2	Power system study	**Modification:** The statement shall be read as "Power system study shall be carried out in latest version of ETAP software for entire petchem project. Owner shall facilitate the downstream input .OTI files for compilation of complete petchem system study by contractor. Contractor shall furnish the native files……"
52.	"do"	124 of 3017	New point 12.6	Vendor list for Grid transformers	**Add following clause under vendor list** **Transformer vendor list attached for item 13KA "Transformers Power-Above 5MVA will not be applicable for Grid transformer (160/200MVA, 220kV/66kV).** 1. The Contractor shall engage Transformer manufacturer for supplying the transformer meeting the following criteria: These details shall be furnished during detail engineering. a. The engaged Transformer manufacturer must be a regular

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					manufacturer and supplier of transformer with min 220kV voltage primary. b. The engaged transformer manufacturer must have designed, engineered, manufactured, tested and supplied at least one similar transformer (min. primary voltage as 220kV, min. power as 80% of project requirement) to any continuous process industry/utilities in last 10 years, as being offered for this project. c. The offered transformer shall be manufactured and tested at the same works as for the reference equipment. (refer 2.c below) d. Transformer as referenced in (b) above shall have completed a period of minimum 1 year after commissioning. (refer 2.b.iii below) e. For qualification of the Transformer manufacturer, the above clauses shall be read in conjunction. 2. Bidder shall submit the following documents to establish that the bidder meets the Qualification requirements as per clause no. 1.0 above: a. Duly completed Experience Record Proforma (doc. No. B957-000-16-50-DS-6804) as enclosed after order, together with all back-up documents specified therein, duly authenticated as required. b. Bidder to furnish the following documents in support of past executed order for transformer: i. Purchase order reference indicating power rating/voltage rating ii. Inspection release note/transporter's invoice pertaining to above listed purchase order iii. End user /PMC certificate pertaining to above listed purchase order indicating that, supplied model has completed a period of minimum one year after commissioning/hand over to end user. Alternatively, Certificate issued by CEO or CFO or Company Secretary of transformer supplier is also acceptable. In such a case, bidder shall submit certificate/undertaking from CEO or CFO or Company Secretary of respective supplier on their letter head indicating "The referenced model of the

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					proposed item/s has completed a period of minimum one year after commissioning/hand over to end user and there is no negative/ adverse feedback received from end user/ PMC regarding operation of equipment''. Regarding the above, Bidder to note that, PO reference of any continuous process industry/ utility shall be acceptable where Vendor has executed the order directly. Relevant extracts of the documentary evidence are also acceptable. c. In case bidder offers transformer from different unit/ works, then certification either from TPI (Third party Inspection agency) or from CEO/ CFO/ Company secretary/ any member of Board of Directors of the company shall be required certifying that the product design, execution methodology/ responsibility matrix, necessary facilities, infrastructure, resources, machineries etc. are equivalent or better than unit/ works for which PTR (Proven Track Record) is given.
53.	General			Voltage detectors	**Modification** Voltage detectors shall be applicable for 220kV GIS and 33kV GIS. Voltage detectors shall not be applicable for 66kV GIS.
54.	All Electrical Datasheets			Frequency	**Modification:** Frequency indicated in all the equipment datasheets-Electrical shall be modified as "50Hz ± 5%"
55.	Key single line diagram – doc. No. B957-000-16-50-00011 Rev. B	847 of 3017		Key single line diagram	**Modification:** The document shall be replaced with B957-000-16-50-00011 Rev. C
56.	Datasheet for main grid transformer – doc. No. B957-000-16-50-DS-6802 Rev. A	995 of 3017		Datasheet for Grid transformer	**Modification** Datasheet replaced with B957-000-16-50-DS-6802 Rev. B
57.	Datasheet for 66kV feeder list– doc. No. B957-000-16-50-DS-6611 Rev. A	890 of 3017		Datasheet for 66kV feeder list	**Modification** Datasheet replaced with B957-000-16-50-DS-6611 Rev. B

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
58.	Datasheet for power transformer – doc. No. B957-000-16-50-DS-6803 Rev. A	1001 of 3017		Datasheet for Power transformer	**Modification** Datasheet replaced with B957-000-16-50-DS-6803 Rev. C
59.	Vendor list doc. No. B957-000-16-50-VL-0020 Rev. A	1132 of 3017		Vendor list - Electrical	**Modification** Vendor list replaced with B957-000-16-50-VL-0020 Rev. B
60.	Typical sketch for chemical earth electrode		New sketch	Chemical earth electrode sketch	**Addition:** Following document shall be added “typical earth electrode in test pit doc. No. B857-000-16-50-SK-0102”
61.	Datasheet for Experience record format for Grid transformer		New datasheet	Datasheet for ERP OF Grid transformer	**Addition:** Datasheet ERP for Grid transformer doc. No. B957-000-16-50-DS-6804 Rev. A is added.

Enclosures:

1) Engineering design basis (Electrical) – doc. No. B857-999-16-50-EDB-1001 Rev. 1
2) Key single line diagram – doc. No. B957-000-16-50-00011 Rev. C
3) Vendor list – Electrical – doc. No. B957-000-16-50-VL-0020 Rev. B
4) Typical earth electrode in test pit – doc. No. B857-000-16-50-SK-0102 Rev. A
5) Datasheet for grid transformer – doc. No. B957-000-16-50-DS-6802 Rev. B
6) Datasheet for power transformer – doc. No. B957-000-16-50-DS-6803 Rev. C
7) Datasheet for 66kV Feeder list – doc. No. B957-000-16-50-DS-6611 Rev. B
8) Datasheet ERP for Grid transformer doc. No. B957-000-16-50-DS-6804 Rev. A

(SIGNATURE AND STAMP OF BIDDER)

TECHNICAL AMENDMENT-2 FOR 220kV GIS PKG TENDER

(Document No : B957-000-16-50-TA-0020-02)

Click on the Document Title to go to that section of the document

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TECHNICAL AMENDMENT NO: 02

TO

BIDDING DOCUMENT NO.: B957-000-16-50-EB-T-0020

220KV SWITCHYARD AND GIS PACKAGE

PROJECT: OVERALL PROJECT MANAGEMENT AS MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND U&O FOR BPREP BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BREP)

A	29.04.2025	Issued as Technical Amendment-2	SK	RSR	HK
REVISION	**DATE**	**PURPOSE**	**PERFORMER**	**REVIEWER**	**APPROVER**

SUBJECT : **Technical Amendment No.: 02**

BIDDING DOCUMENT NO. : **B957-000-16-50-EB-T-0020**

The terms, conditions and specifications of Bidding Document stand modified to the extent indicated under column "MODIFICATIONS/ADDITION/DELETION". Corresponding implications of the same, else-where in the bid package shall be taken care appropriately. All other terms & conditions, stipulations and specifications of Bidding Document shall remain unaltered.

<table>
<tr><th>Sl. No</th><th>Section/ Document</th><th>Page No.</th><th>Clause / Item No.</th><th>Subject</th><th>Modifications/Additions/Deletions</th></tr>
<tr><td>1.</td><td>Technical Amendment-1 (Electrical) (doc. No. B957-000-16-50-TA-0020-01 Rev. A)</td><td>5 of 237</td><td>Sl. No. 9</td><td>66kV Gas insulated Isolating Breaker panels</td><td>Modification:
Following statement shall be read as "26 Nos. 630 Amps & 02 nos. 800 Amps, 66kV, 40 kA (3 Sec), Gas insulated Isolating Breaker Panels with SF6 circuit breaker with Local Control Cubicle and separate control and relay panel complete with disconnector, earth switch, power cable termination kits, surge arrestor, numerical relay, metering and protection as per enclosed specification and datasheet.
These panels shall be installed by others in downstream substations external to this MRS building. Scope of this package includes design, engineering and supply of GIS IBP's including supply of transformer differential relays for both ends. Note that Internal Arc Classification (IAC) rating of switchboard shall be 40 kA for 3 sec. Scope shall also include supply of cables between 66kV GIS IBP and associated CRP Panel for a distance of 100 meter (max.) between 66kV GIS IBP and CRP Panel.
Also refer attached Annexure-1 (attached with TA-01) for MRS package interface scope associated with 66kV IBP.
Following is the list of IBP's & CT ratios of 66kV IBP's:
<table>
<tr><th>Sl. No.</th><th>66kV IBP's (nos. & rating)</th><th>CT ratio</th></tr>
<tr><td>1</td><td>2 nos. 800 Amps</td><td>800/1A</td></tr>
<tr><td>2</td><td>1 no. 630 Amps</td><td>500/1A</td></tr>
<tr><td>3</td><td>1 no. 630 Amps</td><td>350/1A</td></tr>
<tr><td>4</td><td>24 nos. 630 Amps</td><td>250/1A</td></tr>
</table></td></tr>
<tr><td>2.</td><td>"do"</td><td>7 of 237</td><td>Sl. No. 19</td><td>Power factor correction</td><td>Deletion:
The point stands "DELETED"</td></tr>
</table>

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
3.	"do"	92 of 237		Key single line diagram (Rev. C)	**Modification:** The document shall be replaced with B957-000-16-50-00011 Rev. D
4.	"do"	168 of 237		Datasheet for 66kV feeder list (Rev. B)	**Modification:** Datasheet replaced with B957-000-16-50-DS-6611 Rev. C
5.	"do"	37 of 237	cl. no. 4.80	Insulation paint (Epoxy coating)	**Modification:** The clause shall be read as "Insulating paint shall be uniformly applied in switchgear hall floor suitable for the highest system voltage of Air Insulated Switchboards (AIS) present. Same voltage grade of insulating paint on floor as applied for AIS shall be also considered for GIS located in the same switchgear hall/ room to maintain uniformity within substation"
6.	Scope of work & Job Specification (ELECTRICAL), doc. no. B957-000-16-50-SP-0020 Rev. A)	44 of 3017	cl. no. 2	Power system description	**Modification:** The first paragraph shall be read as "To meet the power requirement of Petrochemical complex in BPREP Project in BPCL Bina Refinery, power will be received at 220kV from state electricity board through double circuit (DCDS) overhead line at 220kV from MPPTCL substation located at 21 KM. These lines shall be terminated on the outdoor gantry located in existing refinery area near MRS-100 building and further connection to will be made to 220kV GIS for this project through single core copper cables"
7.	"do"	50 of 3017	3.3(XVIII)	PMCC	**Modification:** The clause shall be read as "1 no. 415 V, 2500 Amps (minimum), 65 kA (1 Sec) and draw out type TPN switchboard (Power and Motor control center – PMCC) complete with numerical relay, metering and protection as per enclosed specification and datasheet. PMCC shall have two incomers from transformers and bus coupler. Outgoing feeders shall be sufficient to cater CONTRACTOR load, Owner's load and spare feeders as per spare philosophy"
8.	"do"	50 of 3017	3.3(XXII)	SAS system	**Modification:** Second Paragraph in the subject clause shall be read as "SAS system for the complete MRS-100 package shall be as per system architecture layout (doc. No. B957-000-16-50-DS-5503) enclosed with tender"
9.	"do"	89 of 3017	5.13(X)	switchboards	**Modification:** The clause shall be read as "All switchboards (PMCC/EPMCC) shall be provided with two incomer and Two bus coupler. No. of outgoing feeders shall be decided based on

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					system requirement, spare feeders and feeders for Owner's use as defined elsewhere. However, feeders, as required, based on final approved single line diagram, shall be provided with no cost and time implication to owner. 20% spare outgoing feeder or minimum one of each type, whichever is higher shall be provided in each switchboard"
10.	"do"	89 of 3017	5.13(XIII)	switchboards	**Modification:** The clause title shall be read as "changeover scheme for two incomers and two bus couplers" In third line of paragraph the statement "Third incomer of PMCC (i.e. Incomer from Solar PV system) shall be connected to the bus having emergency supply" stands "DELETED"
11.	"do"	121 of 3017	cl. No. 7.2	Mandatory spares	**Modification:** The clause shall be read as "Mandatory spares shall be as per cl. No. 6.1 of EDB (Engineering design basis) B857-999-16-50-EDB-1001, Rev.1 attached with Technical Amendment-1. However, following changes to EDB shall be noted as under: 1. Note 5 under clause 5.6.1.2 EHV Switchyard stands "DELETED" 2. Sl. No. 2 Part Description under clause 6.1 Mandatory spares shall be read as

2	**66kV Gas Insulated Switchboard (GIS)**	**One set of spare for each GIS**
2.1	Online portable SF6 gas Filling and Evacuation Cart	1 No.
2.2	Handle for disconnector switch drive	4 Nos.
2.3	Handle for earthing switch drive	4 Nos.
2.4	Pre selection / Mechanical key	1 No.
2.5	Power cable termination kit along with plug and socket (R,Y,B Phases)	2 Sets
2.6	Tripping coil	2 No.
2.7	Closing coil	2 No.
2.8	Capacitive type voltage detectors	1 Set

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions

2.9	Control fuses / MCB	10 Nos. of each rating & type
2.10	Density monitoring device	2 Nos of each type
2.11	Indicating lamps covers	5 nos. of each colour
2.12	Indicating lamps	20% or 3 nos. (min.), whichever is more
2.13	Portable SF6 Gas Leakage Detector	1 Nos.
2.14	Ethernet Switch	1 no. of each type
2.15	Pressure Gauge	2 Nos of each type
2.16	SF6 Gas Analyser	1 No.
2.17	Portable Partial Discharge (PD) Monitoring System	1 No.

3. Sl. No. 2a under clause 6.1 Mandatory spares is added as below:

2a	**66kV GIS Isolating breaker panel & 33kV GIS Isolating breaker panel**	**One set of spare for each substation**
2a.1	Online portable SF6 gas Filling and Evacuation Cart	1 No.
2a.2	Handle for disconnector switch drive	4 Nos.
2a.3	Handle for earthing switch drive	4 Nos.
2a.4	Pre selection / Mechanical key	1 No.
2a.5	Power cable termination kit along with plug and socket (R,Y,B Phases)	2 Sets
2a.6	Tripping coil	2 No.
2a.7	Closing coil	2 No.
2a.8	Capacitive type voltage detectors	1 Set
2a.9	Control fuses / MCB	10 Nos. of each rating &

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions

		type
2a.10	Density monitoring device	2 Nos of each type
2a.11	Indicating lamps covers	5 nos. of each colour
2a.12	Indicating lamps	20% or 3 nos. (min.), whichever is more
2a.13	Portable SF6 Gas Leakage Detector	1 Nos.
2a.14	Ethernet Switch	1 no. of each type
2a.15	Pressure Gauge	2 Nos of each type
2a.16	SF6 Gas Analyser *	1 No.
2a.17	Portable Partial Discharge (PD) Monitoring System *	1 No.

*- applicable only for 66kV GIS IBP

4. Sl. No. 23 under clause 6.1 Mandatory spares stands modified as below

23	220kV GIS for Petchem Project	One set of spare for each GIS
23.1	Portable SF6 Gas Leakage Detector	1 Nos.
23.2	Online portable SF6 gas Filling and Evacuation Cart	1 No.
23.3	SF6 Gas Analyser	1 No.
23.4	Portable Partial Discharge (PD) Monitoring System	1 No.
23.5	Handle for disconnector switch drive (If applicable as per standard design)	4 Nos.
23.6	Handle for earthing switch drive (If applicable as per standard design)	4 Nos.
23.7	Tripping coil	2 Nos.
23.8	Closing coil	2 Nos.

Sl. No	Section/ Document	Page No.	Clause / Item No.	Subject	Modifications/Additions/Deletions
					23.9 Density monitoring device — 2 Nos of each type 23.10 Pressure Gauge — 2 Nos of each type 23.11 Ethernet Switch — 1 no. of each type 23.12 Capacitive type voltage detectors — 1 Set 5. In note no. 7& 8, the term Isolating breaker panel (GIS or AIS)" shall be read as "Isolating breaker panel (AIS)"
12.	"do"	124 of 3017	New cl. no. 12.6	New clause	**Addition:** The following clause shall be added as "Make of 66kV GIS switchboard & 66kV Isolating breaker panels shall be of same make".
13.	Datasheet for EHV Gas insulated switchgear – doc. No. B957-000-16-50-DS-6601 Rev. A	874 of 3017		Datasheet for EHV GIS (66kV)	**Modification** Datasheet replaced with B957-000-16-50-DS-6601 Rev. C
14.	Hardware Datasheet for 220kV incomer – doc. No. B957-000-16-50-DS-6604 Rev. A	881 of 3017		Hardware Datasheet for 220kV Incomer	**Modification** Datasheet replaced with B957-000-16-50-DS-6604 Rev. B
15.	Datasheet for EHV gas insulated switchgear – doc. No. B957-000-16-50-DS-6610 Rev. A	885 of 3017		Datasheet for EHV GIS (220kV)	**Modification** Datasheet replaced with B957-000-16-50-DS-6610 Rev. C

Enclosures:

1) Datasheet for EHV GIS switchboard-66kV – doc. No. B957-000-16-50-DS-6601 Rev. C
2) Hardware Datasheet for 220kV incomer from overhead line – doc. No. B957-000-16-50-DS-6604 Rev. B
3) Datasheet for EHV GIS switchboard-220kV – doc. No. B957-000-16-50-DS-6610 Rev. C
4) Key single line diagram – doc. No. B957-000-16-50-00011 Rev. D
5) Datasheet for 66kV Feeder list – doc. No. B957-000-16-50-DS-6611 Rev. C

(SIGNATURE AND STAMP OF BIDDER)

ENGINEERING DESIGN BASIS
ELECTRICAL

JOB NO: **B857**

PROJECT: **EPCM Services for Site Enabling for Bina Petrochemical and Refinery Expansion Project**

CLIENT: **BPCL - BINA REFINERY**

EIL SIGNATURE: 17/01/25

CLIENT SIGNATURE: Amit Kr Jha 18/01/2025 — 18/01/2025 M. SATISH BABU — 18/01/2025 आर.एच. पचाल R H PANCHAL महाप्रबंधक (यू एण्ड यो) - GENERAL MANAGER (U&O) - BPREP भारत पेट्रोलियम कॉर्पोरेशन लिमिटेड BHARAT PETROLEUM CORPORATION LIMITED बीना रिफाइनरी, बीना, जिला–सागर, 470124 BINA REFINERY, BINA, DIST. - SAGAR, 470124

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Rev. No.	Date	Purpose	Prepared by	Reviewed by	Approved by
1	17/Jan/2025	Revised & Issued For Implementation	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	HARISH KUMAR
0	11/Jun/2024	Issued For Implementation	KANUGUTTA SUMITH	RASHMI SINGH	HARISH KUMAR

Legend: ***Bold italic*** text denotes change with respect to previous revision.

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1.0 SCOPE

This electrical design basis defines the design requirements agreed by owner/clients in addition to EIL standard design philosophy for electrical facilities no. 6-51-0099 Rev no. 7.
In case of any conflict between statutory requirements, this design basis and standard design philosophy, the most stringent requirement shall govern.

2.0 ABBREVIATIONS, CODES & STANDARDS / PUBLICATIONS

2.1 ABBREVIATIONS

Code	Description
AC	Alternating Current
ACB	Air Circuit Breaker
ACSR	Aluminium Conductor Steel Reinforced
AN	Air Natural
APFC	Automatic Power Factor Correction
ASB	Auxiliary Service Board
ATS	Auto Transfer Scheme
CB	Circuit Breaker
CBCT	Core Balance Current Transformer
CEA	Central Electricity Authority
CT	Current Transformer
DC	Direct Current
DCP	Data Concentrator Panel
DG	Diesel Generator
DGMS	Director General Mines Safety
DOL	Direct On Line
EHV	Extra High Voltage
ELCB	Earth Leakage Circuit Breaker
ELR	Earth Leakage Relay
EMPR	Electronic Motor Protection Relay
EPCC	Emergency Power Control Center
EPMCC	Emergency Power cum Motor Control Center
FBT	Fast Bus Transfer
FRLS	Flame Retardent Low Smoke
FS	Fire Survival
GI	Galvanised Iron
GIBD	Gas Insulated Bus Duct
GIS	Gas Insulated Switchgear
GTG	Gas Turbine Generator
HMI	Human Machine Interface
HV	High Voltage
IEC	International Electro-Technical Commission
IS	Indian Standard
LDB	Lighting Distribution Board
LV	Low Voltage
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
MI	Mineral Insulated
MOV	Motor Operated Valve
MPCB	Motor Protection Circuit Breaker
MPR	Motor Protection Relay

Code	Description
MV	Medium Voltage
NA	Not Applicable
NGR	Neutral Grounding Resistor
NGT	Neutral Grounding Transformer
NIFPS	Nitrogen Injection Fire Protection System
OFAF	Oil Forced Air Forced
OLTC	On Load Tap Changer
ONAF	Oil Natural Air Forced
ONAN	Oil Natural Air Natural
PCC	Power Control Centre
PESO	Petroleum & Explosive Safety Organisation
PL	Power Limiting
PLC	Programmable Logic Control
PMCC	Power Cum Motor Control Centre
PRP	Parallel Redundancy Protocol
PVC	Polyvinyl Chloride
RCC	Reinforce Cement Concrete
RSTP	Rapid Spanning Tree Protocol
SAS	Substation Automation System
SFU	Switch Fuse Unit
SPN	Single Phase & Neutral
SPV	Solar Photovoltaic
SR	Self Regulating
STG	Steam Turbine Generator
TP	Three Phase
TPN	Three Phase & Neutral
UPS	Uninterrupted Power Supply
VCB	Vacuum Circuit Breaker
VFD	Variable Frequency Drive
VT	Voltage Transformer
XLPE	Cross Link Poly Ethylene
TCP	***Thyristor Control panel***
SVR	***Static Voltage Regulator***

2.2 CODES & STANDARDS / PUBLICATIONS

The main codes and standards, considered as minimum requirements, as applicable, are as follows -

S.No.	Description	Standards / Codes	Edition
1	IEEE recommended practice and requirements for harmonic control in electric power systems	IEEE-519	
2	Code of Practice for Electrical Wiring Installations	IS 732	
3	Outdoor type oil immersed distribution transformers up to and including 2 500 KVA,33kV - specification part 1 mineral oil immersed	IS-1180	
4	Code of practice for the fire safety of buildings - Electrical Installations.	IS-1646	

S.No.	Description	Standards / Codes	Edition
5	Code of practice for selection: installation and maintenance of automatic fire detection and alarm system.	IS-2189	
6	Code of practice for fire safety of industrial buildings - Electrical generating and distributing stations.	IS-3034	
7	Code of practice for Earthing.	IS-3043	
8	Code of practice for Interior Illumination: Part 1 General requirements and recommendations for welding interiors	IS-3646	
9	Application guide for Insulation Coordination.	IS-3716	
11	Guide for safety procedures and practices in electrical work	IS-5216	
12	Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installations.	IS-5572	
13	Code of practice for Industrial Lighting.	IS-6665	
14	Guide for Control of undesirable static electricity.	IS-7689	
15	Guide for improvement of power factor - consumer's installations.	IS-7752	
16	Application guide for on load tap changers.	IS-8478	
17	Reference ambient temperature for electrical equipment	IS-9676	
18	Code of practice for selection, installation and maintenance of transformer.	IS-10028	
19	Code of practice for selection, installation and maintenance for switchgear and control gear.	IS-10118	
20	Voltage bands for electrical installations including preferred voltages and frequencies.	IS-12360	
21	Energy efficient induction motors-three phase squirrel cage	IS-12615	
22	Guide for short circuit calculations in three phase AC systems.	IS-13234	
23	Electrical apparatus for explosive gas atmospheres - General requirements.	IS/IEC 60079-0	
24	Equipment protection flameproof enclosures "d"	IS/IEC 60079-1	
25	Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"	IS/IEC 60079 : PART 2	

S.No.	Description	Standards / Codes	Edition
26	Electrical Apparatus for explosive gas atmospheres - Powder filling 'q'	IS/IEC 60079 : PART 5	
27	Electrical apparatus for explosive gas atmospheres - Oil immersion "o"	IS/IEC 60079 : PART 6	
28	Electrical apparatus for explosive gas atmospheres Increased safety type "e"	IS/IEC 60079 : PART 7	
29	Explosive Atmospheres Part 10 Classification of Areas Section 2 Combustible dust atmospheres	IS/IEC 60079 : PART10-2	
30	Explosive atmospheres: Part 11 equipment protection by intrinsic safety "i"	IS/IEC 60079 : PART 11	
31	Explosive Atmospheres: Electrical Installations Design, Selection and Erection	IS-16724/ IEC 60079 : PART 14	
32	Electrical apparatus for explosive gas atmosphere -Part-15 Construction, test and marking of type of protection "n" electrical apparatus	IS/IEC 60079 : PART 15	
33	Explosive atmospheres: Part 18 equipment protection by encapsulation "m"	IS/IEC 60079 : PART 18	
36	Explosive atmospheres: Part 31 equipment dust ignition protection by enclosure "t"	IS/IEC 60079 : PART 31	
37	Code of practice for the protection of buildings and allied structures against lightning.	IS/IEC- 62305	
38	Recommended practices on static electricity	OISD-RP-110	
39	Classification of Area for electrical installation at Hydrocarbon Processing and handling facilities	OISD STD-113	
40	Inspection and safe practices during electrical installation	OISD-RP-147	
41	Design aspects for safety in electrical systems	OISD-RP-149	
42	Fire Protection System for Electrical Installations	OISD STD 173	
43	Lightning Protection	OISD-GDN-180	
44	National Electrical Code (NEC) - BIS Publication.	SP-30	
45	Rotating Electrical Machines - Efficiency classes of line operated AC motors	IS/IEC 60034-30-1	
46	Electrical apparatus for use in the presence of combustible dust: Selection and installation	IS/IEC 61241-14	
47	Electrical apparatus for use in the presence of combustible dust: Type of protection "pD".	IS/IEC 61241-4	

S.No.	Description	Standards / Codes	Edition
48	Recommended Practice for Lightning Protection of Aboveground Storage Tanks for Flammable or Combustible Liquids	API-RP-545	

3.0 GENERAL / DESIGN CONSIDERATIONS

S.No.	Project Philosophy
1	LV - Low Voltage. The voltage which does not normally exceed 250 V.
2	MV - Medium Voltage. The voltage which normally exceeds 250 V and does not exceed 650 V.
3	HV - High Voltage. The voltage which normally exceeds 650 V but does not exceed 33 kV.
4	EHV - Extra High Voltage. The voltage which exceeds 33 kV under normal condition.
5	FRP Canopy shall be provided for all outdoor equipment except transformers and Capacitor Banks.
6	Circuit breaker provided for PCC/ EPCC/ MCC/ ASB/ LDB/ ELDB incomer shall be 4 Pole type.

4.0 SPECIFIC DESIGN REQUIREMENTS

S.No.	Project Philosophy
1.0	***Equipment numbering philosophy for electrical equipment in this petchem project shall be as listed below (@@@- denotes substation number):*** ***220/69kV Power Trafo.: @@@-TR-011*** ***66/6.9kV Power Trafo.: @@@-TR-021*** ***33/6.9kV Power Trafo.: @@@-TR-031*** ***6.6/0.433kV Dist. Trafo.: @@@-TR-041*** ***415/415V Normal/Emergency Ltg. Trafo.: @@@-TR-061*** ***220kV GIS switchboard: @@@-EHV-101*** ***66kV GIS Isolator: @@@-HV-111*** ***66kV GIS: @@@-HV-102*** ***33kV GIS Isolator: @@@-HV-121*** ***6.6kV Isolator: @@@-HV-211*** ***6.6kV Switchboard: @@@-HV-201*** ***415V Normal/Emg. Power PCC: @@@-PCC-301*** ***415V Normal/Emg. Power MCC: @@@-MCC-311*** ***415V Normal/Emg. Lighting: @@@-LB-331*** ***415V Aux. Power: @@@-ASB-351*** ***Normal lighting panels: @@@-LP-501*** ***Emg. Lighting panels: @@@-ELP-531*** ***Power panels: @@@-PP-601*** ***Space heater panels: @@@-SHP-631*** ***Power panels for Instrumentation: @@@-PPI-661*** ***110V DCDB: @@@-DCDB-701*** ***110V UPS-ACDB: @@@-ACDB-711*** ***ECS panels: @@@-IFP/IRP/RTU-901*** ***Marshalling panels: @@@-DCSMB/ECSMB-911*** ***Tag number indicated above is for the first equipment in the series of that type.***

S.No.	Project Philosophy
2	***5 years comprehensive AMC charges for UPS, DC chargers, SAS, ECS (including EMS), VFDs/Soft starters (except air fin coolers), TCP and Nitrogen Injection Fire protection systems (NIFPS) shall be taken into account while evaluating the offer. Placement of this comprehensive AMC will be done after expiry of the guarantee period.***
3	Miscellaneous Requirements
3.1	All push button stations shall be provided with 2 nos. earthing lugs/studs.
3.2	***Sufficient no. of 240 volts flame proof plug points along with 240/24 volts flame proof transformer units shall be provided in the plant for shutdown purpose. In the column near each man way minimum TWO no. 240 volts flame proof plug point along with one no. 240/24 volts flame proof transformer unit to be provided. Transformer unit shall be suitable for connecting two nos. flame proof hand lamps. Also sufficient no. of 3 phase 4 wire FLP welding receptacles shall be provided at suitable location near each columns and heaters, at least ONE 3 Phase Welding receptacles near each column & heater.***
3.3	Paint Shade for Electrical equipment"s shall be as below: a) RAL-7032 (for Indoor Equipment) b) 632 as per IS-5/RAL-7031 (for Outdoor Equipment) c) Paint shade of the motor shall be grass green shade No. 218.
3.4	All the MCCs shall be intelligent type with intelligent motor protection relays for all the motors having rating less than 55 KW. All the PLC and DCS signals shall be through relay logic. The iMCCs shall be fully integrated with DCS through Modbus, Ethernet communication.
3.5	***Motor having 1.2 MW or above capacity shall have differential protection. In case the motor is having provision for both VFD and direct on line, necessary provision shall be considered so that differential CT circuit gets by-passed whenever the motor is running in VFD mode.***
3.6	***VFD (critical), failure of which, causes tripping of plant shall have 100% hot standby facility with redundant PLC (with individual signals from field/control room to respective PLC)***
3.7	Shroud shall be provided on the stop push button of LCP/LCS
3.8	Cable trays used shall be GI coated of 100 micron thickness. All the hardware used for joining the cable trays shall be of SS-316 material. However for cooling tower area and CWPH, FRP trays shall be used.
3.9	All cables shall be supplied in metallic drums as specified in the data sheet. Each drum shall have the BPCL PO no., BPCL Project Electrical & BPCL Project Name mentioned on both sides of the drum. The cable shall have BPCL Project Name-Electrical printed on the cable outer sheath at regular intervals.
3.10	Cable tray earthing shall be done by laying GI strip or earthing cable along the cable tray and earthing the tray at every 25m interval.
3.11	Wherever welding has been done on the cable tray, an anti-rust zinc coating shall be provided for preventing rusting of cable tray.
3.12	LIGHTNING PROTECTION: Risk assessment against Lightning strike on plant structure, buildings (including Control room, SRR, Substation), Pump house sheds and tanks etc. shall be carried out as per OISD-GDN-180, IS/IEC 62305 and API-RP-545. Based on risk level assessment mitigation arrangement required to lower the risk less than tolerable limit shall be carried out. In buildings where solar panels have been provided, lightning protection shall be taken care accordingly.
3.13	For temporary electrical installation, requirement of Cl. no. 7 of OISD-147 shall be followed.
3.14	***For maintenance 3 phase (415V 3P + N + E), 125A Power sockets shall be provided so as to ensure complete coverage of the plant through 50 meter radius.***

S.No.	Project Philosophy
3.15	Convenience outlets (240V) 15/5 A shall be provided so as to ensure complete coverage of the plant through 20 meter radius. Near the manholes of the vessels 24V transformer unit shall be fixed type and shall be provided with single hand lamp at each man hole. Design of the sockets shall be such that 240V and 24V plugs are not interchangeable.
3.16	***The following minimum standard equipment shall be supplied in each substation:*** ***Fire extinguishers (type Co2 and Dry chemical powder), 1 pcs framed key diagram of electrical system(SLD), Discharge earthing rod-2 sets, first aid kit & Breaker trolley (1 no. suitable for each type)***
3.17	Solar power fencing system shall be provided for new boundary wall.
3.18	Independent LCS with ammeters shall be provided for all the auxiliary motors of HVAC system i.e. cooling water pump motors, condensate pump motors, chiller pump motors etc. These LCS shall have LOTO facility.
3.19	***LOTO system facility (Box, lock & Key, HASP,Wire etc.) shall be provided in each substation.***
3.20	***In every manned generating station, sub-station or switching station of voltage exceeding 650 V, an artificial respirator shall be provided and kept in good*** ***working condition.***
4.0	Following clause-wise modifications / additions to Design Philosophy (6-51-0099 Rev.7) shall be applicable:
4.1	Clause 4.1 System Design Philosophy First line to be modified as Safety to personnel and equipment both during Installation, testing, commissioning, operation and maintenance.
4.2	Clause 4.6.2 Note-c) Voltage Drops The subject note shall be read as "For MV motors, the voltage available at the motor terminals must not be less than 80% of rated voltage during start up and reacceleration. However, motor shall be able to start up at 75% of the rated voltage available at the motor terminals."
4.3	Clause 4.10.3 Protection and metering schemes The subject clause gets modified as "Metering shall be provided to keep a record of power and cumulative energy consumption and supervision of all concerned parameters....."
4.4	Clause 4.17.6 Electrical Surface Heating System Add a new clause as "For Electrical Heat Tracing system, temperature sensing device shall be RTD. Controllers with all requisite status and control signals shall be provided accordingly. These signals shall be also wired upto control room including supply of cables by vendor."
4.5	***Clause 4.12 Emergency Power supply system for UPS and DC system shall be as below:*** ***a) For UPS system – UPS-1 incomer shall be fed from EPMC/EPCC, whereas UPS-2 & SVR (bypass) shall be fed from PMCC/PCC.*** ***b) For DC system (switchgear control & critical lighting) – charger-1 shall be fed from EPMC and charger-2 shall be fed from PMCC/PCC.***
4.6	Clause 4.15.2 Plant Communication System The subject clause gets modified as "Each exchange shall be designed to have at least 20% spare capacity"
4.7	Clause 4.15.4 Plant Communication System Add a new clause as "Call station shall have min 4 keys. One for master, one for slave to slave and two spare."
4.8	Clause 4.16.4 Fire Detection and Alarm System The subject gets modified as "Each panel and each loop / zone shall have at least 20% spare capacity.
4.9	Clause 4.16.7 Fire Detection and Alarm System Add a new clause as "Manual fire call point as per OISD requirement."
4.10	***DELETED***
4.11	***DELETED***

S.No.	Project Philosophy
4.12	Clause 5.3.7 Switchgear In the subject clauses Future load growth of 20% shall be considered instead of 10%.
4.13	Clause 5.3.9 Switchgear The subject clause gets modified as "Circuit breaker / contactors controlling motor feeders shall have a rating of at least 150% of the maximum continuous rating instead of 125% of the connected load."
4.14	Clause 5.3.12 Switchgear Add at the end of the clause "Breaker rating shall be in-panel rating"
4.15	Clause 5.3.14 Switchgear Add at the end of the clause "Motors 55KW and above shall be provided with air circuit breaker having DC control supply for closing and tripping purpose."
4.16	***Clause 5.3.15 Switchgear Add at the end of the clause "1 no. PCC at each substation shall be provided with one 800A feeder on each side to feed construction power supply. The construction power supply module shall be equipped with numerical relay having all necessary protections, energy meter and CBCT with sensitive earth fault protection along with other protection. However, these feeders shall not be considered in transformer sizing."***
4.17	Clause 5.3.16 Switchgear The subject clause gets modified as "For ALL motors, CT in Y phase shall be provided in switchboard for remote metering."
4.18	Clause 5.3.17 Switchgear Add at the end of the clause " ACBs/MCCBs/Switches of I/Cs & B/C of MCC, ASB, LDB & ELDB shall have 4 poles".
4.19	Clause 5.3.19 Switchgear Add a new clause "In HV switchgear, horizontal bus bar size in the complete board shall be of same size. Similarly size of the bus bar from horizontal bus to breaker and breaker to outgoing shall be designed based on breaker rating and not on CT/feeder rating."
4.20	Clause 5.3.20 Switchgear Add a new clause "Bus bar material for PCC & MCC shall be Electrolytic grade Aluminium / Copper and Neutral bus bar size shall be same as phase bus bar size."
4.21	Clause 5.4 Bus Duct Add at the end of the clause "Bus bar material shall be Electrolytic grade Aluminium / Copper and Neutral bus bar size shall be same as phase bus bar size."
4.22	Clause 5.7.1 DC Power Supply System The subject gets modified as " ------- DC distribution board. Charger shall be dual redundant type with separate battery set (2 sets with 100% capacity for switchgear protection and control & 1 set with 100% capacity for DC Emergency Lighting) for each charger."
4.23	Clause 5.7.3 DC Power Supply System In the subject clause 20% spare capacity for future load growth shall be considered instead of 10%.
4.24	Clause 5.7.5 DC Power Supply System In the subject clause 20% Spare feeders for future use shall be considered instead of 10%
4.25	Clause 5.8.4 Uninterrupted Power Supply System In the subject clause 20% Spare feeders for future feeders shall be considered instead of 10%.
4.26	Clause 5.8.3 Uninterrupted Power Supply System In the subject clause 20% Spare capacity for future load growth shall be considered instead of 10%
4.27	Clause 5.8.6 Uninterrupted Power Supply System Add a new clause "ACDB shall have current and voltage transducer to give signal to DCS for total current & voltage. Same to be connected to DCS also apart from other UPS alarm."
4.28	Clause 5.11.7 Emergency Generator Add a new clause "The Emergency generator shall have brushless excitation system with PMG & Pilot excitor or rotating diodes."
4.29	Clause 5.11.8 Emergency Generator Add a new clause "In house breaker shall be provided near Emergency generator set for positive isolation.
4.30	Clause 5.11.9 Emergency Generator Add a new clause "Emergency Generator shall have auto/ manual synchronizing facility for trial/ going on load/ offload."
4.31	Clause 5.13.3 and 5.13.4 Cables and Wires In the subject clause XLPE insulated cables shall be considered instead of PVC insulated cables.

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4.32	Clause 5.13.8 Cables and Wires In the subject clause considering 20% future load growth, all incoming cables to switchgear/UPS/DC system/ DB's and other equipment shall be sized instead of 10%. Cable for capacitor banks shall be sized for 135 % of the rated capacitor current.
4.33	Clause 5.13.9 Cables and Wires The subject clause gets modified as "The incoming cable for heat tracing power distribution panel and lighting distribution board shall be with four cores....."
4.34	Clause 5.13.12 Cables and Wires Add a new clause "Outer sheath shall be FRLS for all the cables and wires."
4.35	***Clause 5.13.13 Cables and Wires Add a new clause "For LAN and electronic data transfer, only fiber optic cables shall be used."***
4.36	Clause 5.15.3 Convenience Receptacles The last line of the subject clause gets modified as "..... In hazardous areas as well as in safe areas flameproof hand lamps shall only be rated for 24V & shall be LED based"
4.37	***Clause 5.16.3 Actuators for Motor Operated Valve Add new clause "MOVs shall be installed away from the heat source (radiated heat) so as to avoid failure of electronic cards due to the heat or MOV control shall be away from the heat source. If this is not possible, feasibility of having control unit located at suitable location shall be explored during detailed engineering".***
4.38	***Clause 5.20 Add a new clause "Conformal coating shall be done for all PCB, electronic equipment as per min. Class 3C2 (Harsh environment) of IEC 60721-3-3. Alternatively, it shall comply with ANSI/ ISA S71.04 class G3 or IEC 60068-2-60 for mixed flow gas test or ASTM B845. Supporting documents shall be provided for the same"***
4.39	Clause 6.5 Substation / MCC Room Design Philosophy In the subject clause instead of rolling shutter door MS door in two parts shall be provided.
4.40	Clause 6.8 Substation / MCC Room Design Philosophy The subject clause gets modified as "------ Light fittings in this room shall be flameproof LED type. -------The battery room shall be provided with minimum two nos. flameproof exhaust fans..... No switches shall be provided inside the battery room."
4.41	Clause 6.9 Substation / MCC Room Design Philosophy Add at the end of the clause "Excitation panel, Digital voltage regulator panels & PLC based thyristor control panel shall also be located in air conditioned room."
4.42	Clause 6.11 Substation / MCC Room Design Philosophy The last line of clause gets modified as "Fire protection for transformers and switchgear room shall be provided to comply with the requirements of OISD-STD-116,117, 173 and as per latest CEA rules."
4.43	Clause 7.1 Installation Design Philosophy The 2nd line of the subject clause gets modified as ".... Shall generally conform to EIL/BPCL standard specifications and installation standards".
4.44	***Clause 7.2.1 Cabling System at the end of the clause following shall be added "Preferably, total cable route connected to fire water pump/motors starting from receiving substation to Fire water pump house shall be through a built-in RCC cable trench"***
4.45	Clause 7.2.2 Cabling System In the 2nd line of the subject clause instead of sand, trenches in hazardous areas shall be filled up with stone dust.
4.46	***Clause 7.2.5 Cabling System In the 1st line of the subject clause instead of 10%, 20% space for future cables shall be considered on cable trays, racks and trenches.***
4.47	***Clause 7.3.6 Earthing System Add new bullet point, All values shall comply to latest revision of OISD Std. – 137.***

S.No.	Project Philosophy
4.48	Clause 7.3.12 Earthing System Add a new clause "If required/ suggested by the original equipment manufacturer of electronic equipment"s like UPS, Excitation voltage regulator, Numerical Relays, LCP etc. dedicated clean earth shall be provided by having dedicated earth pits."
4.49	Clause 7.4.5 Lighting System The 3rd last line of the subject clause gets modified as "Adequate number of self contained flameproof portable hand lamps and battery operated....."
4.50	***Clause 7.4.8 Lighting System The subject clause gets modified as ".....Tall structure shall have aviation obstruction LED based lighting as per statutory requirements."***
4.51	***Clause 5.16.4 Actuators for Motor Operated Valve Add new clause "All MOV actuators shall be non-intrusive type."***
4.52	***Clause 5.16.5 Actuators for Motor Operated Valve Add new clause " Fire safe Electric Actuators shall be provided with Intumescent paint for fire proofing and same shall be suitable for 30 minutes. Fire Proofing shall be ensured as per UL-1709 for hydrocarbon fire."***
4.53	Clause 5.3.8 Switchgear : The subject clause gets modified as "Spare outgoing feeders shall be provided in all switchgear. For HV switchboards, the number of spares shall be as indicated in SLD. For other switchboards (and where not specifically indicated in SLD), at least one number of each type of outgoing feeder or 20% of each type of outgoing feeder, whichever is more, shall be provided as spare in the switchboard."
4.54	Clause 5.13.4 Cables and Wires : The subject clause gets modified as "The control cables shall be twisted pair, copper conductor, XLPE insulated, armoured, extruded FRLS PVC outer sheathed and individual & overall shielded. Control cables with twisted pair and shielding shall also be provided for specialized applications i.e. for CT secondary current, differential protection, restricted earth fault protection, etc."
4.55	***Clause 5.13.10 Cables and Wires : The subject clause gets modified as "All control cables shall have minimum 10% spare pairs, except that control cables having up to seven pair shall have one pair as spare."***
4.56	Clause 4.16.1 Fire Detection and Alarm System Add at the end of the clause "The system shall be connected to nearest control room and fire station control room through redundant fibre optic network. FA panel shall have Modbus connectivity features for interfacing with DCS system in lieu of repeater panel".
4.57	Clause 5.3.17 Switchgear In the subject clauses maximum rating of bus-bars 800A for ASB/LDB/ELDB shall be considered instead of 1250A.
4.58	Clause 5.14.4 Control station Add a new clause as "Stop Push button shall have provision of putting LOTO locks and padlocks."
4.59	Clause 5.10.1 HV Capacitor Banks Add at the end of the clause "Dry type series reactor shall be used for capacitor banks. Dry type series reactor shall not be integrated with capacitor cubicle and shall be separate standalone panel."
4.60	***Clause 5.14.1 Control station Add at the end of the clause "For air cooler motors, Emergency stop push button station shall have ammeter and stop push button at grade level."***
4.61	Clause 5.16.6 Actuators for Motor Operated Valve Add new clause "MOVs shall be explosion proof and suitably fire rated of 1100 deg. C for 30 min duration."
4.62	Clause 6.15.j The subject gets modified as "Battery rack to wall clearance for Single row, single/double tier & Double row, single tier as 750mm instead of 100mm.

S.No.	Project Philosophy
4.63	***Clause 4.1 System Design Philosophy, Add at the end of the clause " "All motors efficiency class shall be IE3 (for Hazardous area) / IE4 (safe area). Distribution transformer upto 2500 kVA shall be minimum energy efficiency level 2 / Table-3 of GOI notification dtd 08 Dec 2023, BEE star rating 2 (including latest GOI notifications). All lighting fixtures shall be LED type. Intelligent MCC (i-MCC) shall be considered for MV switchboards (draw-out type).***
4.64	***Clause 4.4.1 Capacity of Electrical system, Add at the end of the clause "Electrical system shall be designed to suit single feeder operation. However in case of three incomers any two incomers shall be able to take full load of the system."***
4.65	Clause 4.10.1 Protection and Metering Schemes, Add sr. no. "d) Type 2 coordination for LV system shall be ensured"
4.66	Clause 4.11.1 DC Power Supply, Add at the end of the clause "Critical Lube oil pumps of generators/ critical equipment or as specified by OEM/Process Licensor."
4.67	cl. no. 4.19: Add the following: For Existing refinery revamp - New ECS & EMS system shall be considered of same make as existing system. OEM basis. For Petchem - Separate new ECS & EMS system shall be considered. The same need not be on OEM basis.
4.68	Clause 4.6.1 (Note-2) shall be replaced with the following "In case of difficulty in achieving specified voltage drops in cables up to lighting panel, total 5% drop from Auxiliary switchboard/ LDB up to lighting points may be permitted".
4.69	New cl. no. 5.3.19: Add "LOTO facility shall be provided in switchgear."
4.70	cl. no. 4.15: Add the following: For Existing refinery revamp - New Plant communication system shall be considered of same make as existing system. OEM basis. For Petchem - Separate new Plant communication system shall be considered. The same need not be on OEM basis.
4.71	cl. no. 4.16: Add the following: For Existing refinery revamp - New Fire alarm system shall be considered of same make as existing system. OEM basis. For Petchem - Separate new Fire alarm system shall be considered. The same need not be on OEM basis.
4.72	cl. no. 5.7.1: Add the following "DC system for switchgear control: refer attached sketch (option-II), however the battery bank shall be 2x100%. DC system for Lighting: Refer attached sketch (option-II), with 1x100% battery bank."
4.73	cl. no. 5.8.1: Add the following "UPS system shall be as per attached sketch (option-III), however the battery bank shall be 2x100%"
4.74	cl. no. 5.11.5: replace the following "The Emergency generator set shall have at least 20% spare capacity for meeting future requirements"
4.75	cl. no. 6.15: Add sl. no. o as "Spacing between the two LT panels where the breakers are mounted shall be minimum 2 meters."
4.76	New cl. no. 6.22: Add "SLD of HT board shall be painted behind the HT board indicating the bus bar arrangement."
4.77	New cl. no. 6.23: Add "All the modules shall have stickers (Yellow background with black letters) or letter painting indicating KW, cable size, FLC at front and back for HT and front for LT. A bigger size sticker having list of motor tag nos. and module no. shall be pasted on both side of the panel end covers"

S.No.	Project Philosophy
4.78	New cl. no. 6.24: Add "All spare cut outs in sub-station floor shall be properly marked and flushed with floor level"
4.79	New cl. no. 6.25: Add "Spare entries in panels, gland plates shall be blocked to avoid dust and vermin ingress."
4.80	New cl. no. 6.26: Add "Insulation paint (epoxy coating) shall be applied in substations as per the highest system voltage in respective substations subject to market availability."
4.81	New cl. no. 6.27: Add "All HT tools, First aid Box etc. shall be provided and located at an earmarked place in sub-station and labelled."
4.82	New cl. no. 6.28: Add "Two nos. (min.)gas masks shall be provided conspicuously and installed and maintained at accessible places for use in the event of fire or smoke."
4.83	New cl. no. 6.29: Add "Fire buckets filled with clean dry sand and ready for immediate use for extinguishing fires in addition to fire extinguishers suitable for dealing with fires, shall be conspicuously marked and kept in all generating stations, enclosed sub- stations and switching-stations in convenient location."
4.84	New cl. no. 6.30: Add "In every manned generating station, sub-station or switching station of voltage exceeding 650 V, an artificial respirator shall be provided and kept in good working condition"
4.85	New cl. no. 6.31: Add "Instructions, in English or Hindi and the local language of the District and where Hindi is the local language, in English and Hindi for the resuscitation of persons suffering from electric shock, shall be affixed; in a conspicuous place in every generating station, enclosed sub-station, enclosed switching station"
4.86	***New cl. no. 6.32: Add "415V, 400A DB (FLP) total 4 nos. shall be provided at suitable locations in each process unit of petchem in consultation with BPCL. It is proposed to take the supply source for this DB from the ASB/EPCC of same substation having DG backup."***
4.87	New cl. no. 6.33: Add "10/20 Pairs telephone cable shall be laid from nearest existing telephone JB to the plant end (for Hazardous area - analogue telephones)"
4.88	New cl. no. 6.34: Add "All new substations shall be connected to MRS through fibre optic cable network. FO cable laying can be planned along with Power cable from MRS. All interfacing shall be through OFC cables such as differential protection, inter-tripping & ECS connectivity etc."
4.89	New cl. no. 6.35: Add "Fire proofing of all substation entries for cable / bus duct shall be done."
4.90	cl. no. 7.2.3: In the statement "30 m" shall be read as "15 m"
4.91	cl. no. 7.2.14: Add the following after the statement "GI cover shall be considered for top most cable tray and bottom of the lowest cable trays shall also be covered with GI sheet. GI type sheet shall be selected based on the type of cable trays. Tray cover shall be provided for the outermost trays of vertical droppers."
4.92	cl. no. 7.4.12: The statement shall be read as "Lighting system design shall be based on minimum illumination levels as specified in latest PNGRB guidelines"

5.0 OWNER / CLIENT SPECIFIC REQUIREMENTS

5.1 SITE CONDITIONS

S.No.	Description	Selected Option	Available Options
1	Equipment design temperature	45 DEG C	a)40 DEG C b)45 DEG C c)50 DEG C d)Any other
2	Relative humidity	86%	

S.No.	Description	Selected Option	Available Options
3	Soil Resistivity	As per soil investigation report	
4	Minimum temperature. for battery sizing	10 DEG C	a)10 DEG C b)20 DEG C c)Any other
5	Minimum temperature For Electric heat tracing	1.1 DEG C	
6	Altitude above mean sea level	Less than 1000m above MSL	a)Less than 1000m above MSL b)Any Other
7	Maximum temp	48 DEG C	
8	Minimum temp	1.1 DEG C	
9	Pollution level for outdoor equipment	Heavy	a)Light b)Medium c)Heavy d)Very heavy

5.2 POWER SOURCE DETAILS

S.No.	Description	Selected Option	Available Options
1	Power System	220kV system (Independent system) For Petchem. 33kV System for BINA Refinery.	a)Grid Supply b)In house CPP c)Grid supply with CPP d)Existing electrical system
2	Grid Supply	220kV from MPSEB for PETCHEM.	a)Yes b)No (Below Clause is not applicable)
2.1	Name of sub station	***400kV MPPTCL substation Bina***	
2.2	Number of feeders	***2 circuits (DCDS)***	
2.3	Length of feeder	***21 KM***	
2.4	Type /size of conductor/ cable size	* __ sqmm	
2.5	Voltage	220 kV ± 10%	
2.6	Frequency	***50 Hz ± 5%***	
2.7	Maximum fault level		*
2.7.1	3 Phase fault	***12615.04 MVA***	
2.7.2	1 Phase fault	***10739.69 MVA***	
2.7.3	X/R Ratio	*	
2.8	Minimum fault level	* kA, sec.	
2.9	Design fault level	50 kA for 3 sec.	
2.10	Basic Insulation Level	460 kV / 1050 kV	
2.11	System neutral Earthing	Solid Grounded	
2.12	Parallel operation of incomers	Yes*	a)YES b)NO
2.14	PLCC requirement	Yes	a)YES b)NO
3	CPP and its configuration		
3.1	Type of Generator	STG	a)STG b)GTG
3.1.1	Number of Generators	REFER CPP DESIGN BASIS	

S.No.	Description	Selected Option	Available Options
3.1.2	Rating of Generator/Voltage/P.f	REFER CPP DESIGN BASIS	
3.1.3	Requirement of Generator Circuit Breaker	No	a)YES b)NO
3.2	Parallel operation with grid	Yes*	a)YES b)NO
3.3	Black Start DG Envisaged	As per CPP Design Basis	a)YES b)NO
3.4	Electricity duty metering	*	a)YES b)NO
4	Existing System	220kV Grid with Internal Generation	
4.1	Name of Substation	Existing Substation	
4.2	Voltage rating	33 kV	
4.3	Maximum fault level	*	
4.4	Design fault level	40 kA for 1 sec.	
4.5	System neutral earthing	Solid earthed	
4.6	NGR rating (if applicable)	Not Applicable	
5	Emergency generator	Centralised (REFER NOTE-1)	a)Centralised b)Distributed
5.1	Generator Voltage	6.6kV	a)6.6KV b)415V c)Any Other
5.2	Parallel operation with other sources	Momentary Paralleling However during load trial, continuously paralleling with grid is also envisaged.	a)Momentary Paralleling b)Continuously Paralleling
5.3	Auto Starting	Yes	a)YES b)NO
5.4	Type of Emergency Generator	*	a)Diesel b)Gas
6	Solar Power System		
6.1	Solar PV System	Provided	a)Provided b)Not provided
6.2	Buildings on which solar power system to be mounted	Non Plant Building, Admin Building. Further Sub-station, Control Room & Warehouse not associated with Process Units	
6.3	Technology	Silicon Crystalline (Mono/Poly)	a)Silicon Crystalline Mono b)Silicon Crystalline Poly c)Silicon Crystalline (Mono/Poly)
6.4	Battery	Not Provided	a)Provided b)Not Provided
6.5	Connectivity	Local Switchboard	
6.6	Monitoring System	Data logger based connection to SAS	a)Data logger based connection to SAS b)Internet web based with HMI

**** - New Power System selection option shall be finalised after detailed study by MPPPTCL.***

Note:-

1. The rating and Qty. of emergency Generator sets shall be finalized during detailed engineering.The emergency Generator set for the plant shall cater to emergency loads of various units,utility and offsite areas.

2. Based on Process Licensor/ Flare Loading, the emergency generator option (distributed / centralized) shall be selected during detail engineering. However, preferred option shall be centralized Emergency generator with black start facility.

3. For Bina refinery power distribution is 33KV & 6.6 KV level from Existing substation. For new refinery unit loads, Power distribution will be 33KV & 6.6 KV.

4. Power factor correction with APFC control shall be at 6.6kV bus. Exact value of Power factor at load centre & grid connection shall be ascertained during detail engineering.

5. Location of solar inverter: Installed in switchgear hall either floor or wall mounted as per site condition as suggested by PMC/EPCM.

6. Power distribution for the new petchem complex shall be as below:
a) Normal power - through 220kV Grid
b) Emergency power - through Diesel generator (DG)
c) Critical/Most Essential power - Being fed from existing CPP having existing grid backup.

5.3 POWER SUPPLY DISTRIBUTION SYSTEM

5.3.1 VOLTAGE AND FREQUENCY VARIATION

S.No.	Description	Selected Option	Available Options
1	AC System		
1.1	Voltage	For Bina Refinery 33kV/6.6kV/415V ± 10% For Petchem 220kV/66kV/6.6kV/415V ± 10%	a) 11kV/6.6kV/415V ± 10% b) 33kV/6.6kV/415V ± 10% c) 66kV/6.6kV/415V ± 10% d) 66kV/11kV/415V ± 10% e) Other
1.2	Frequency	***50 Hz ± 5%***	a)50 Hz ± 3% b)60 Hz ± 3%
2	DC System		
2.1	Electrical protection and Control system	110V ± 10%	a)220V ± 10% b)110V ± 10%

S.No.	Description	Selected Option	Available Options
2.2	DC critical Lighting system	110V ± 10%	a)220V ± 10% b)110V ± 10%
2.3	Instrumentation Power Supplies	Refer Instrumentation Design Basis	

Note:
1.0 Refer section 5.6.10 of this document for design voltage/frequency variation for motors.

2.0 110 V DC control supply shall be considered for 220 KV GIS substation at Petchem and for all other substations.

5.3.2 UTILISATION VOLTAGE

S.No.	Description	Selected Option	Available Options
1	Primary EHV/HV distribution voltage	33kV (For Bina Refinery) 66kV (For Petchem)	a)33kV b)66kV c)11kV d)Any other
2	Secondary HV distribution voltage	6.6kV	a)11kV b)6.6kV c)3.3kV d)Any Other
3	Primary EHV/HV distribution system neutral Earthing	Solidly Earthed	a)Solidly Earthed b)NGR c)Unearthed
4	Secondary HV distribution system Neutral Earthing	NGR	
5	HV motor voltage for DOL	6.6kV (For motors rating > 132kW)	
6	MV motor voltage	415 V AC (DOL)(For motors rating 0.18<=kW<=132)	
7	AC Motors	240V AC (except MOVs) (For motors rating < 0.18kW)	
8	DC Motor	110V DC (if required)	
9	Motor operated valves	415V AC, TP	
10	Battery chargers incoming power supply	415V AC,TPN	
11	UPS System incoming power supply	415V AC,TPN	
12	AC Lighting/Power Panels	415V AC,TPN (incoming power supply)	
13	Auxiliary Boards incoming power supply	415V AC,TPN	
14	Welding Receptacles	415V AC,TPN	
15	Electrical heaters	415V AC, TP	
16	Normal Lighting/Emergency Lighting	240V AC,SPN	
17	LAN UPS Output Voltage	***230V AC,SPN***	

1. Utilisation Voltage for Convenience outlets shall be 240 VAC, SPN.

2. For higher rated motors such as MAB, WGC etc.(in ECU) & Extruder (in PPU/LLDPE) etc, input supply shall be provided at 66kV level respectively which will be step-down to suitable voltage level for feeding respective motors.

3. Contactor shall close satisfactorily at any value between 85 % and 110 % of their rated control supply voltage. The limits between which contactors shall drop out and open fully shall be between 75 % to 20 % for a.c. The drop off voltage shall be governed by following criteria and same shall be finalized during detailed engineering:-Process critical motors/Electrical system stability.

4) The above S. no. 5 & 6 are related to DOL motors. For VFD fed motors refer Cl. no. 5.6.15.

5) following new subclauses for utilisation voltage shall be added as:
a) Rim seal UPS : 230V AC, SPN
b) Weigh bridge: 230V AC, SPN

5.3.3 UTILISATION VOLTAGE FOR CRITICAL SUPPLIES

S.No.	Description	Selected Option	Available Options
1	Switchgear protection control power supply	110V DC (Note-1)	a)220V DC b)110V DC
2	Critical lighting power supply	110V DC	a)220V DC b)110V DC
3	Input power supply for Plant communication system	240V AC SPN (With Dedicated battery back up)	a)240V AC SPN (With Dedicated battery back up) b)110V AC UPS
4	Input power supply Fire alarm system	240V AC SPN (With Dedicated battery back up)	a)240V AC SPN (With Dedicated battery back up) b)110V AC UPS
5	Power supply for electrical annunciation panel	Not Applicable	a)220V DC b)110V DC
6	Control supply for VFD/ Soft-Starter/ Thyristor Panel	230V AC UPS	a)110V DC b)220V DC c)110V AC UPS d)230V AC UPS
7	Normal Instrumentation power supply	Refer Instrumentation design basis	
8	Critical instrumentation power supply	Refer Instrumentation design basis	
9	Instrumentation Shut-down system power supply	Refer Instrumentation design basis	
10	DC system for lighting and switchgear control	Separate	a)Separate b)Common

Notes: 1.
110 V DC control supply shall be considered for 220 KV GIS substation at Petchem and for all other substations.

5.3.4 SYSTEM NEUTRAL EARTHING

S.No.	Description	Selected Option	Available Options
1	EHV System	Solid earthed	a)Solid earthed b)Resistance earthed
2	HV System	6.6kV (Resistance earthed) 33kV (Solid earthed)	a)Solid earthed b)Resistance earthed c)Unearthed
3	415V System	Solid earthed	a)Solid earthed b)Resistance earthed
4	GT/ST Generator with generator transformer	NGT	a)NGT b)NGR c)Solid earthed d)Unearthed
5	GT/ST Generator without generator transformer	Not Applicable	a)NGT b)NGR c)Solid earthed
6	Emergency Generator-HV System	NGR	a)NGT b)NGR c)Solid earthed
7	Emergency Generator-415V System	Solid earthed	a)Solid earthed b)Resistance earthed
8	NGR rating- HV System	___A	
9	NGR rating- 415V System	___A	

5.3.5 OPERATING PHILOSOPHY

S.No.	Description	Selected Option	Remarks
1	Auto/Manual transfer at primary distribution voltage bus with momentary paralleling	YES (continuous parallel operation)	a)NA b)YES c)NO
2	Auto/Manual transfer at secondary distribution voltage bus with momentary paralleling	Yes (Continuous parallel operation)	a)YES b)NO
2.1	Bus transfer scheme	Normal	a)Fast b)Normal c)NA
3	Auto /Manual transfer at MV with momentary paralleling		
3.1	At PCC/EPC/EPMCC Level	Yes (Note-1)	a)YES b)NO c)OTHER
3.2	At MCC Level (In case ACB incomers and Bus couplers)	Not Applicable (Note-2)	a)YES b)NO c)OTHER
3.3	At ASB/ LDB Level	No (including MCC level)	a)YES b)NO c)OTHER
4	Continuous Parallel operation of Incomers		
4.1	Primary EHV/HV voltage	Yes for 220kV & 66 kV GIS switchboards at Petchem & 33kV GIS switchboards at Bina Refinery.	a)YES b)NO

S.No.	Description	Selected Option	Remarks
4.2	Secondary HV voltage	Yes	a)YES b)NO
4.3	PCC/PMCC	No	a)YES b)NO
5	Power Factor Correction	Required	
5.1	Power factor improvement capacitors- location	6.6kV bus with APFC	a)6.6kV bus b)415V c)Both 6.6kV & 415V d)Any other
5.2	Minimum P.F. to be maintained at Power Transformer Primary at respective sub-station	***Refer Note-4 below***	a)0.95 b)0.90
5.3	Monitoring at Power Transformer Primary at respective sub-station	Yes	a)YES b)NO
6	Load shedding	Yes (Note-3)	a)YES b)NO
6.1	Voltage level for Load Shedding	For Bina refinery 33kV, 6.6kV For Petchem 66kV, 6.6kV	a) 66kV b) 33kV c) 11kV d) 6.6kV e) 0.415kV - PCC/PMCC incomer f) Any Other

Notes:-
1. Auto changeover logic/ABT is not envisaged in normal (GRID power) EHV, HV, MV, LV switchboards. However, for Emergency DG switchboard (EPCC/EPMCC etc.) shall have the facility of auto changeover/ABT.

2. Manual Transfer shall be considered for MCC switchboards.

3. Voltage level for Load Shedding shall be 66KV,33 KV,415V). Load shedding at 415V-PCC/EPCC level shall be 415V switchboard (I/C-ACB, B/C-ACB and outgoing ACB feeders).

4. Power factor 0.99 (min.) - at Grid transformer primary
Power factor 0.995 (min.) - at 6.6kV switchboard

5.4 CONTROL-PROTECTION - METERING

5.4.1 CONTROL PHILOSOPHY

S.No.	Description	Selected Option	Available Options
1	Location of Relays for Generator	Separate Relay and Control Panel	
2	Location of Relays for Outdoor Switchyard	Not Applicable	
3	Location of Protection relays for EHV/HV switchgear		

S.No.	Description	Selected Option	Available Options
3.1	Primary voltage EHV/HV switch gear	***On switchgear (33kV at Bina refinery switchboards)*** ***Bay controller and separate Relay & control panel for 220kV GIS & 66kV GIS in Petchem***	a)On switchgear b)Separate relay and control panel
3.2	Secondary Voltage HV switchgear	On 6.6kV switchgear	a)On switchgear b)Separate relay and control panel
4	EHV/HV Switchgear control		
4.1	Generator	Control Relay Panel	a)Control Relay Panel b)SCAP c)ECS
4.2	Outdoor Switchyard	Not Applicable	a)Control Relay Panel b)SCAP c)ECS (for breaker)
4.3	Primary voltage EHV/HV switch gear	***On switchgear (for 33kV at Bina Refinery switchboards)*** ***Separate Relay & control panel (for 220kV GIS & 66kV GIS in Petchem Project)***	a)On switchgear b)SCAP (for breaker) c)Separate relay and control panel
4.4	Secondary Voltage HV switchgear	On 6.6kV switchgear	a)On switchgear b)Separate relay and control panel c)ECS
5	Numerical Protection/Monitoring system for		
5.1	Generators	Yes	a)YES b)NO
5.2	EHV system	Yes	a)YES b)NO
5.3	HV Switchboard	Yes	a)YES b)NO
5.4	PMCC/PCC	Yes	a)YES b)NO
5.5	MCC (for incomer and bus coupler having ACB)	Yes & IMPR relay for motor feeders upto 45kW.	a)YES b)NO
6	Control and logic through numerical relays	Yes (Note-3)	a)YES b)NO
7	Hardwired synchronization control panel-SCAP	Yes	a)YES b)NO
7.1	Synchronizing trolley required	Yes	a)YES b)NO
7.2	Type of Panel	*	a)Mosaic b)Simplex
7.3	Extent of Coverage on SCAP	*	
8	Type of annunciation panel	Not Applicable	a)HMI b)Part of SCAP

S.No.	Description	Selected Option	Available Options
9	Load shedding panel	Yes (Part of ECS with RTU)(Note-5)	a)Part of ECS b)Separate PLC c)Hardwired
10	Method of motor starting		
10.1	HV Motors	DOL (above 132kW). VFD controlled soft starter shall be considered. if required depending upon motor rating (Note-1)	a)Direct on line (Note-1) b)Auto transformer c)Voltage Controlled Soft starter d)V/F Soft starter e)Dedicated transformer 2 MW and above
10.2	MV Motors	DOL upto 132 kW motor rating (Note-1)	a)Direct on line b)V/F Soft starter c)Voltage Controlled Soft starter
11	Starting MVA limitation conditions for Motors		
11.1	HV Motors	***Starting current 500% (inclusive of positive tolerance) of full load current (Note-2)***	
11.2	MV Motors	As per IS-12615-2018/IEC 60034-30	

**** To be decided during detail engineering.***

Notes:

1. V/F controlled soft starter shall be considered for starting large HV motors if essential/unavoidable as per system design requirement/equipment design limitation based on power system study.

2. Lower starting current shall be specified if required based on motor start-up study.

3. STOP signals shall be directly hardwired. However, start and DCS permissive signals shall be routed through numerical relay for time stamping & monitoring. this will also reduce wiring within the switchboards. All status signals to DCS shall be through ECS on Modbus TCP IP protocol except critical process signals used in interlocking which shall be hardwired and to be decided during detail engineering.

4. Separate On, Off, Spring Charged, Trip Circuit Healthy, Process Trip, Breaker in Test, Breaker in Service indication lamps required.

5. Voltage level for Load Shedding shall be 66KV,33 KV,415V). Load shedding at 415V-PCC/EPCC level shall be 415V switchboard (I/C-ACB, B/C-ACB and outgoing ACB feeders).

6. In case of VFD/Soft starter, starting current shall be limited to 100% of FLC.

5.4.2 POWER ISOLATION FOR TRANSFORMERS LOCATED REMOTELY AWAY FROM EHV/HV SUBSTATION

S.No.	Description	Selected Option	Available Options
1	Push button in transformer bay for tripping remote breaker	Yes (Break glass type)	a)YES b)NO
2	Local Primary isolating breaker	Standalone breaker (Indoor type) in respective substation.	a)YES b)NO
3	Protection relay required	Only feeder differential at receiving end.	a)YES b)NO

5.4.3 RELAY PROTECTION SYSTEM

5.4.3.1 PROTECTION DEVICES FOR POWER DISTRIBUTION SYSTEM

Protection devices for power distribution system shall be as indicated below -
(Figure inside bracket refers to note below)
(YES - Applicable)

S.No.	Relay Description	Relay No.	HV Transformer Feeder - Sec. Winding Volt=>3.3kv	HV Transformer Feeder - Sec. Winding Volt<=0.433kv	HV Motor Feeder	Outgoing Breaker Feeder - HV Plant Feeder	Outgoing Breaker Feeder - MV PCC/PMCC	Incomer - EHV/HV	Incomer - MV PCC/PMCC
1	IDMTL over-current relay	51	YES	YES	-	YES	YES	YES (1)	YES
2	IDMTL earth-fault relay	51N	YES(2)	YES	-	YES	YES	YES (1)	YES
3	51G backup earth-fault relay (Earthed neutral)	51G(11)	YES(23)	YES(23)	-	-	-	-	-
4	Motor protection relay with (50, 50N,46, 49, 50L/R,86,95)	99	-	-	YES(3)	-	YES(3)	-	-
5	Instantaneous restricted earth-fault relay (Earthed side)	64R(11)	-	-	-	-	-	YES(24)	YES(24)
6	Instantaneous over-current relay	50	YES	YES	-	-	-	-	-
7	Instantaneous earth-fault relay	50N	YES(4)	YES	-	-	-	-	-
8	Differential protection relay	87	YES(5)(16)	YES(16)	YES(6)(16)	YES(7)(16)	-	YES(16)	-

S.No.	Relay Description	Relay No.	HV Transformer Feeder - Sec. Winding Volt=>3.3kv	HV Transformer Feeder - Sec. Winding Volt<=0.433kv	HV Motor Feeder	Outgoing Breaker Feeder - HV Plant Feeder	Outgoing Breaker Feeder - MV PCC/PMCC	Incomer - EHV/HV	Incomer - MV PCC/PMCC
9	High speed tripping relay	86(20)	YES	YES	YES	YES	YES	YES	YES
10	Trip circuit supervision relay	95(20)	YES	YES	YES	YES	YES	YES	YES
11	Transformer auxiliary relay	63	YES	YES	-	-	-	-	-
12	Under-voltage relay with timer	27/2	-	-	YES	-	-	YES(9)	YES(9)
13	Check synchronisation relay	25	-	-	-	-	-	YES(10)	YES(10)

5.4.3.2 POWER GENERATION AND EXTERNAL POWER SUPPLY

Minimum protection relays for Synchronous generator (GTG/STG), generator transformer Grid power supply incomer and Synchronous motors shall be as follows:
(YES - Applicable)

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
1	Distance protection	21	YES		YES		
2	Synchronous check	25	YES(27)	YES	YES		
3	Under voltage with timer	27	YES		YES		YES
4	Reverse power	32	YES				YES
5	Low power flow	37	YES				
6	Loss of excitation	40	YES				YES
7	Negative sequence	46	YES				YES
8	Over current	50				YES	YES

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
9	Earth fault relay	50N				YES	YES
10	Over current	51			YES	YES	
11	Voltage restrained	51V	YES	YES			
12	Earth Fault back up	51G	YES	YES		YES	
13	Over current E/F	51N		YES	YES	YES	
14	Over voltage with timer	59	YES		YES		YES
15	VT failure	60	YES				YES
16	Auxiliary relay for transformer	63TX		YES		YES	
17	Transformer Restricted Earth Fault	64R	YES(26)	YES		YES	
18	Stator back up earth fault	64G	YES				
19	Generator Rotor Earth fault	64R	YES				YES
20	Directional O/C	67			YES		
21	Directional E/F	67N			YES		
22	Under frequency and df/dt	81	YES		YES		YES
23	Tripping relay	86	YES	YES	YES	YES	YES
24	Gen differential	87G	YES				
25	Gen and Transformer differential	87GT		YES			
26	Transformer differential	87T		YES		YES	
27	Feeder differential	87F				YES	
28	Bus bar differential and check	87B/ 87CH		YES			
29	Trip circuit supervision	95	YES	YES	YES	YES	

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
30	Dead bus charging relay	98	YES(27)	YES	YES		
31	Over fluxing	99	YES	YES(28)			
32	Out of step	78	YES				YES
33	Thermal overload relay	49G	YES				
34	Local breaker backup protection	50LBB	YES				

5.4.3.3 RELAY PROTECTION PHILOSOPHY

S.No.	Project Philosophy
1	In case of HV switchboards with continuous parallel operation of incomers, following additional relays shall be provided: a. One set of 87B (Bus differential) and 95 B (Bus wire supervision) for each bus section. b. 67 and 67N (Directional IDMTL over current and earth fault) relays for the incomers.
2	Instantaneous earth fault (50N) shall be provided only for transformer with delta primary.
3	For breaker fed motor feeders. Relay 50 shall not be provided for contactor controlled feeders.
4	Directional IDMTL earth fault (67N) shall be provided for transformer with star primary.
5	For transformers rated 5 MVA and above.
6	***For motors rated 1200 kW and above, excluding VFD fed motors.***
7	For critical/long feeders and plant feeders connected to main power generation and distribution bus. A plant feeder implies outgoing feeders from one switchboard to another switchboard of same voltage level.
8	***Trip circuit supervision relay 95 shall be provided separately and NOT as part of the numerical relay for HV/ MV feeders wherever numerical relays are provided.***
9	Wherever auto-transfer feature is provided
10	For switchgears where continuous or momentary paralleling of Incomers is envisaged, check synchronising relay shall be provided.
11	51G and 64R relays for input transformer of VFD system shall be decided by VFD Manufacturer.
12	The bus tie feeders in HV switchboards shall be provided with 51, 51N, 86 and 95 relays.
13	HV capacitor bank feeders shall be provided with 51, 51N, 59 (over voltage), 60 (Neutral displacement), 86 and 95 relays.

S.No.	Project Philosophy
14	The following feeders shall be provided with timers for delayed tripping on bus under voltage while the under voltage relay shall be common for the bus a. HV and MV capacitor feeders b. HV and MV breaker controlled motor feeders c. Contactor controlled motor feeders with DC control supply. Numerical relays & iMPR where ever provided for motor and capacitor feeders shall use in built under voltage relay and timer for delayed tripping on bus under voltage.
15	One no. DC supply supervision relay (80) shall be provided for each incoming DC supply to the switchboard.
16	One set of bus differential relays (87B) and bus wire supervision relay (95 B) for each bus section shall be provided for HV switchboards connected directly to generation buses.
17	In case of numerical relays, all relays shall be comprehensive units including all protection, metering and control having communication protocol of IEC 61850.
18	Under voltage and over voltage function along with associated timer shall be part of the numerical relays.
19	***Auto changeover logic/ABT is not envisaged in normal (GRID power) EHV, HV, MV, LV switchboards.*** ***However, for Emergency DG switchboard (EPCC/EPMCC etc.)shall have the facility of auto changeover/ABT.***
20	Tripping relays (86) & Trip Circuit supervision relay (95) shall NOT be part of numerical relay.
21	1 No. of 86 relay and 1 no. Auxiliary relay (VAA type) shall be considered for HV and MV motor rated 55KW and above and it shall be separate and not part of Numerical relays wherever provided. This is required to facilitate quick starting of the motor in case of tripping due to process/instrument interlock. VAA relay for process trip shall be auto reset but flag shall be hand reset type only.
22	Breaker control switch shall be hardwired type.
23	Stand by earth fault relay 51G shall be provided in the outgoing HV transformer feeder.
24	Restricted earth fault relay 64R shall be provided for transformer rating >= 2 MVA in the incomer of switchboard fed from transformers.
25	Relay 51V voltage controlled over current relay shall be provided on specific requirement considering the rating of the outgoing feeders with respect to the Incomer rating. Generally this relay shall be provided wherever CT primary current of outgoing feeders is exceeding 40% of the CT primary current of the Incomer.
26	415V DG set shall be provided with protection but not limited to 51V,51G,40,46,86,95,80,64R etc for generator rated above 500KVA and Generator rated less than 500KVA shall have 51V,51G,40,46,86,95,80 unless otherwise agreed with the owner.
27	For directly connected generator.
28	For large transformer as per manufacturer's standard.
29	Relay 87 and 64R shall be numerical relay and shall not be part of main comprehensive numerical relay. CT for 87 and 64R can be clubbed, as two core of single CT.
30	Stabilizing resistor shall be provided in residual earth fault connection for all motors and transformers even in case of numerical relay to avoid spurious tripping during start up.
31	Feeder differential relay shall be connected with optical fibre cable for communication between two relays.

S.No.	Project Philosophy
32	For transformer feeder, WTI/OTI/Buchholz relay alarm to be connected to hooter so that other can come to know on actuation of these alarms
33	Check zone scheme for bus-differential protection shall be provided wherever bus differential scheme is provided.
34	Process Trip indication on the LV motor feeders with rating less than 55KW with manual reset facility shall be considered. Also, the process trip contactor shall not be dependent on the Reset PB. The logic of process trip shall be independent of Reset PB and Process Trip Indication lamp.
35	Numerical relays shall be used for logic build-up in addition to protection & monitoring provided induced voltage phenomenon is taken care to prevent maloperation of digital inputs(DIs).
36	Interposing relays for all the DI signals from DCS/ PLC in VFD"s/ soft starters shall be considered.
37	***Low impedance-based busbar differential protection scheme shall be considered in 220kV & 66kV GIS***

5.4.4 METERING

5.4.4.1 METERING DEVICES IN EHV, HV AND MV SWITCHBOARDS

The metering devices in EHV, HV and MV switchboards shall be as below:
Type of metering : Analogue/As part of the Numerical relay

(Figure inside bracket refers to note below) (YES - Applicable)

S.No.	Feeder Type	A	V	Hz	PF	MW	MWH	HM	MVAR	MVAH	MVA
1	Grid Incomers	YES	YES	YES	YES	YES(2)	YES	-	YES(2)	YES(2)	YES(1,2)
2	Grid Bus Tie	YES									
3	Grid Transformer	YES				YES	YES				
4	Grid Bus P.T.		YES								
5	EHV/HV Incomer	YES	YES	YES	YES	YES	YES	-	YES	YES	YES
6	EHV/HV Bus Tie	YES	-	-	-	-	-	-	-	-	-
7	EHV/HV Transformer	YES	-	-	-	YES	YES	-	-	-	-
8	EHV/HV Bus P.T.	-	YES	-	-	-	-	-	-	-	-

S.No.	Feeder Type	A	V	Hz	PF	MW	MWH	HM	MVAR	MVAH	MVA
9	EHV/HV Plant Feeder	YES	-	-	-	-	YES	-	-	-	-
10	EHV/HV Motor	YES	-	-	-	-	YES(kWh)	YES	-	-	-
11	EHV/HV Capacitor	YES	YES	-	-	-	-	-	YES	-	-
12	PCC/PMCC Incomer	YES	YES	-	YES	-	YES(kWH)	-	-	-	-
13	PCC/PMCC Bus Tie	YES	-	-	-	-	-	-	-	-	-
14	PCC Bus P.T.	-	YES	-	-	-	-	-	-	-	-
15	ACB Outgoing (Non motor)	YES	-	-	-	-	YES(kWh)	-	-	-	-
16	MV Motor (>55kW)	YES	-	-	-	-	-	-	-	-	-
17	MCC/ASB Incomer	YES	YES	-	-	-	-	-	-	-	-
18	MCCB/SFU O/G(250A)	YES	-	-	-	-	YES(kWh)	-	-	-	-
19	LDB Incomer	YES	YES	-	-	-	YES(kWh)	-	-	-	-
20	DG Set-MV	YES	YES	YES	YES	YES(kW)	YES(kWh)	YES	-	-	-

Notes:

1. MVA meter in EHV external power supply Incomers shall include maximum demand indication also.

2. Separate MW, MVAR, MVA and MVAH meters shall be provided for EHV external power supply Incomers only.

3. Seperate 3 nos. voltmeter and 3 nos. ammeter shall be provided for EHV external power supply incomers.

4. In addition to conventional metering, all metering shall be provided through numerical relay in case respective switchboard is having numerical relay.

5. Field ammeters are to be provided for all motors.

6. Motor feeder shall be provided with 4-20mA current/ voltage/ power dual output transducers (as required) for feedback to DCS.

7. CT has to be 0.2s, burden 15 VA. PT has to be 0.2, burden 50 VA. Main and check energy meter shall be availability based tariff meter, 0.2s class accuracy, with feature of every 15 minutes recording of all the readings. The above is applicable for Petchem, open access power measurement.

8. Communicable Multifunction Meter (MFM) shall be used for metering purpose as per table above for all feeders.

9. Conventional ammeter, voltmeters and communicable multifunction meter shall be considered for all incomers of switchboards (HV/MV/PCC/EPMC/MCC/ASB/LDB).

10. Communicable Multi function meters (MFM) shall be considered with interconnectivity to existing ECS system for Bina Refinery and new ECS system for Petchem.
11. Metering for generator shall be provided as minimum as specified above but not be limited to the same.
12. Ammeter provided at push-button station shall be 240 degree taut band moving coil type. However for smaller rating motor (less than 1 HP), this ammeter can be normal moving iron type.
13. Harmonic meter shall be considered in the incomers of 220kV, 66kV, 33kV, 22kV, 11kV & 6.6kV switchboards/Isolator breaker panels.
14. Metering facility for space heater current of transformer and bus duct shall be provided on Space hater distribution board (DB).
15. Metering facility shall be provided on switchboard panels(Motor Feeder > 22 KW) for Space heater current.

5.4.4.2 METERING FOR GENERATOR AND GENERATOR TRANSFORMER

S.No.	Meter	HV Generator	Generator transformer
1	Ammeter (3 nos.)	YES	YES
2	Voltmeter (3 nos.)	YES	YES
3	MW meter	YES	YES
4	MVAR meter	YES	
5	MVA meter	YES	
6	MWH meter	YES	YES
7	MVARH meter	YES	
8	Power factor	YES	YES
9	Frequency meter	YES	

5.5 SUBSTATION DESIGN

5.5.1 SUBSTATION AUTOMATION SYSTEM

S.No.	Description	Selected Option	Available Options
1	Substation Automation System (SAS)	Required	
2	Communication protocol for relay network	IEC 61850	a)IEC 61850 b)open protocol
3	System architecture	IEC 61850 RSTP	a)IEC 61850 RSTP b)IEC 61850 PRP c)Redundant architecture for other open protocols
4	Data concentrator for SAS	***Not required.***	a)Required b)Not Required
5	Communication with other devices		
5.1	Communication with ECS	Yes	
5.1.1	Protocol for communication with ECS	IEC 61850	a)IEC 61850 b)Modbus
5.2	Communication with DCS	Part of ECS RTU	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch
5.2.1	Communication with DCS-HV Switchboard	Part of ECS RTU	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch
5.2.2	Communication with DCS-PCC/PMCC	Part of ECS RTU	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch
5.2.3	Communication with DCS-Conventional MCC	***Not Applicable***	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch

S.No.	Description	Selected Option	Available Options
5.2.4	Communication with DCS-Intelligent MCC	Part of ECS RTU	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch
5.2.5	Protocol for communication with DCS	Modbus TCP/IP	
5.3	Communication with VFD & UPS	Part of ECS RTU	a)Part of data concentrator b)Part of ECS RTU c)No d)Part of ethernet switch
5.3.1	Protocol for communication with VFD & UPS	Modbus TCP/IP	
6	HMI for SAS	Operator Cum Engineering Workstation	a)not required b)operator cum engineering workstation c)1 operator & 1 engineering workstation
7	Laptop	Common laptop for EHV, HV & MV for each substation with all necessary software.	a)not required b)common for HV & MV for each substation c)seperate for HV & MV for each substation
8	Local storage of data	part of HMI	a)not required (part of ECS) b)part of HMI c)part of data concentrator
9	Relay parameterization	Through numerical relays / laptop & SAS HMI	a)SAS HMI b)ECS HMI

Notes:
1. Dual redundant gateway shall be provided for control/ communication with DCS/ PLC for i-MCC.
2. Communicable multi function meters installed on panels shall have communication facility with open protocol. Energy meter/MFM on panel shall have accuracy class min 0.2.
3. Parameterization and fault record downloading facility shall be provided from Engg. Station.

5.5.2 EHV OUTDOOR SWITCHYARD

S.No.	Description	Selected Option	Available Options
1	Type	220kV EHV GIS substation at Petchem	
2	Type of bus	Double bus bar system	a)String bus b)Tubular bus
3	Structure for outdoor	Not applicable	a)Galvanised b)Painted c)Not applicable
4	Bus material	As per type test design	a)ACSR b)Aluminium

EHV Switchyard shall be read as EHV GIS SUBSTATION

5.5.3 SUBSTATION FEATURES

S.No.	Description	EHV	HV	MV	MCC/Elec. Room
1	Elevated with trays in cable cellar	YES	YES	Yes	***NO***
2	Raised with internal trenches	NO	NO	NO	***YES***
3	All top cable entry with trays below ceiling	NO	NO	NO	NO
4	Pressurisation against ingress of dust	NO	NO	NO	NO
5	Roof slab for				
5.1	Generator Transformer/ Tie transformer	NO	NO	NA	NA
5.2	Power transformer	***YES***	***YES***	***YES***	NO
5.3	Distribution transformer	YES	YES	YES	-
6	Air conditioning with false ceiling of switchgear hall	YES (Note-3)	YES	YES	***YES***
7	EOT Crane in EHV GIS area	YES (Note-2)	NA	NA	NA
8	Lift for substation having 2 Switchgear room floors	YES	YES	YES	NA
9	Electrical maintenance room	YES	YES	NO	NA
10	Electrical store room	YES	YES	NO	NO
11	Separate room for Instrumentation RIO panels	NO	***YES***	***YES***	***YES***
12	Exhaust fans/Ventilation fans for Switchgear room	NO	NO	NO	***NO***

Note :

1. Column HV is defined as Sub-station having full fledged EHV/ HV switchboard.
2. EOT Crane is not envisaged for isolator breaker panels located inside substation building.
3. False ceiling is not envisaged for areas where EHV GIS panels are located.
4. For 33 KV and above rated switchboards, Gas Insulated Switchgear (GIS) with double bus-bar shall be provided. GIS switch board shall have bus tie on each bus and bus-coupler between buses (In all 4 section i.e. Bus 1A / 1B and 2A / 2B).
5. DELETED.
6. Annunciation for tripping of HVAC system shall be provided in DCS.
7. Exhaust fans shall be provided in cable cellar at feasible location.
8. Each substation shall be provided with a toilet and maintenance room outside

switchgear hall (with split AC) which shall have facility for workmen to keep their tools.
9. 20A single phase DP MCB with industrial socket shall be provided at every 20 mtr interval in the switchgear hall.
10. MCC/Electrical room shall be without any power/distribution transformer. Any building with power/distribution transformer shall be considered as substation.

5.5.4 SPECIFIC EQUIPMENT LOCATIONS

S.No.	Description	Selected Option	Available Options
1	Batteries in substation and control Rooms	Separate room	
2	Battery charger in substation	Air conditioned room	a)Air conditioned room b)Non air conditioned room
3	Battery charger in control room	Air conditioned room	a)Air conditioned room b)Non air conditioned room
4	Variable speed drive panels	Air-conditioned room in substation	a)Air-conditioned room in substation b)SRR
5	Thyristor controlled panels	Air-conditioned room in substation	a)Air-conditioned room in substation b)SRR
6	UPS System	Air conditioned room in control room & substation	
7	Lead-Acid and Nickel-Cadmium	Separate room	a)Separate room b)Common room
8	Location of VRLA battery	Air conditioned room	
9	Annunciation panel	Not applicable (Note-6)	
10	Lighting Transformers	Switchgear room	a)Switchgear room b)Separate transformer room
11	Neutralisation pit with drain from flooded battery room	Required	a) Required b) Not required

Notes:-

1. Battery room shall be preferably located in corner side at Ground floor of the sub-station building.
2. Battery charger for Instrumentation shall be placed in air-conditioned UPS room in control room.
3. Electrical equipment installed in battery room such as exhaust fan, lighting, receptacles shall be of flameproof construction and certified for gas group II-C classified locations. Heat detectors installed in battery room shall be of intrinsically safe type with zener barrier. Battery Circuit Breaker shall be located outside battery room.
4. Battery rooms shall be provided with wash basin, eye washer and safety shower. Acid resistant apron, face shield and gloves shall be provided in each battery room.
5. Exhaust fans and flameproof light fittings in battery rooms shall be installed in such a way that they can be accessed using suitable ladders without removing the batteries.
6. Annunciation is part of ECS & separate annunciation panel in not required. However, provision of annunciation with hooter shall be considered as part of HV AIS switchboards. IRF status of numerical relay and Fault alarm status for VFD/excitation

system/FA/PA system shall also be provided.
7. Separate air conditioning system/ split air conditioning system shall be considered for UPS battery room in control room if battery type is VRLA.

5.6 EQUIPMENT DESIGN

5.6.1 EHV DESIGN

5.6.1.1 EHV OUTDOOR SWITCHYARD

S.No.	Description	Selected Option	Available Options
1	Bus bar system	***Not Applicable (Part of EHV GIS)***	a) Single Bus b) Double Bus c) Main and Transfer Bus
2	Circuit breaker type	Not Applicable	
3	Isolator type	***Centre rotating (For gantry Isolator)***	a)Pantograph b)Semi Pantograph c)Centre rotating d)Centre break

5.6.1.2 EHV SWITCHBOARD

S.No.	Description	Selected Option	Available Options
1	Type of Switchgear	Gas Insulated	
2	Busbar	Double	a)Single b)Double
3	Circuit Breaker Type	SF6	
4	Local Control Cabinet	***Separate free standing (for 220kV GIS) & Mounted on GIS (for 66kV GIS) (refer Note-2)***	a)Mounted on GIS b)Separate free standing c)As per vendor drawing

Note:
1. Short Circuit rating & duration : 50kA for 3 sec. (for 220kV GIS) & 40kA for 3 sec. (for 66kV GIS).
2. Local control cabinet for 220kV GIS shall be mounted in GIS hall.
3. Two relays of different make shall be used for Petchem 220 KV LILO incomer line side protection.
4. GIS switchboard shall have bus tie on each bus and bus-coupler between buses (In all 4 section i.e. Bus 1A / 1B and 2A / 2B).
5. Following equipment shall be supplied along with GIS of 220kV, 66kV and 66kV IBPs (for IBP's 1 set for each substation) :
a) SF6 Gas Leakage Detector
b) Online SF6 gas Filling and Evacuation Cart
c) SF6 Gas Analyser
d) Portable Partial Discharge (PD) Monitoring System

5.6.2 HV SWITCHBOARD

S.No.	Description	Selected Option	Available Options
1	Execution	Drawout (AIS) Fixed (GIS)	a)Drawout b)Fixed

S.No.	Description	Selected Option	Available Options
2	Type of switchgear	Air Insulated & Gas insulated	a)Air insulated b)Gas insulated
3	Bus bar	Single bus & Double bus	a)Single bus b)Double bus
4	Circuit breaker type	VCB	a)SF6 b)VCB
5	Motor Control	Breaker	a)Breaker b)Vacuum contactor
6	Marshalling Cabinet	Part of HV Switchboard	a)Part of HV Switchboard b)Separate c)Not Applicable
7	Internal Arc Classification		
7.1	Short Circuit Current (kA)	40	a)40 b)25 c)Any Other
7.2	Duration (Second)	1	a) 0.1 b) 0.2 c) 0.5 d) 1.0 e) Other
8	No. of bus-coupler	Two	a)One b)Two c)Other
9	Thermography window	No	a)No b)Yes
10	Online temperature monitoring system	Yes	a)No b)Yes

Notes:
1. Short Circuit Rating and duration:
i) DELETED.
ii) 33kV HV (GIS) at Bina Refinery location - 40kA for 1sec.
iii) 6.6kV HV (AIS) at Bina Refinery & at Petchem location - 40kA for 1Sec.
2. LOTO facility shall be provided for each module.
3. ON/OFF indication shall also be provided on rear side of panel.
4. Auto tripping of HT circuit breaker upon opening rear side cover shall be provided.
5. All the numerical relays used in a particular substation shall be time synchronized with GPS.
6. 6.6 KV and above rating HV switch boards shall have two bus couplers.
7. For HV switchboards, the number of spares shall be as indicated in SLD.
8. The back side cable compartment cover of HV switchboard shall not be able to open while the feeder is electrically connected. Breaker shall trip if any person opens the back side cover preferably by mechanical interlock otherwise on electrical interlock. Back side cover shall have on / off LED indication lamp.
9. Breaker operated direct contacts to be used to the maximum extent for DCS / interlock. If it is not possible than same to be given through bi-stable relays.
10. HT off load isolator shall not be used, in its place normal VCB panel shall be used.
11. Instrumentation remote IO panels are envisaged in substation for command interface. whereas all status signals to DCS shall be through ECS on Modbus TCP IP protocol except critical process signals used in interlocking through PLC which shall be hardwired and to be decided during detail engineering.
12. GIS Isolating breaker panels (for 33kV & 66kV) shall be single bus type.

5.6.3 CURRENT TRANSFORMER (CT)/POTENTIAL TRANSFORMER (PT)

S.No.	Description	Selected Option	Available Options
1	CT Secondary		
1.1	General Protection	1A	
1.2	Special protection(87,64R ,51G etc)	1A	
1.3	Metering	1A for conventional and remote metering	
2	VT Secondary	110V AC	

5.6.4 TRANSFORMERS (POWER/DISTRIBUTION)

S.No.	Transformer	Voltage Ratio	Vector Group	Tap Changer	Cooling
1	Grid power transformer	220/66kV	YnYn0	OLTC	ONAN/ONAF or ONAN/ONAF/OFAF
2	Generator transformer	11/66kV	YNd 11	Off-circuit	ONAN or ONAN/ONAF
3	Tie Transformer	During detail engg.	During detail engg.	Off-circuit	ONAN/ONAF
4	Generator auxiliary transformer	During detail engg.	During detail engg.	Off-circuit	ONAN/ONAF
5	Intermediate power transformer	33/6.9kV for Bina Refinery 66/6.9kV for Petchem	Dyn 11	OLTC	ONAN/ONAF
6	Dedicated (e.g. for VFD)	As per OEM	As Reqd.	Off-circuit	Dry type
7	Distribution transformer (<= 3150 KVA)	6.6/0.433kV	Dyn 11	Off-circuit	ONAN

Note:
1) Provision of Oil Soak Pit & Oil Collection Pit for transformers shall be as follows:
a) Oil quantity <= 2000L: Not Required
b) 2000L < Oil Quantity <= 9000L: Soak Pit
c) Oil Quantity > 9000L: Soak Pit + Collection Pit
2) DELETED.
3) Automatic fixed Fire fighting system of Nitrogen Injection Fire Protection System (NIFPS) type shall be provided for transformers rated 10MVA and above or Oil quantity greater than 2000 litres.
4) Lighting transformer and dedicated transformer for VFD shall be dry type.
5) Flexible oil resistant air bag shall be provided for conservator for transformer rated above 750KVA.
6) All the power and distribution transformers shall be high efficiency. Distribution Transformer rated upto 2500 kVA shall be minimum Energy efficiency level-2 as per IS:1180 (Part-1) table-6/Table-3 of GOI notification dtd. 08 Dec 2023, BEE star rating 2 (including latest GOI notifications).
7) Emergency stop PB station shall be provided for tripping of transformer. The emergency trip PB station shall be located outside the transformer yard and shall have on / off indication & protective shroud for avoiding inadvertent operation.

8) In case of space constraint, dry type transformers shall be considered with rating up to 2MVA and temperature rise shall not be more than 95 deg. C over and above ambient temperature.
9) Transformer terminal box shall be properly approachable and platform shall be provided for primary and secondary terminal box inspection for cover opening / maintenance purpose wherever feasible.

5.6.5 MV SWITCHBOARD

S.No.	Description	Selected Option	Available Options
1	PCC / PMCC		
1.1	Breaker panels	Drawout Single front	
1.2	Contactor feeders	Drawout Double front	a)Drawout Single Front b)Drawout Double front c)Fixed Single front
2	MCC	Drawout Double front iMCC (Intelligent MCC)	a)Drawout Single Front b)Drawout Double front c)Fixed Single front
3	ASB	Drawout Double front	a)Drawout Single Front b)Drawout Double front c)Fixed Single front
4	LDB	Drawout Double front	a)Drawout Single Front b)Drawout Double front c)Fixed Single front
5	Motors		
5.1	PMCC	FVNR feeder with iMPR for motors rating upto 45kW. ACB motor feeder with NR for motors rated 55 kW and above	
5.2	MCC	FVNR Feeder with iMPR for Motors rating upto 45KW.	
6	Switchboard for small package (AC system, Pressurisation system ,Bagging plant etc)		
6.1	Type	***Compartmentalised Fixed type, single front***	a)Compartmentalised Fixed type b)Drawout type
6.2	Configuration	Two incomers without Bus coupler	a)Single incomers b)Two incomers without Bus coupler c)Two incomers with Bus coupler
7	Marshalling Cabinet	Separate (Note-11)	a)Part of MV Switchboard b)Separate c)Not Applicable
8	Internal Arc Classification		
8.1	Short Circuit Current (kA)	65 kA	a)65 kA b)50 kA c)35 kA d)25 kA e)Any other

S.No.	Description	Selected Option	Available Options
8.2	Duration (Second)	0.1	a)0.1 b)0.2 c)0.5 d)1.0 e)Any other
9	Bus-bar material	Aluminium	a)Aluminium b)Copper c)Any other
10	Closed door operation required	No	a)Yes b)No
11	Type of cooling for switchboard (Note-2)	Natural	a)Natural b)Forced
12	Incomer & bus-coupler for MCC & ASB	ACB	a)ACB b)Heavy duty switch
13	Incomer & bus-coupler for LDB	MCCB	a)MCCB b)Heavy duty switch

Notes:

1. MCC shall be limited to 1250A and ASB shall be limited to 800A.
2. Up to 4000A rating, forced cooling shall not be provided.
3. Power Panel and Lighting Panel shall be wall mounted fixed type.
4. IP plate of LV MCC shall have control on/ off switch & on / off / trip indication lamp in case same cannot be accommodated in relay LED.
5. LOTO facility shall be provided for each module.
6. Breaker operated direct contacts to be used to the maximum extent for DCS / interlock. If not possible same to be given through bi-stable relays.
7. Separate control switch & control fuse for isolation of control supply in all the motor feeders shall be provided. Separate control supply facility from space heater bus for checking module healthiness in TEST position shall not be provided.
8.All the numerical relays & iMPR used in a particular substation shall be time synchronized with GPS.
9. iMPR & Numerical relays shall also be used for for control logic except Start/ Stop command. For iMPR, PLC and DCS signals shall be through relay logic provided timing shall be less than 50ms as per instrument/ process requirement.
10. DELETED.
11. Marshalling Cabinet for MV Switchboard shall be standalone type (not part of MV switchboard panel). However, separate marshalling panel not required wherever remote I/O panels are located in substation.
12. Instrumentation remote IO panels are envisaged in substation for command interface. whereas all status signals to DCS shall be through ECS on Modbus TCP IP protocol except critical process signals used in interlocking which shall be hardwired and to be decided during detail engineering.
13. MV switchboard (PCC/EPCC) shall be provided with 2 bus couplers.
14. All the MV switchboards (PCC/PMCC/EPC/EPMCC/MCC) shall be provided with online temperature monitoring system.
15. Floor mounted fixed type non-compartmentalised space heater DB (SHDB) with 2 incomers shall be considered for space heater power supply in substations for EHV,HV,MV,LV switchboards.

5.6.6 MEDIUM VOLTAGE MOTOR STARTER TYPE

S.No.	Description	Selected Option	Available Options

S.No.	Description	Selected Option	Available Options
1	Contactor and switch fuse with overload relay	Not Applicable	
2	Contactor, switch fuse and overload relay with CBCT & ELR	Not Applicable	
3	Contactor and switch fuse with communicable motor protection relay	Not Applicable	
4	Air circuit breaker with numerical motor protection relay	***55kW and above***	
5	Contactor and MPCB with overload relay	Not applicable	
6	Contactor, MCCB with CBCT & ELR	Not Applicable	
7	MCCB with contactor and communicable Motor Protection Relay	< 37kW (Note-1)	
8	Contactor and MCCB with overload relay with CBCT & ELR	37kW & 45kW (Note-1)	
9	Contactor, MCCB with O/L Relay	Not applicable	

Note-

1. Instead of overload relay, all motor feeders upto 45kW shall be provided with iMPR (intelligent motor protection relay) for Draw-out type switchboards, whereas for Fixed type switchboards (in HVAC pkg, Lift/elevator etc.) it shall be with non-communicable DMPR (Digital motor protection relay).
2. Double Break MCCB with LOTO facility shall be provided in MV switchboard panels.
3. R-C Circuit across power contactor and low-burden auxiliary contactor for receiving start/ stop command from field shall be provided in all DOL starter feeders.

5.6.7 MEDIUM VOLTAGE OUTGOING FEEDER TYPE

S.No.	Description	Selected Option	Available Options
1	MCCB and CBCT with ELR	Not Applicable	a)___A and up to ___A b)Not Applicable
2	Switch fuse	Not applicable	
3	Switch fuse with Contactor and CBCT & ELR	Not applicable	
4	MCCB with Contactor and CBCT & ELR	***250A & upto 400A (refer Note-2). 32A/63A for Aux. heater feeders.***	a)___A and up to ___A b)Not Applicable
5	***MCCB with E/F release***	***below 250A***	a)___A and up to ___A b)Not Applicable

Note-

1. All MCCBs shall be provided with shunt trip coil and shall be microprocessor based.
2. CBCT+ ELR & contactor shall be provided for all MCCB feeder for E/F protection for 250A and above rated feeders.

5.6.8 MOTOR CONTROLS (AS PER PROCESS PACKAGE & OPERATING PHILOSOPHY)

S.No.	Description	Selected Option	Available Options
1	Auto/OFF/Manual switch	***In LCS near motor***	a)Near motor b)Switchgear c)Control room
2	Local/OFF/Remote switch	***Switchgear (Local/remote)***	a)Near motor b)Switchgear c)Control room
3	Process interlock (Note-1)	PLC	a)PLC b)Switchgear
4	Reacceleration equipment	Switchgear	a)PLC b)Switchgear

Notes;
1. To be made available at switchgear as per Instrumentation philosophy.

5.6.9 CONTROL SUPPLY VOLTAGE

S.No.	Description	Selected Option	Available Options
1	Breaker control	110V DC	a)220V DC b)110V DC
2	Breaker spring charging	110V DC	a)240V AC b)220V DC c)110V DC d)230V AC UPS
3	Contactor feeder	240V AC	a)240V AC b)220V DC c)110V DC d)230V AC UPS
4	Control supply for earth fault relay in contactor feeder	***110V DC (iMPR – for Drawout swbd) / 240V AC (DMPR – for fixed type swbd)***	a)240V AC b)220V DC c)110V DC d)230V AC UPS
5	Control supply for contactor motor starter and contactor feeder	***Tapping P-N of Respective Feeder***	a)Control Transformer common for each bus b)Tapping P-N of Respective Feeder c)Control transformer in individual DOL starter d)NA
6	MCCB/ MPCB shunt trip voltage	240V AC	a)220V DC b)110V DC c)240V AC

Notes:
1) DELETED.
2) DC control supply to MCC is applicable for main substation where DC power supply is available.
3) Control supply of VFDs and exciter panel supply shall be from UPS. Dual redundant battery banks shall be provided for each UPS.
4) All modules in LT shall have isolate, test and service position

5.6.10 MOTORS

S.No.	Motors	High voltage	415 volts
1	Enclosure		
1.1	Indoor	IP55	IP55
1.2	Outdoor	IP55	IP55
2	Insulation class	F (Temp. Rise limited to B)	F (Temp. Rise limited to B)
3	Anti-condensation heater	Yes	30 kW and Above
4	Additional canopy (outdoor motors)	Yes	Yes
5	Design voltage variation	±10%	±10%
6	Design frequency variation	***±5%***	***±5%***
7	Combined voltage / frequency variation (Design)	±10 % Any combination of above	±10 % Any combination of above
8	Energy efficient IE motors	NA	Yes (Refer Note-2)

Notes:

1. MOV Actuators:
1.1. Motors for MOV actuator shall have F class of insulation with temperature rise limited to class-B.
1.2. MOVs shall not change their status during voltage drop/power outages. The control supply for MOV shall be tapped internally from the 415V, 3ph supply to MOV. No separate DC/UPS control supply provision shall be made by the Owner.
1.3. Actuator of MOV shall have provision for Partial Stroke Test (PST). Actuator of MOVs shall be commissioned by OEM.
2. Motor Efficiency class shall be IE3 (for Hazardous area) / IE4 (for Safe area) as per latest IS 12615 /IEC 60034-30.
3. Permanent arrangement for monsoon protection for AFC motors shall be provided. Necessary arrangement shall be provided so that water ingress through the shaft in the motors can be avoided.
4. Thermistors shall be provided in VFD driven motors and the provision for tripping the motor in case of excess temperature shall be considered.
5. DELETED.
6. Motor antifriction bearings on DE & NDE shall have greasing facility to lubricate the bearings at site.
7. There shall be proper provision for carrying out the greasing of NDE/DE side of AFC/Vertical HT motor from ground floor. Longer length of grease pipe shall be made available for AFC/vertical HT motors with grease nipple at bottom of the pipe for ease of greasing.

5.6.11 UPS SYSTEM

S.No.	Description	Selected Option	Available Options
1	Redundancy	100%	a)50% b)100%
2	Type of redundancy	Parallel redundant (Note-10)	a)Parallel redundant b)Hot standby c)Dual redundant
3	Back-up time	60 minutes	a)30 minutes b)60 minutes c)120 minutes

S.No.	Description	Selected Option	Available Options
5	Separate fault diagnostic unit (Note 1)	No	a)YES b)NO
6	Battery type	Ni-Cd	a)Ni-Cd b)Lead acid c)VRLA
7	Battery configuration	(2 x 100% configuration)	a)(2 x 50% configuration) b)(2 x 100% configuration) c)(1 x 100% configuration)
8	UPS Output Supply	Single Phase	a)Single Phase b)Triple Phase
9	UPS Output Voltage	110V AC (Final voltage shall be as per Instrumentation Design Basis)	
10	ACDB outgoing feeder type	Switch fuse unit	a) Switch fuse unit b) MCCB c) MCB

Note-

1. Separate Fault Diagnostic Unit (FDU) is not required.
2. UPS for CFAP of FA system, PA system, Rim Seal fire protection system & Weigh bridge shall be non redundant with bypass type with VRLA/SMF battery.
3. By pass supply shall be through SVR (static voltage regulator) only.
4. UPS & ACDB shall be as below:
a) Output of UPS-1 & 2 along with SVR output shall be paralleled.
b) ACDB shall be provided with 2 incomers (incomer-1 from UPS-1/SVR, incomer-2 from UPS-2/SVR). Both incomer and bus coupler shall always be NC (normally closed).
5. All outgoing feeders in UPS ACDB which are going to the field shall be provided through isolating transformers as per instrumentation requirement.
6. Outgoing feeders with isolation transformer shall be provided with HRC type switch fuse on primary side and semi-conducting type fuse along with switch on secondary side.
7. Outgoing feeders without isolation transformer shall be provided with semi-conducting type fuse along with switch.
8. DELETED.
9. DC to DC convertor between UPS charger and battery bank is not acceptable i.e. battery bank float voltage shall be equal to charger float voltage.
10. UPS shall be designed with 100% isolation with UPS-1 and 2.
11. Type of switchboard for DCDB, UPS ACDB, PDB, MDB, weatherproof/flameproof (as per hazardous area classification) outdoor type switchboards: Compartmentalized Fixed type, single front.
12. UPS for VFDs/soft starter, ECS, sub-station Automation system (SAS) HMI, Thyristor control panel shall be parallel redundant type with Ni-cd battery (2 x 100%)". LAN UPS Power requirement (substation/MCC, SRR/CR etc.) shall also be fed from this UPS through isolation transformer. In case of UPS for LAN system is required for remote buildings where substation UPS is not available, the same shall be with non-redundant with bypass type with VRLA battery.
13. 230V AC LAN Power requirement for substation, MCC room, SRR & CR shall be fed from respective UPS of the buildings.

5.6.12 COMMUNICATION SYSTEM

S.No.	Description	Selected Option	Available Options
1	Plant Communication System	Yes	a)YES b)NO
2	Telephone System	***IP based (Refer Instrumentation EDB & Note-1 below)***	a)YES b)NO c)Separate
3	Telephone system and plant Communication system	Separate	a)Separate b)Integrated
4	Interface of Communication system		
4.1	With fire alarm system	Yes	a)YES b)NO
4.2	With telephone system	Yes	a)YES b)NO
5	FLP Telephone for process units	Yes (Note-2)	a)YES b)NO
6	Telephone cable type (Outdoor)	***Non Jelly filled (copper) for Analogue telephones only. for IP telephones refer Instrumentation EDB.***	a)Non Jelly filled b)Jelly filled

Notes:
1) At least 2 phones per switchgear floor, shall be provided in the substation.
2) FLP telephones shall be provided for process units, and process plant lifts also.

5.6.13 FIRE DETECTION AND ALARM SYSTEM

S.No.	Description	Selected Option	Available Options
1	Type	Digital addressable	a)Conventional b)Analogue addressable
2	Name of buildings to be provided with Detectors	Control room, sub-station, SRR, Administration building/office, other buildings as required.	
3	Detection System	Break Glass, Multi sensor detection, heat detector, Linear heat sensing cables (if required), Linear beam detector (if required)	
4	Type of manual call point	Without call back facility	a)With call back facility b)Without call back facility
5	Qty of Siren and location	***1 no. at each substation and Petchem MCR***	
6	Power supply for Siren	***415V AC (Emergency)***	a) 415V AC b) 110V AC UPS c) 240VAC
7	Siren range	8 Km(Diametrically)	a)5 Km(Diametrically) b)8 Km(Diametrically)
8	Response indicator for rooms and concealed area for Addressable Fire alarm system	Yes	a)YES b)NO c)Not Applicable

S.No.	Description	Selected Option	Available Options
9	Detector type for battery room	Intrinsically safe-IIC	a)Flameproof b)Intrinsically safe-IIC

Notes:
1. All the FA system shall have the facility to communicate with DCS and it shall be compatible with DCS protocol and existing central FA panel at BPCL fire station in case of Bina Refinery.
2. FA Interface with DCS shall be Modbus Communication only.

5.6.14 DC SYSTEM

S.No.	Description	Selected Option	Available Options
1	Battery type		
1.1	Switchgear Protection Control and critical lighting	Ni-cd	a)Lead acid b)Ni-Cd c)VRLA
1.2	Instrumentation System	Not Applicable	a)Lead acid b)Ni-Cd c)VRLA
1.3	Diesel Engine Starting	Lead Acid	
1.4	DC Motors	Not Applicable	a)Lead acid b)Ni-Cd c)VRLA
1.5	Fire alarm system	***VRLA/SMF***	
1.6	Telephone system	***As per Instrumentation EDB***	
1.7	End Cell Voltage		
1.7.1	Lead Acid Battery	1.85 VOLT	
1.7.2	VRLA Battery	1.75 VOLT	
1.7.3	Ni-Cd Battery	1.0 VOLT	
2	Battery backup time		
2.1	Switchgear Protection and Control	120 minutes	a)30 minutes b)60 minutes c)120 minutes
2.2	DC Critical lighting	120 minutes	a)30 minutes b)60 minutes c)120 minutes
2.3	Instrumentation	60 minutes	a)30 minutes b)60 minutes c)120 minutes
2.4	Diesel Engine Starting	10 starts (FW pumps) & 6 starts (others)	
2.5	DC Motors	As per equipment manufacturer's recommendation	
3	Battery Configuration	2X100% (for substation control) 1x100% (for DC critical lighting)	a)2X50% b)1X100%
4	DCDB outgoing feeder type	Switch fuse unit	a)Switch fuse unit b)MCCB c)MCB

Notes:
1. Battery for Plant communication system shall be VRLA/SMF type.
2. All intercell & inter row links shall be of copper with lead coating. Al links are Not acceptable.
3. Chargers shall be provided with voltage dropping diodes with bypass facility to maintain terminal voltage at level to suit instrument requirement at field. Annunciation for failure of the dropping diode shall be given.
4. All the battery chargers shall be designed to have on-line battery load testing facility.
5. The battery charger for switchgear control and critical lighting shall be Thyristor based.
6. All the chargers shall have inbuilt load test provision.
7. Common cell booster suitable for largest battery rating shall be provided in each substation building for similar battery systems.

5.6.15 VARIABLE FREQUENCY DRIVE

S.No.	Description	Selected Option	Available Options
1	By pass feature required	Yes(Note-1)	a)YES b)NO
2	VFD rated output voltage(in case bypass is not provided)		
2.1	MV Inverter	i) Motor kW rating upto 315kW at 415V without bypass (Note-3) ii) Motor kW rating above 315kW & up to 700kW at voltage up to 690V without bypass (Note-4)	
2.2	HV Inverter	>1100V for Motor rating more than 750kW (Note-5)	

Notes:
1. Bypass for VFD shall be provided as a standard practice unless not recommended from Process or driven equipment operation point of view.
2. VFD control supply shall be from 230V AC UPS.
3. 415 V – For VFD fed motor with bypass facility with rating less than or equal to 132 KW.
4. 6.6kV – For VFD fed motor with bypass facility with rating above 132kW and upto 750KW.
5. For motors > 750kW, 6.6 KV voltage shall be used. For higher rated motors such as MAB, WGC etc.(in ECU) & Extruder (in PPU & LDDPE), input supply shall be provided at 66kV level respectively which will be step-down to suitable voltage level for feeding respective motors

5.6.16 CABLE SIZES

The power and control cables shall have the following minimum cross sectional areas

S.No.	Description	Selected Option	Available Options

S.No.	Description	Selected Option	Available Options
1	Medium voltage power cable	25mm^2(Aluminium)/2.5 mm^2 to 16 mm^2(Copper)	a)Above 16 sqmm (Aluminium) b)2.5 sqmm to 16 sqmm (Copper)
2	Control cables	2.5 mm^2 (Copper) twisted pair, multi strand, flexible, shielded (individual pair shielded & overall shielded)	
3	Lighting	2.5 sqmm (Copper), multistrand, flexible	
4	Communication system	0.63 sq.mm i.e. 0.9 mm dia (Copper) for telephone and FO cables for Electrical network PLC system	
5	Telephone System	0.63 mm dia.(Copper) Non Jelly Filled cable	
6	Fire alarm system	1.5 sqmm (Copper)twisted pair	

Notes:

1. For lighting inside the building, minimum 2.5 sqmm. Copper conductor, PVC insulated FRLS wire shall be used in conduit system (for circuit and point wiring), with proper color coding.
2. Cable sizes are indicative only and these shall be finalised as per the recommendations of the equipment manufacturer.
3. Special cable type and size shall be decided on specific requirement.
4. All power cables 2.5 sqmm upto 16 sqmm shall be with copper conductor and above 16 sqmm shall be aluminium/copper conductor.
5. Control cable shall be twisted pair shielded (individual pair shielded & overall shielded type).
6. Outer PVC sheath of all cables shall be flame retardant type. Cables shall have low smoke properties i.e. FRLS type with 60% (Max) smoke density.
7. Earthing cable shall have multi strand copper conductor & overall insulation above the conductor.
8. All control cables, Fire alarm cable and Plant communication cables shall be XLPE insulated.
9. Medium voltage power cable for motors shall be minimum 4 sq.mm (Copper).

5.6.17 BUS DUCT

S.No.	Description	Selected Option	Available Options
1	HV Bus Duct (Phase segregated type)	Conventional	a)Conventional b)Sandwich type c)Cast resin type
2	MV Bus Duct (Non-phase segregated type)	Conventional	a)Conventional b)Sandwich type c)Cast resin type

5.6.18 CAPACITOR BANK

S.No.	Description	Selected Option	Available Options

S.No.	Description	Selected Option	Available Options
1	Voltage Level (kV)	6.6KV	a)0.415KV b)6.6KV c)11KV d)Other
2	Location	Indoor (Panel mounted)	a)Outdoor b)Indoor
3	Type of series reactor	Dry type (panel mounted)	a)Oil filled b)Dry Type
4	APFC Panel	Required (Indoor)	a)Required (Indoor) b)Not Required c)Other

5.7 CABLING SYSTEM

5.7.1 CABLE DETAILS

S.No.	Design Criteria	EHV	HV	415 volts
1	Loads located beyond 1 km	1 core cable	Cable	Cable
2	Loads located 200-1000 m	1 core cable	1-core cable/ 3-core cable	1-core / 3 1/2-core cable
3	Loads located upto 200 m	1 core cable	Cable	Cable
4	Loads beyond 1250A rating and located near the transformer	GIBD/ 1 core cable	Bus duct /1 core cable	Bus duct /1 /3.5 core cable
5	Recommended limiting size of multi-core cable (sqmm)	NA	300	300
6	Short-circuit withstand time (seconds)	1.Incomer from transformer:1 2.Incomer from other switchboard:0.6 3.Plant feeder:0.6 4.Transformer feeder:0.2	1.Incomer from transformer:1 2.Incomer from other switchboard:0.6 3.Plant feeder:0.6 4.Motor/Transformer feeder:0.2 5.Capacitor feeder:0.4	Not Applicable
7	Insulation voltage grade	Earthed	Unearthed for 6.6kV cable. Earthed for 66kV cable in Petchem & 33kV cable in Bina refinery	Earthed
8	Type of cable insulation	XLPE	XLPE	XLPE
9	Fire survival (Resistant) cable for Fire proof MOV and NIFPS	NA	NA	Yes
10	Power Cable for Motors/MOV	NA	3 core	3 core
11	Cable Conductor	***Copper***	Copper/ Aluminium	Refer Cl. 5.6.16

S.No.	Design Criteria	EHV	HV	415 volts
12	Armouring	Unarmoured or Armoured	Power cable Armoured Earthing cable un-armoured	Power cable Armoured Earthing cable un-armoured
13	Type of Moisture barrier	***Corrugated Aluminium***	NA	NA
14	Termination Type	Cold Shrink/ Hot Shrink/ Premoulded	Cold Shrink/ Hot Shrink	NA
15	Screen Bonding arrangement for single core cables	Single point or Cross bonding	Single point or Cross bonding	NA

Notes:
1. EHV GIBD shall be phase separated SF6 insulated type.
2. Following color code shall be used for power cables:
220kV: Black
66kV: Violet
33kV: Pink
6.6kV: Yellow
1.1kV: Black
FS (Fire survival cables for MOV power & control): White
PA: Grey
FA: Red
Control: Black

5.7.2 CABLE LUGS MATERIAL

S.No.	Description	Selected Option	Available Options
1	Copper conductor cable & copper bus bar/ terminals	Tinned Copper	a)Tinned Copper
2	Copper conductor cable & Aluminium bus bar/ terminals	Tinned Copper	a)Tinned Copper b)Bi-metallic (Aluminium palm with Copper barrel)
3	Aluminium conductor cable & Copper bus bar/ terminals	Bi-metallic (Aluminium barrel with Tinned Copper palm)	a)Bi-metallic (Aluminium barrel with Tinned Copper palm) b)Tinned Copper
4	Aluminium conductor cable & Aluminium bus bar/ terminals	Aluminium	a)Aluminium b)Tinned Copper

5.7.3 CABLE LAYING PHILOSOPHY

S.No.	Description	Selected Option	Remarks
1	Process area where pipe-rack/sleeper is available	Above ground cable tray	a)Above ground cable tray b)RCC Trench
2	Process area where pipe-racks/ sleeper is not available	***Overhead cable tray/RCC trench sand filled without racks (localised), wherever overhead cable tray route is not possible***	a)Overhead cable tray b)RCC trench, sand filled without racks

S.No.	Description	Selected Option	Remarks
3	Offsite paved area where pipe-rack / sleeper is available	Above Ground cable tray	a)Above Ground cable tray b)Overhead rack c)RCC trench d)Other
4	Offsite paved area where pipe-rack / sleeper is not available	RCC trench, sand dust filled without racks	a)Above ground cable tray b)Overhead rack c)RCC trench, sand filled without racks d)RCC trench,without sand filling with racks
5	Offside unpaved area where pipe-rack/ sleeper is available	Above Ground cable tray	a)Above Ground cable tray b)Overhead rack c)RCC trench d)Other
6	Offside unpaved area where pipe-rack/ sleeper is not available	Directly buried/RCC trench as per site conditions	a)RCC Trench b)Directly buried
7	Type of cable trays	Galvanized prefabricated FRP type for CT & CWPH	a)Galvanized prefabricated b)Site fabricated and Painted c)FRP type
8	Road Crossings for underground cables	***Cable culvert/ERC***	a)PVC Pipes b)Cable culvert
9	Road Crossings for Above ground cables	Overhead cable bridge / culvert	a)Overhead cable bridge b)Culvert
10	Walkway, handrail and ladder for overhead cable trays	Required	a)Required b)Not Required
11	Cable entry into Blast resistant CR/SRR	Through MCT	a)Through MCT b)Without MCT through trench c)Without MCT through sleeves below ground
12	Cable entry into Sub-station	Underground through trench	a)Underground through trench b)Overhead through trays

Notes:-

1. Plant communication, fire alarm and telephone cables shall be laid in instrumentation overhead cable duct / instrumentation trenches as far possible. In case these are not available. Cable shall be laid in electrical routes along berm of the roads.
2. FO Cable shall be laid through HDPE / GI conduit.
3. All hardware used for joining cable trays shall be of SS material.
4. Cables shall not pass through area where high temperature lines, steam vents / drains etc are provided. Adequate precautions shall be taken in un-avoidable cases.
5. Signal cables i.e. Instrument, communication, fire alarm, LAN and data highway, etc. shall preferably not be laid in the same trench / tray along with electrical cables. In case they are laid in the same trench / tray, a clearance of minimum 300 mm from electrical cables shall be provided. The overall cable layouts shall be designed for minimum interference between signal and power cables.
6. Cable entry to CR/SRR - Through MCT.
7(a). Walkway, handrail and ladder for overhead cable tray - Required.
7(b). No cable joints in overhead cable trays is permitted in Process unit/Hazardous

area.
8. EHV (220kV) cables shall be laid in RCC Trench, filled with stone dust without racks.
9. Cable laying philosophy
a) Cables in general shall be laid in overhead cable trays in the unit area & in overhead cable trays/cable trenches in offsite paved and unpaved areas.
b) Lighting cables in unit area shall be laid overhead in cable trays
c) For Offsite unpaved area, cable may be buried underground built-in cable trench depending on number and criticality of cables which may accordingly be decided during detailed engineering.
d) Cable shall cross the road through cable culvert or ERC. For ERC details, refer structural design basis.
e) FO cables shall be laid in HDPE / GI conduit.
f) No process pipe shall pass through cable trench. If unavoidable, minimum 300mm clearance to be provided between pipe and cables. In this case, either pipe or cables shall be taken through RCC congregate.
g) Ensure no hydrocarbon or water seepage into the cable trench.
h) All cables shall be provided with Fire proofing coating upto 1.0m from termination point as per OISD requirement.
10) All new substations shall be connected to MRS through fibre optic cable network. FO cable laying can be planned along with Power cable from MRS. All interfacing shall be through OFC cables such as differential protection, inter-tripping & ECS connectivity etc.
11) Fire proofing of all substation entries for cable / bus duct shall be done.
12) In case of direct burial, cable route markers shall be installed at 15 m interval all along the cable routes and where the direction of cable trench changes.
13) All cables shall have cable lead marker wrapped on cables for easy identification indicating Tag No., Size, voltage grade & source. These lead markers shall be put at each 15m interval, at all bend and at places from where cables come out from ground.
14) In case when cable is laid underground in normal soil (not in trench) then a layer of stone dust up to 150 mm shall be provided over laid cables, over the stone dust a single layer of bricks shall be provided and then the area shall be filled with loose soil. A PCC shall be made over these type of cable trenches which shall be of min. 100mm thickness. A red colour marking shall be done over the PCC for easy identification.

5.8 EARTHING SYSTEM

S.No.	Description	Selected Option	Available Options
1	Earth electrode	***Chemical earth electrode***	
2	Main earth loop material	GI main earth grid upto Earth plate. Earth plate to Equipment by Copper cable	
3	Substation earth loop	Combination of GI strip and CU cable	
4	EHV switchyard earth grid	YES for EHV GIS	

Notes:
1. Earth pits shall be painted as per standard for e.g. earth pit for equipment earthing, body earthing etc. shall be green, transformer neutral earthing shall be black and lightening arrestors shall be blue.
2. Earth pit number shall be marked on each earth pit.
3. Earth pit cover size shall be min 650 X 650 mm.
4. Earth pit chamber covers shall be flushed with FFL for paved area. For unpaved area, it

should be elevated.

5.9 LIGHTING SYSTEM

5.9.1 SUPPLY SYSTEM

S.No.	Description	Selected Option	Available Options
1	Centralised with Lighting distribution board-LDB	***NO***	a)YES b)NO
2	LDB at each substation	Yes	a)YES b)NO
3	Lighting transformer required	Yes	a)YES b)NO
4	100% Standby transformer for normal lighting system	***Yes***	a)YES b)NO
5	100% Standby transformer for emergency lighting system	***Yes***	a)YES b)NO
6	Lighting transformer voltage ratio	415V/415V with tapping (Note-1)	a)415V/415V b)415V/400V c)Other

1) Off circuit tap changer shall be with voltage variation in steps of +/- 2.5% with tap range +10% and -5%.
2) Following philosophy shall be followed for lighting system:
a) The Lighting distribution board (LDBs) shall have outgoing feeders to feed Indoor & Outdoor lighting panels of each unit and U&O. 240V convenience sockets in plant area shall be fed through power panel which in turn will get feeder from ASB.
b) LDBs shall be provided with Astronomical type digital timer with programming over full year for outdoor/plant lighting auto control.
c) The outdoor lighting in unit shall be done using multi-way FLP lighting panels.
d) DC critical lighting is required in Plant / Substation / SRR / Control room through separate 110 V DC battery charger so that fault in lighting circuit will not affect substation charger. DC critical lighting shall be 110V LED type.
e) For LED fixture, integral junction box shall be provided with 3 nos. cable entries for loop-in, loop out and associated wiring to fixture. Alternatively 2 nos. cable entries for loop-in and loop-out shall be provided with internal wiring for driver and lamp.
f) For emergency lighting in the plant, there shall be separate Emergency Lighting distribution board (ELDBs). Distribution to emergency light fitting shall be similar to normal light fitting i.e. from ELDB to flameproof multiway lighting panel & from this to individual light fitting.
g) For platform mounted poles, bottom of light fitting shall be 2 metre from floor/platform. All platform mounted poles shall be of GI type with all SS mounting hardware including SS U clamps & SS platform mounting lock nuts.
h) For light fitting, 4 core cables shall be used. 4 core cable for lighting shall be stranded type. Cables shall be connected at terminals with use of lugs.
i) Final LUX level study shall be carried out after mechanical completion of project activities.
j) LDB & ELDB shall have different compartments as per project datasheet to feed lighting supply for different areas either in auto/manual mode. Each LDB & ELDB board for auto circuit shall be provided with one common astronomical type digital timer to control outdoor plant lighting. Also one unwired additional astronomical timer shall be provided in the timer compartment of LDBs & ELDBs.
k) LED light/latest energy efficient light fittings shall be provided for plant area lighting, street lighting, transformer bay lighting, substation, control room and office lighting. All these fittings shall be covered under 5 year warrantee. Flameproof well

glass type LED fitting shall be provided for plant area lighting. Wire Guard of FLP light fittings shall be made up of SS304 material (min. 4mm thickness). However, flameproof focus LED lights need not be well glass type.
l) Surge suppressor for LED fitting shall be suitable for 10KV. LED fitting driver shall take care of neutral opening for long sustained cases.
m) Goose neck poles mounted light fittings to be used wherever gratings are there e.g. on the columns, heaters, stair case etc. The bottom of light fitting from the grating shall be 2 metre. Goose neck pipes shall be installed on the railings and orientation shall be parallel to the railing and shall not obstruct the walkway. On the grating area where goose neck pole cannot be installed, lighting fittings can be installed on the structure in such a way that fitting height is 2 metre. Goose neck poles shall be of GI with coating of 100 microns.
n) The lighting fittings on ground floor shall be approachable by max 12 feet ladder and on upper floors wherever solid concrete surface is available the lighting fittings shall be approachable by max 8 feet ladder.
o) All lighting fittings and junction boxes shall be properly approachable. For e.g. location of lighting fitting should not be above any equipment motor/pump/panel etc.).
p) All hardware such as Nuts, Bolts & washers used for light fittings, JBs, goose neck pole etc shall be of SS304 material.

5.9.2 CONTROL PHILOSOPHY

S.No.	Description	Selected Option	Available Options
1	Outdoor yard	Auto	a)Auto b)Manual c)Centralised d)Local
2	Street lighting	Auto/Manual/centralised	a)Auto b)Manual c)Centralised d)Local
3	Outdoor process area	Auto/manual; centralised/local	a)Auto b)Manual c)Centralised d)Local
4	Process building	Auto/manual/Local	a)Auto b)Manual c)Centralised d)Local
5	Auto control	Astronomical timer with programming over full year	a)Synchronous timer b)Photocell c)ECS
6	Lamp type for all types of lighting fixtures.	LED	
7	ELCB in outgoing of LDB/ ASB feeding Lighting/ Power Panels	Yes sensitivity of 300mA*	a)YES b)NO
8	ON /OFF Push button at substation entry	Yes	a)YES b)NO
9	ELCB (30mA) in each circuit of LP/PP	Yes (2-pole)*	a)YES b)NO

Notes:
1) ELCB indicated in the above clause shall be referred as "RCCB".

2) Substation lighting control switch shall be provided outside the substation room (both side doors) for switching ON and OFF the substation lighting (normal) from outside.

5.9.3 AC EMERGENCY LIGHTING

S.No.	Description	Selected Option	Available Options
1	Name of process plants	All process areas (as per operation requirement)	
2	Name of buildings	Substation, Control room, Fire Water Pump House, Admin Building, Lab., Workshop, Canteen, Warehouse (Office Area) etc.	
3	Power supply source	Diesel generator	

5.9.4 DC CRITICAL LIGHTING FOR ESCAPE

S.No.	Description	Selected Option	Available Options
1	Name of process units	Required (as per OISD)	
2	Name of building	Substation, control room, SRR, Administration building, FWPH, Fire Station, Emg. generator shed, First Aid Center	
3	DC lighting for remote buildings	Lighting fixture with built in battery	

5.9.5 WIRING TYPE

S.No.	Description	Selected Option	Available Options
1	Process plant / Building / Shed	Armoured cable	
2	Large service building	Surface conduit	
3	Buildings with false ceiling	METSEC/Surface conduit above false ceiling	a) Surface conduit above false ceiling except in switchgear room, concealed conduit below false ceiling b) Cables c) Perforated cable tray
4	Substation (Switchgear Room)	METSEC channel/Concealed conduit	a)METSEC channel b)Concealed conduit
5	Substation (Cable Cellar)	Surface Conduit	a)Surface Conduit b)Armoured cable c)METSEC channel d)Concealed conduit
6	Other buildings in safe area	Surface conduit/cable (armoured)	

5.9.6 SPECIFIC LIGHTING REQUIREMENTS

S.No.	Description	Selected Option	Available Options
1	Aviation warning lighting	Yes, LED based Flashing	a)YES b)NO

S.No.	Description	Selected Option	Available Options
2	Security lighting for peripheral road boundary wall	Required for Petchem	a)Required b)Not Required
3	Type of high mast flood light	30 meters Telescopic tubular with LED lamps (Note-3)	a)30 meters Telescopic tubular b)Lattice structural mast
4	Overall general lighting	High Mast	a)High Mast b)Street Lighting c)High mast with street lighting d)Photovoltaic solar hybrid street light e)Other

Notes:
1. Type of Fitting for indoor and outdoor lighting : LED Lamp
2. 30m High mast control panel and motor shall be FLP type for Hazardous area.
3. The high mast shall be smart enabled consisting of dimmable type lighting fixtures, along with dimmable drivers, dimming controller, smart high mast feeder pillar panel, associated cabling between drivers & controllers, controller & smart high mast feeder pillar panel etc.
4. Adequate number of street lighting poles shall be provided along the peripheral roads of the unit. The supply to street light shall be taken through plant lighting DB at substation. Street lighting poles shall be octagonal type, hot dip galvanised to 100 micron.
5. Lighting mast provided in the plant area during construction time shall have flame proof motor and flame proof starter with 24 nos. of LED lighting fitting/fixture(400W). The LUX level shall be minimum 5 LUX at 80 m radius of lighting mast. Height of the lighting mast shall be 30 meter. Lighting mast shall be installed during construction stage in such a way that same can be used after commissioning of the plant. Light Fittings on top of the mast shall be LED based with individual fuse for protection.

5.10 ELECTRIC HEAT TRACING SYSTEM

S.No.	Description	Selected Option	Available Options
1	Maximum sheath temperature of Tracer	Product classification approach for SR	a) Product classification approach for SR b) System approach for PL/ MI
2	Skin effect heat tracing	Not required	a)Required b)Not Required
3	Circuit Temperature Control	RTD	a)RTD b)Thermostat
4	Central Monitoring System	Yes (Note-2)	a)Yes b)No

Note:
1. Skin Effect Heat tracing system shall be provided for long length pipeline application based on requirement.
2. Corresponding central monitoring units of respective Electrical heat tracing system shall be located in SRR/MCR for which exact location shall be decided during detail engineering.

5.11 ELECTRICAL EQUIPMENT FOR HAZARDOUS AREAS

The electrical equipment for hazardous areas both for flammable gas & vapour areas and for explosive dust areas shall be selected as per IS-16724, OISD-149 and Petroleum rules. The Gas/ Dust group and Temperature class shall be selected based on the hazardous area classification. The minimum requirement is summarised below (for flammable gas and vapour areas):

S.No.	Equipment	Zone-1	Zone-2
1	MV Motors	Ex-d	Ex-d
2	HV Motors	Ex-d / Ex-p (Note-2.8)	Ex-d / Ex-p (Note-2.8)
3	Push Button Station	Ex-d	Ex-d
4	Motor Starters	Ex-d	Ex-d
5	Plug & Socket	Ex-d	Ex-d
6	Welding Receptacle	Ex-d	Ex-d
7	Lighting fitting	Ex-d	Ex-d
8	Junction Boxes	Ex-d	Ex-d
9	Transformer Unit	Ex-d	Ex-d
10	Plug & Socket	Ex-d	Ex-d
11	Break Glass Unit (Fire Alarm System)	Ex-d	Ex-d
12	Lighting Panel/Power Panel	Ex-d	Ex-d
13	Transformers	Hermetically sealed with surface temperature not exceeding 200 DEG C	Hermetically sealed with surface temperature not exceeding 200 DEG C
14	Plant communication system	Ex-d / Intrinsically safe	Ex-d / Intrinsically safe
15	Plant Lift	Ex-d	Ex-d
16	Aviation lighting fitting	Ex-d	Ex-d

For additional Hazardous Area requirements, refer notes below -

5.11.1 NOTES

S.No.	Notes
1	The electrical equipment for hazardous areas shall generally be suitable for gas group IIB and temp classification T3 as applicable to the selected type of explosion protection. In case of hydrogen or hydrocarbon mixtures having more than 30% hydrogen, the gas group to be considered shall be IIC.
2	As additional safety features, the following requirements for electrical equipment shall be followed.
2.1	The electric motors for agitators/mixers, metering pumps and canned pumps handling flammable material shall be flameproof type irrespective of the area being classified as zone 2 or zone 1.
2.2	All electric motors for vertical sump pumps handling flammable material shall be flameproof type. (Ex-d)
2.3	Irrespective of the area classification (whether zone 1 or zone 2), all lighting fixtures within the storage areas shall be flameproof type. (Ex-d)
2.4	Irrespective of the area classification (whether zone 1 or zone 2), all motors and lighting fixtures within the pump house/pump station/ compressor house associated with offsite tank farm, within the loading/unloading gantries shall be of flameproof type. (Ex-d)
2.5	The emergency/critical lighting fixtures and associated junction boxes in hazardous areas (whether zone-1 or zone-2) shall be flameproof type. (Ex-d)
2.6	Even though fired heaters in process units are not considered for area classification, all electrical equipments associated with fired heaters in process units shall as a minimum be suitable for installation in Zone-2 area.

S.No.	Notes
2.7	Building such as Compressor sheds inside the process area shall be designed to allow adequate ventilation to allow area classification as Zone-2. Lighting equipment, EOT crane etc. in the shed shall be flameproof type. All other electrical equipment shall be suitable for Zone-1 or Zone-2 area depending on extent of hazard.
2.8	The motors for hazardous area Zone-1 shall preferably be flameproof type. Pressurised motors may be provided in exceptional cases, when flame proof motors are not available.
2.9	In zone-1 areas, Ex-de motor i.e. Ex-d motor with Ex-e terminal box is acceptable provided the motor has been tested/ certified by CIMFR or equivalent testing agency and approved by PESO
3	Statutory Approval 1. Statutory Authority for Electrical Installation: State Electrical Inspectorate/CEA 2. Statutory authority for hazardous area: DGMS:For mining area PESO:For area other than mines

5.12 ELECTRICAL CONTROL SYSTEM-ECS

S.No.	Description	Selected Option	Available Options
1	Extent of coverage	APPLICABLE FOR PETCHEM LOCATION	
1.1	No of substations	All	
1.2	Monitoring		
1.2.1	EHV/HV switchboard	Yes	a)YES b)NO
1.2.2	415V switchboard (I/C, B/C & outgoing breaker feeders)	Yes	a)YES b)NO
1.2.3	Emergency DG set	Yes	a)YES b)NO
1.3	Control		
1.3.1	EHV/HV switchboard	Yes	a)YES b)NO
1.3.2	415V switchboard (I/C, B/C & outgoing breaker feeders)	No	a)YES b)NO
1.3.3	Emergency DG set	No	a)YES b)NO
2	Base ECS functionalities		
2.1	Breaker control in CPP & Switchyard	OFF control for motor feeders, ON/OFF for all other breakers	
2.2	Breaker control in other substations	ON/OFF Control for Capacitor feeder. OFF control for all feeders	
2.3	Area lighting	ON/OFF control	
2.4	Electrical plant data acquisition and display	Yes	a)YES b)NO
2.5	Routine log report generation and energy balance report	Yes	a)YES b)NO
2.6	Detection and reporting of alarms	Yes	a)YES b)NO
2.7	Sequence of event recording	Yes	a)YES b)NO

S.No.	Description	Selected Option	Available Options
3	Advanced ECS functionalities		
3.1	Load shedding including maximum demand limit control	YES (Note-1)	a)YES b)NO
3.2	Synchronization	YES	a)YES b)NO
3.3	Capacitor feeder control for power factor improvement	No	a)YES b)NO
3.4	Active & Reactive power control	YES	a)YES b)NO
3.5	Frequency & load control of all generators except DG	YES	a)YES b)NO
3.6	Excitation control of synchronous motors	NO	a)YES b)NO
3.7	Grid transformer OLTC control	YES	a)YES b)NO
4	Communication with other systems	Refer communication requirements in SAS	

Notes: 1.
Dedicated load shedding scheme shall be provided for Petchem Project.

6.0 SPARE PARTS

6.1 MANDATORY SPARES

Mandatory spares shall be procured along with the main equipment. Such spares for each equipment shall be as per the below table. These spares include only those spares, which are critical for equipment.

S.No.	Part Description	Description
1	Generator	One set of spare for each Generator
1.1	Generator relay	One set (each type & make)
1.2	DVR - all control card	One each type
1.3	Control fuses / MCB	10 Nos. of each rating & type
1.4	Exciter Diodes and fuses	1 set
1.5	Control and Selector switches	1 No. of each type and make
1.6	Aux. contactors	20% of each type and make OR 1 No.(min) of each type and make, whichever is more
2	66kV / 33kV Gas Insulated Switchboard (GIS)	One set of spare for each switchboard (Refer Note-7 & 10)
2.1	Portable gas filling equipment/SF6 gas cart	1 No.
2.2	Handle for disconnector switch drive	4 Nos.
2.3	Handle for earthing switch drive	4 Nos.
2.4	Pre selection / Mechanical key	1 No.
2.5	Power cable termination kit along with plug and socket (R,Y,B Phases)	2 Sets
2.6	Tripping coil	2 No.
2.7	Closing coil	2 No.
2.8	Capacitive type voltage detectors	1 Set
2.9	Control fuses / MCB	10 Nos. of each rating & type

S.No.	Part Description	Description
2.10	Density monitoring device	2 Nos of each type
2.11	Indicating lamps covers	5 nos. of each colour
2.12	Indicating lamps	20% or 3 nos. (min.), whichever is more
2.13	Portable SF6 Gas Leakage Detector	1 Nos.
2.14	Ethernet Switch	1 no. of each type (Refer Note-10)
2.15	Pressure Gauge	2 Nos of each type
3	Power Transformer	One set of spare for each power transformer
3.1	Complete set of gaskets	1 set
3.2	Sealing / Gauge glass of Conservator	2 Nos of each rating & type.
3.3	Control fuses / MCB for MB cubicles	20% for each rating OR 1 No. (min.) of each rating, whichever is more
3.4	HV bushings	One set of each type and rating
3.5	OTI	1 no.
3.6	WTI	1 no.
3.7	Buchholz relay	1 no.
3.8	OLTC Diverter switch along with transition Resistance	1 set
3.9	OLTC fixed & moving contacts along with transition resistance	1 set
4	Distribution Transformer	One set of spare for each transformer
4.1	Complete set of gaskets	1 set
4.2	Sealing / Gauge glass of Conservator	2 Nos. of each rating & type.
4.3	Control fuses / MCB for MB cubicles	20% for each rating OR 1 No. (min.) of each rating, whichever is more
4.4	HV & MV bushings	One set of each type and rating
4.5	OTI	1 no.
4.6	WTI	1 no.
4.7	Buchholz relay	1 no.
5	HV Air Insulated Switchboard (AIS)	One set of spare for each switchboard (Refer Note-7 & 10)
5.1	Closing coil	1 No. of each rating & type
5.2	Shunt trip coil	1 No. of each rating & type
5.3	Control fuses / MCB (all type & rating)	10 Nos. of each rating & type
5.4	Breaker Finger jaws	1 set for each rating and type
5.5	Indicating lamps covers	5 Nos. of each colour
5.6	Indicating lamps	20% or 3 Nos. (min.), whichever is more
5.7	Ethernet Switch	1 no. of each type (Refer Note-10)
5.8	Spring Charging Motor	1 no. each type
5.9	Numerical Protection relays	1 no. each type
6	415V MV Switchboard & iMCC (Intelligent MCC)	One set of spare for each switchboard (refer Note-9 & 10)
6.1	Closing coil	1 No. of each rating & type
6.2	Shunt trip coil	1 No. of each rating & type
6.3	Control fuses / MCB	10 Nos. each rating & type
6.4	Indicating lamps covers	5 Nos. of each colour
6.5	Indicating lamps	20% or 3 Nos. (min.), whichever is more
6.6	Breaker finger jaws	1 set for each rating and type
6.7	Contactor contacts	1 set for each rating and type
6.8	Ethernet Switch	1 no. of each type (Refer Note-10)

S.No.	Part Description	Description
6.9	Electronic modules of iMCC (Intelligent MCC)	20% electronic modules of each type
6.10	Spring Charging Motor	1 no. of each type
6.11	Numerical Protection relays	1 no. of each type
6.12	Contactors(Beyond 400 Amps)	1 No. of each rating
7	Variable Frequency Drive (one set of spare for each VFD) and Soft Starter	Quantity is per VFD and Soft Starter
7.1	IGBT / Thyristor /IGCT/ Other Power Semiconductor devices	3 No. of each type & rating
7.2	Control cards	1 No of each type
7.3	Power supply cards	1 No of each rating & type
7.4	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
7.5	Drive Unit	1 No. of each type
7.6	Contactors	10% of each type OR 1 no. (min) of each type, whichever is more
7.7	Indicating lamps	20% OR 1 nos. (min.), whichever is more
7.8	Indicating lamps covers	2 nos of each colour
7.9	Blocker Diode	2 nos. of each rating & type
7.10	Control power supply module	1 No of each rating & type
7.11	Power module	3 No of each rating & type
7.12	Inverter Cell for Drive (Only HV)	1 No of each rating & type
8	Substation Automation System (SAS) / HMI / Data Concentrator	One set of spare for each SAS / HMI / Data Concentrator
8.1	All cards such as input & output cards, power supply cards, processor cards etc.	1 No. of each type
8.2	Ethernet switches	1 No. of each type
8.3	Control fuses / MCB	10 Nos. of each rating & type
9	Relays for GIS/ Switchboard / Relay control Panel	One set of spare for each GIS/ Switchboard (Refer Note-8) /Relay control Panel
9.1	Protection Relays	1 No. of each type
9.2	Auxiliary Relays	10% or minimum 2 Nos. of each type
10	UPS System	One set of spare for each UPS system
10.1	Power Thyristors / Transistors / IGBT / IGCT	1 No. of each rating & type
10.2	Control cards	1 No. of each type
10.3	Power supply cards	1 No. of each rating and type
10.4	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
10.5	Control fuses / MCB	10 Nos. of each rating & type
10.6	Indicating lamps	10% OR 3 nos. (min.), whichever is more
10.7	Indicating lamps covers	2 Nos. of each colour
10.8	Blocker Diode	2 Nos. of each rating & type
11	DC System	One set of spare for each DC System
11.1	Power Thyristors / Transistors / IGBT / IGCT	1 No. of each rating & type
11.2	Control cards	1 No. of each type
11.3	Power supply cards	1 No. of each rating and type
11.4	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
11.5	Control fuses / MCB	10 Nos. of each rating & type

S.No.	Part Description	Description
11.6	Indicating lamps	10% OR 3 nos. (min.), whichever is more
11.7	Indicating lamps covers	2 Nos. of each colour
11.8	Blocker Diode	2 Nos. of each rating & type
11.9	Thyristors/Transistors/ IGBT/ IGCT	3 Nos. of each rating & type
11.10	Power fuses	3 Nos. of each rating & type
12	Synchronous motors	One set of spare for each rating & type
12.1	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
12.2	Control fuses / MCB	10 Nos. of each rating & type
12.3	Bearing (DE & NDE)	1 set
12.4	Control cards	1 No. of each type
12.5	Terminal studs/bushing assembly	1 set each
12.6	Exciter Diodes and fuses	1 set
13	HV induction motors	One set of spare for each rating & type
13.1	Bearing (DE & NDE)	1 set
13.4	Purge panel	Complete 1 Panel (for Ex """"P"""" motor)
13.2	Terminal studs/bushing assembly	1 set each
13.3	speed switch	1 set each type
14	MV induction motors 37 kW & above	One set of spare for each rating & type
14.1	Bearing (DE & NDE)	1 set
14.3	Speed switch	1 set each type
14.2	Terminal studs/bushing assembly	1 set each
15	Fire alarm system	
15.1	All cards	1 No. of each type
15.2	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
15.3	Control fuses / MCB	10 Nos. of each rating & type
15.4	Terminal blocks	20 Nos
15.5	Smoke/Multisensor/Heat Detectors	1% of total installed capacity of each type OR 1 no.(min.) of each type, whichever is more
15.6	Glass for Break Glass Boxes/ Manual call point	5 % of each type OR 1 No. (min.) of each type, whichever is more
15.7	Ethernet Switch	1 No. of each type
16	Paging system / Plant Communication System	
16.1	All cards	1 No of each type
16.2	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
16.3	Control fuses / MCB	10 Nos. each rating & type
16.4	Ethernet Switch	1 No. of each type
17	Thyristor control panel for heaters	
17.1	Rectifier control module (Control card fully assembled)	1 No. of each type
17.2	Power supply card	1 No. of each type
17.3	Control cards	1 No of each type
17.4	Power fuses	2 Nos. min. of each rating and type
17.5	Control fuses / MCB	10 Nos. each rating & type

S.No.	Part Description	Description
17.6	Contactors	10% of each type OR one no (min) of each type, whichever is more
17.7	Indicating lamps	20% OR 1 nos. (min.), whichever is more
17.8	Indicating lamps covers	2 nos. of each colour
17.9	Blocker Diode	2 nos. of each rating & type
17.10	Power Module	1 No. of each rating and type
17.11	Thyristors	6 Nos. each rating
17.12	Transducer,Signal Isolator /Multiplier	1 No. each rating
18	Electrical Control System (ECS)	
18.1	Interposing relays (As applicable)	5 Nos. of each type
18.2	Power supply & control cards	1 No. of each type
18.3	Transducers	20% of estimated quantity of each type and make OR 1 no (min) of each type and make, whichever is more
18.4	Function generator cum counter	1 No.
18.5	4-20mA signal injection set	1 No.
18.6	Isolation transformer	1 No.
18.7	Ethernet Switch	1 No. of each type
19	Electrical Heat Tracing System	
19.1	RTD/Thermostat	1 no. of each type
19.2	Control fuses/ MCB/ELCB	5 Nos. each rating & type
19.3	Indicating lamps	10% or 2 nos. (min.) whichever is more
19.4	Indicating lamps covers	5 nos. of each colour
19.5	Contactor contacts	1 set for each rating and type
20	APFC panels for Capacitor Bank	One set of spare for total APFC panels
20.1	Control cards	One no. of each type
20.2	Power supply cards	One No of each rating & type
20.3	Power fuses	20% for each rating or one no. (min.) of each rating, whichever is more
20.4	Control fuses/ MCB	10 Nos. of each rating & type
20.5	Auxiliary Contactors	10% of each type or 1 no. (min.) of each type, whichever is more
20.6	Numerical Relays	One no. of each type
20.7	Indicating lamp covers	2 nos. of each colour
20.8	Indicating lamps	20% or 1 no. (min.), whichever is more
21	Solar Photovoltaic System	One set of spare for each system
21.1	Power Thyristor / Transistors / IGBT / IGCT	1 No. of each rating & type
21.2	Control cards	1 No. of each type
21.3	Power supply cards	1 No. of each rating and type
21.4	Cable connectors	10% or minimum 2 Nos. of each type
22	Lift	
22.1	Control Card	1 No. of each type
22.2	PLC/VFD	1 No. of each type
22.3	Floor Level indicator	1 no. of each type
22.4	Limit switches	1 no. of each type
22.5	Brake assembly	1 no. of each type
22.6	Complete Gear box Assembly	1 No. of each type
22.7	Relays & contactors	1 no. of each type
23	220kV GIS for Petchem Project	One set of spare for each GIS
23.1	SF6 Gas Leakage Detector	1 nos.

S.No.	Part Description	Description
23.2	Portable Gas filling and evacuating cart	1 nos.
23.3	SF6 Gas Analyzer	1 nos.
23.4	Portable Partial Discharge Monitoring System	1 nos.
23.5	SF6 Gas topping system	1 nos.
23.6	Handle for Disconnector switch drive (If applicable as per standard design)	4 nos.
23.7	Handle for earthing switch drive (If applicable as per standard design)	4 nos.
23.8	Tripping coil	2 nos.
23.9	Closing coil	2 nos.
23.10	Density monitoring device	2 Nos. of each type
23.11	Pressure Gauge	2 Nos. of each type
23.12	Ethernet Switch	1 Nos. of each type
23.13	Capacitive type voltage detectors	1 set
24	Excitation system for motors	
24.1	Transistors/IGBT/IGCT	3 Nos. of each rating & type
24.2	Controls cards	1 No. of each type
24.3	Power supply Cards	1 No. of each type
24.4	Power Fuses	3 Nos. of each rating & type
24.5	Contactors	no. of each rating and type (for rating > 400A)
25	Igniters	
25.1	Ignition transformer	1 No. of each rating & type
25.2	Control Card	1 No. of each rating & type
25.3	Ignition tip	1 No. of each type
26	Desalter	
26.1	Entrace Bushing	3 Nos. of each rating
26.2	Transformer Bushing	3 nos. of each rating
26.3	Insulators	3 Nos. of each rating
27	Flameproof Light Fitting	5% LED drivers for each type of FLP light fitting.

NOTES:

1. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.
2. Wherever % age is identified, Contractor shall supply next rounded figure.
3. The terminology used under 'Part Description' is the commonly used name of the part and may vary from manufacturer to manufacturer.
4. Mandatory spares as indicated above do not cover commissioning spares.
5. Mandatory spares as indicated above do not cover two year O&M spares.
6. Mandatory spares shall be applicable for electrical items of motors / sub-packages as per mandatory spares philosophy specified elsewhere in the bid document.
7. For Isolation breaker panel (GIS or AIS) one set of "Tripping Coil (1 No.), Closing coil (1 No.) and Control fuse/MCB (10 Nos. of each rating and type)" shall be considered as mandatory spares for each Isolation breaker panel (GIS or AIS).
8. For Isolation breaker panel (GIS or AIS) one set of "Auxiliary relays (1 no. of each type)" shall be considered as mandatory spares for Relays for Isolation breaker panel (GIS or AIS).
9. MV Switchboard shall include fixed and drawout type of switchboards such as PCC, MCC, PMCC, EPCC, EPMCC, ASB, LDB, ELDB, package switchboards etc.
10. 1 no. Ethernet switch of each type shall be provided for all switchboards put together.

6.2 COMMISSIONING SPARES

Commissioning Spare Parts shall be procured along with the main equipment as per equipment manufacturer's recommendations. The list of such recommended spares shall be obtained along with the offer.

Minimum 2 nos. Breaker handling trolley, 5 nos. each Breaker racking / rack out handle, Breaker spring charging handle and Fuse puller shall be procured for each type of switchboard.

6.3 RECOMMENDED SPARE FOR NORMAL OPERATION & MAINTAINENCE

Quotation for two-years spares for normal operation and maintenance (over and above mandatory spares) along with unit price shall be obtained with the proposal for Client to order the same separately.

6.4 SPECIAL TOOLS AND TACKLES

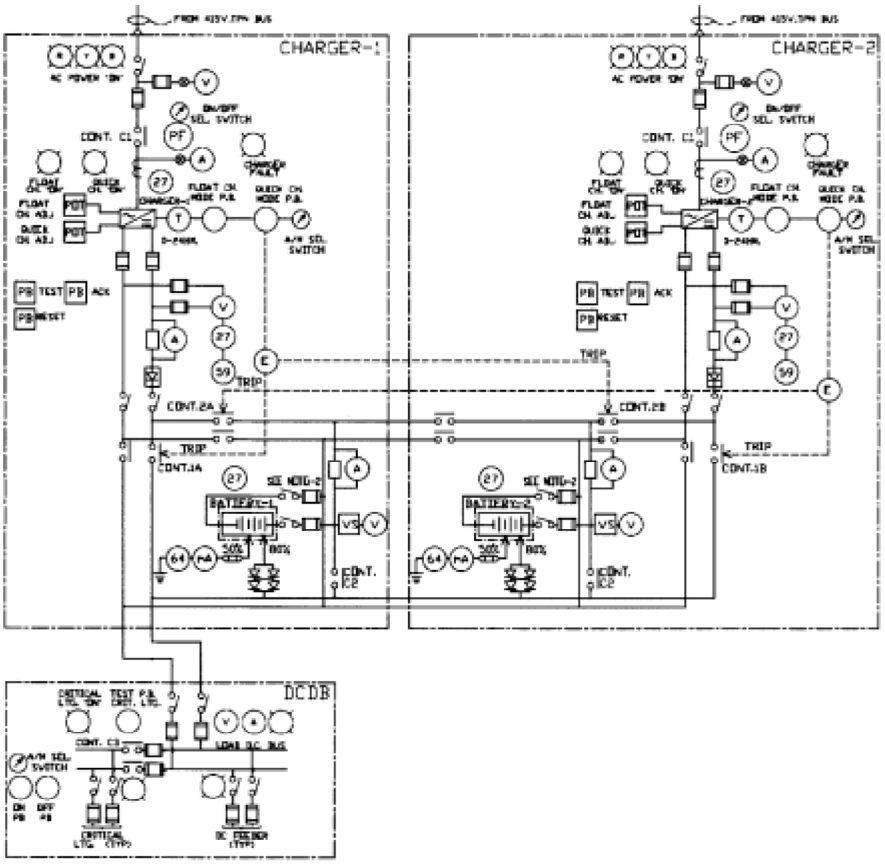
Required Special Tools and Tackles shall be procured along with the main equipment as per equipment manufacturer's recommendations. The list of such recommended special tools/tackles shall be obtained along with the offer.

7.0 VENDOR DATA REQUIREMENT

Vendor Data Requirement as indicated in the respective equipment Material Requisitions shall be followed.

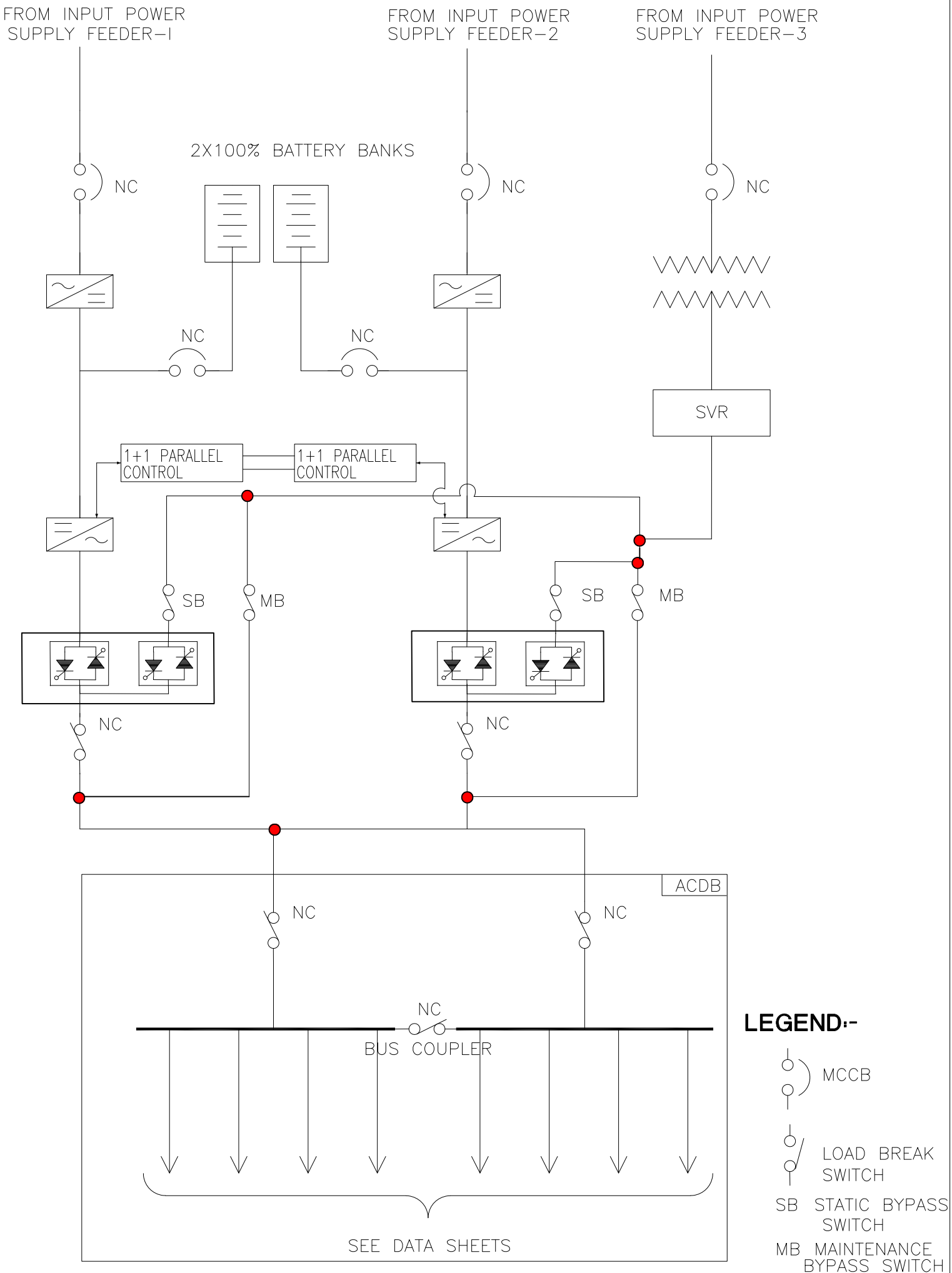
EDB Annexure-1

OPTION–II



1. a) THE DC CONTACTORS SHALL HAVE A TESTED/ PUBLISHED DC RATING EQUAL TO OR EXCEEDING THE MOST STRINGENT CURRENT CARRYING AND BREAKING REQUIREMENTS CONSIDERING ADEQUATE DESIGN MARGINS.
   b) PUSH BUTTONS ARE NOT ACCEPTABLE IN PLACE OF SELECTOR SWITCHES FOR THE ON/OFF SWITCHING OPERATIONS OF THE CONTACTORS.
   c) THE DC CONTACTORS SHALL BE OPERATED WITH A DC CONTROL SUPPLY.
2. SUITABLY RATED DC MCCB CAN BE ACCEPTED IN PLACE OF SWITCH FUSE UNIT AT BATTERY OUTPUT.
3. BATTERY CONFIGURATION SHALL BE 2X50% AH CAPACITY UNLESS SPECIFIED OTHERWISE IN DATASHEET/ JOB SPECIFICATION

EDB OPTION–III



DRAWINGS
(STRUCTURAL)

220 KV SWITCHYARD & GIS PACKAGE

TENDER NO. – B957-000-16-50-EB-T-0020

PROJECT: MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

UNIT : 000

OWNER : BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PMC : ENGINEERS INDIA LTD.

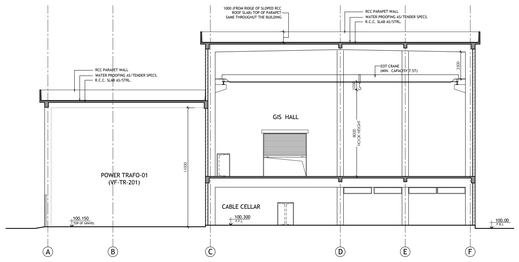
JOB NO. : B957

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
0	06.11.2024	ISSUED FOR BIDS	IF	PU	SP

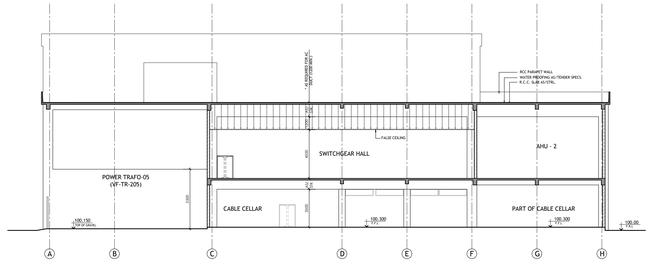
LIST OF DRAWINGS

NIL

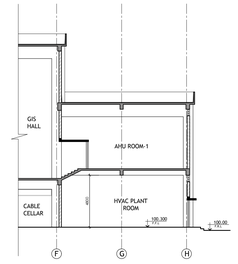
B957-710-81-46-02471



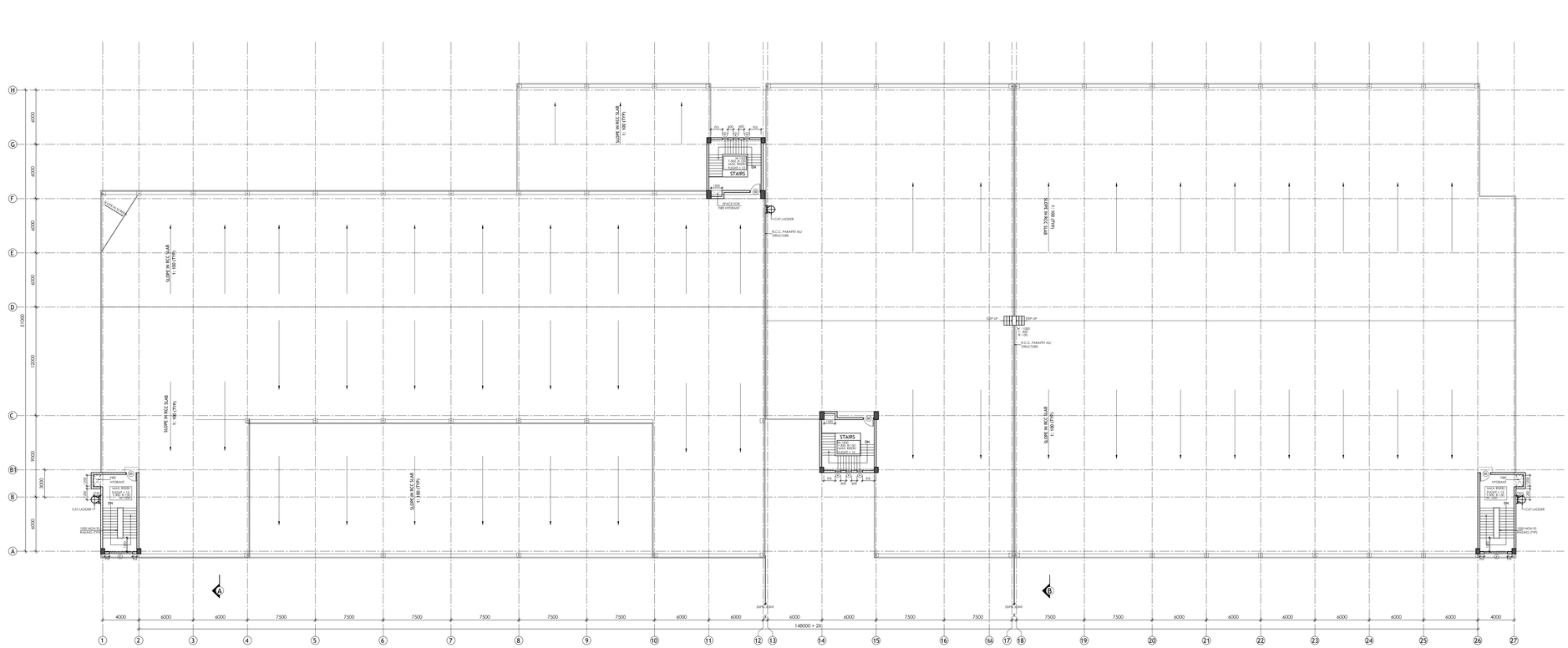
SECTION A-A



SECTION B-B



SECTION C-C



TERRACE PLAN

REF. DWG. NO.	REFERENCE DRAWING TITLE
B957-710-81-46-02470	GROUND FLOOR & FIRST FLOOR PLAN

NOTES:

THIS DRAWING IS GUIDE DRAWING IN NATURE AND IS INDICATIVE OF BROAD REQUIREMENT SUCH AS SPACE REQUIREMENT, SIZE AND LAYOUT.

THE CONTRATOR SHALL MAKE DESIGN IMPROVEMENTS OR REDESIGN THE BUILDING COMPLYING WITH BID REQUIREMENT.

HOWEVER TOTAL BUILDING AREA OF THIS DRG SHALL BE MAINTAINED AS MINIMUM REQUIREMENT.

CONTRACTOR TO PROVIDE A SUITABLE ARRANGEMENT TO MINIMIZE THE GAP BETWEEN SWITCHGEAR HALL AND DOOR/ SHUTTER DURING CLOSED CONDITION SO THAT THE LEAKAGE OF COLD AIR THROUGH THIS GAP WILL BE NEGLIGIBLE/ MINIMUM.

CUT-OUTS/ OPENINGS IN WALLS FOR HVAC SYSTEM SHALL BE FINALIZED BY CONTRACTOR DURING DETAILED ENGINEERING BASED ON HVAC VENDOR DRAWINGS/ DUCT LAYOUTS APPROVED BY PMC/ OWNER.

LEGEND :-

A.R.L. - TOP OF APPROACH ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

AC = AIR CONDITIONED
FC = FALSE CEILING

= 345 THK BRICK WALL AROUND TRANSFORMER AREA
= 230 THK BRICK WALL
= 115 THK BRICK WALL

RS - MOTORISED ROLLING SHUTTER
FD - 2 HRS FIRE RATED DOOR
ALD - ALUMINIUM DOOR
ALW - ALUMINIUM WINDOW
V - ALUMINIUM VENTILATOR
SD - STEEL DOOR
WD - WOODEN DOOR

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
D	30.10.24	RE-ISSUED FOR TENDER	BK	PD	AG	
C	17.10.24	ISSUED FOR TENDER	BS	PD	AG	
B	15.10.24	REVISED & RE-ISSUED FOR COMMENTS	BS	AG	AK	
A	10.10.24	ISSUED FOR COMMENTS	BK	AG	AK	

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

BHARAT PETROLEUM CORP. LTD.

बीना पैट्रोकेमिकल एवं रिफाईनरी एक्सपैन्शन परियोजना

BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

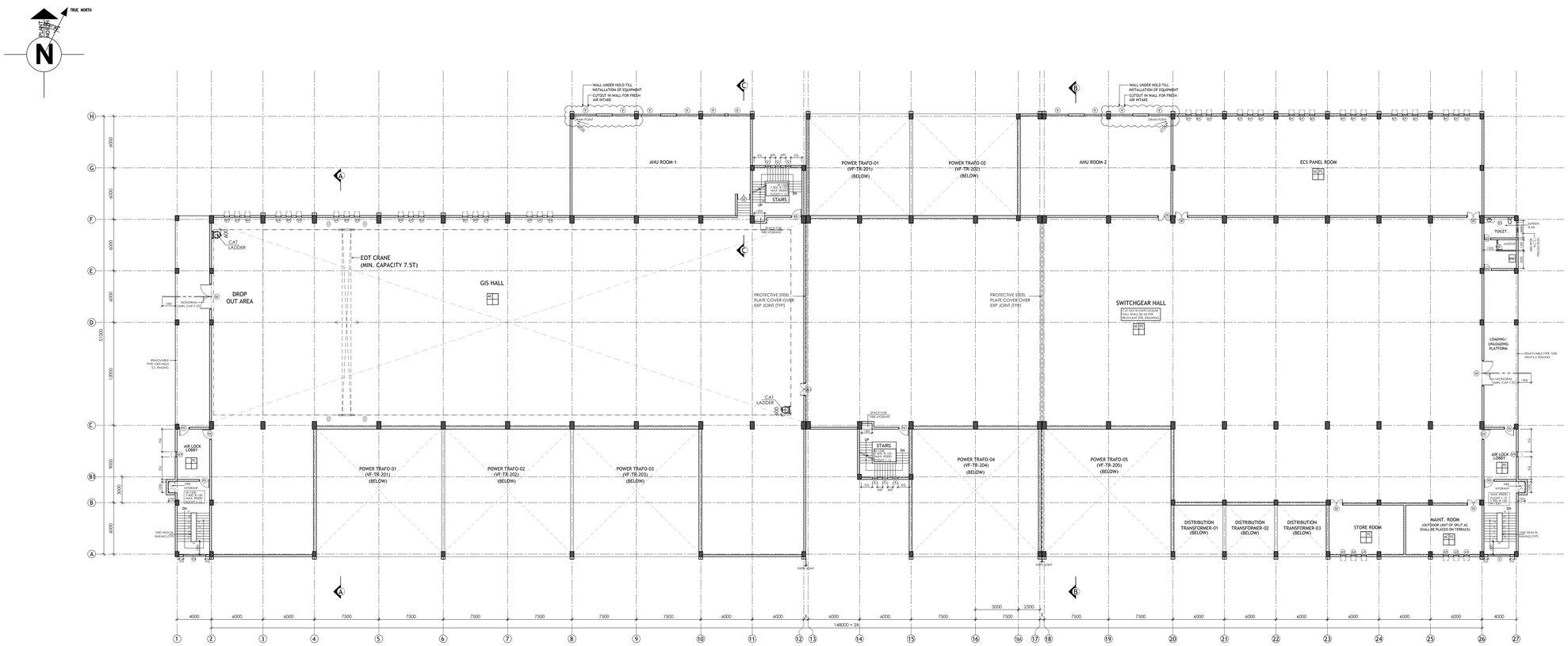
SUBSTATION - MRS 100

TERRACE PLAN & SECTIONS

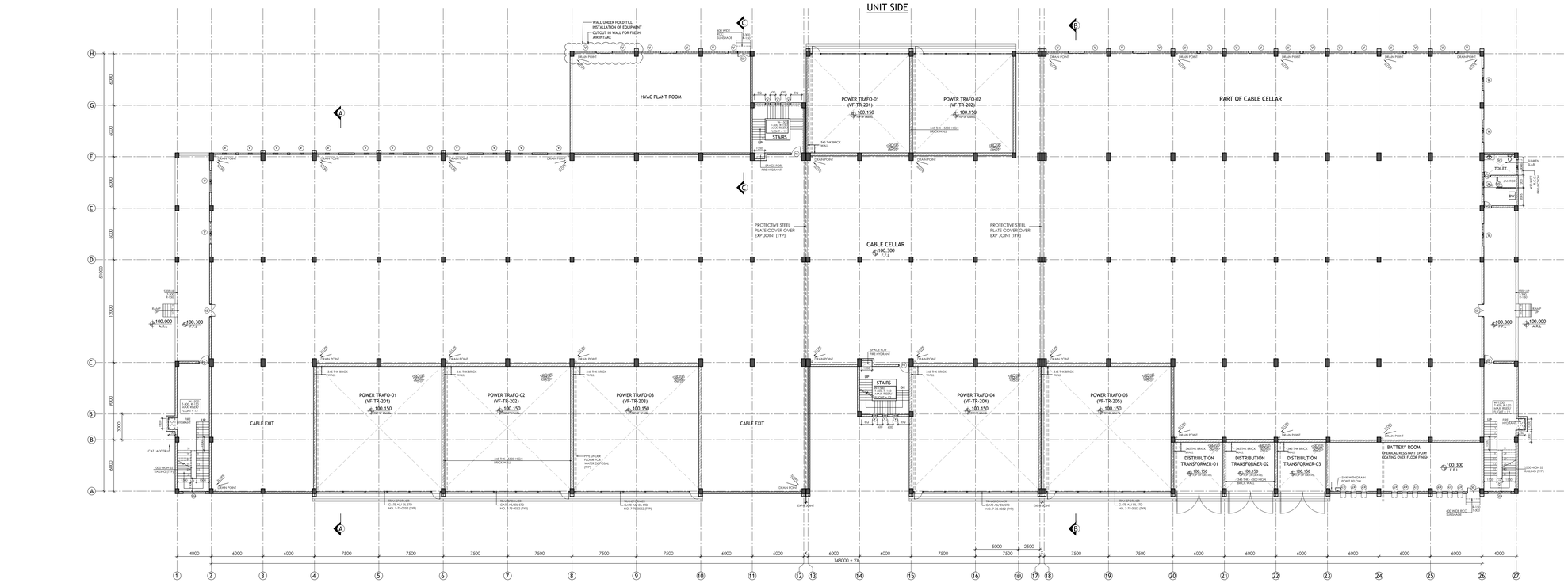
SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:200	B957	710	81	46	02471	D

3-1641-0500 REV.4 / 06.03.2024 A0-1189 x 841

B957-710-81-46-02470



FIRST FLOOR PLAN



GROUND FLOOR PLAN

REF. DWG. NO.	REFERENCE DRAWING TITLE
B957-710-81-46-02471	TERRACE PLAN & SECTIONS

NOTES:

THIS DRAWING IS GUIDE DRAWING IN NATURE AND IS INDICATIVE OF BROAD REQUIREMENT SUCH AS SPACE REQUIREMENT, SIZE AND LAYOUT.

THE CONTRATOR SHALL MAKE DESIGN IMPROVEMENTS OR REDESIGN THE BUILDING COMPLYING WITH BID REQUIREMENT.

HOWEVER TOTAL BUILDING AREA OF THIS DRG SHALL BE MAINTAINED AS MINIMUM REQUIREMENT.

CONTRACTOR TO PROVIDE A SUITABLE ARRANGEMENT TO MINIMIZE THE GAP BETWEEN SWITCHGEAR HALL AND DOOR/ SHUTTER DURING CLOSED CONDITION SO THAT THE LEAKAGE OF COLD AIR THROUGH THIS GAP WILL BE NEGLIGIBLE/ MINIMUM.

CUT-OUTS/ OPENINGS IN WALLS FOR HVAC SYSTEM SHALL BE FINALIZED BY CONTRACTOR DURING DETAILED ENGINEERING BASED ON HVAC VENDOR DRAWINGS/ DUCT LAYOUTS APPROVED BY PMC/ OWNER.

ARCHITECTURAL FINISHES SCHEDULE

ROOM	FLOORING	WALL FINISH	CEILING
CABLE CELLAR	CEMENT CONCRETE FLOORING	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER & ACRYLIC DISTEMPER
BATTERY ROOM	CHEMICAL/ ABRASION RESISTANT EPOXY COATING OVER CEMENT CONCRETE FLOOR FINISH	CHEMICAL RESISTANT EPOXY COATING OVER CEMENT PLASTER UP TO 2500MM HEIGHT AND CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT ABOVE 2500MM HEIGHT	CEMENT PLASTER & ACRYLIC DISTEMPER
HVAC PLANT ROOM , AHU	HEAVY DUTY FLOORING	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER & ACRYLIC DISTEMPER
SWITCHGEAR HALL	EPOXY COATING OVER HEAVY DUTY CEMENT CONCRETE FLOORING	CEMENT PLASTER & ACRYLIC DISTEMPER	ALUMINIUM PANEL FALSE CEILING
GIS HALL	EPOXY COATING OVER HEAVY DUTY CEMENT CONCRETE FLOORING	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER & ACRYLIC DISTEMPER
AIR LOCK LOBBY	VITRIFIED TILES FLOORING	CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT	COMBINATION OF GYPSUM BOARD & MINERAL FIBER TILE FALSE CEILING AT 3000 MM FROM FFL
STORE ROOM, MAINTENANCE ROOM, ECS PANEL ROOM	VITRIFIED TILES FLOORING	CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT	COMBINATION OF GYPSUM BOARD & MINERAL FIBER TILE FALSE CEILING
TOILET/ D/W AREA	NON-SLIP VITRIFIED TILE FLOORING	CERAMIC TILE DADO UP TO 2100 MM AND CEMENT PLASTER, POP PUNNING & PLASTIC EMULSION PAINT ABOVE	MOISTURE RESISTANT GYPSUM BOARD FALSE CEILING AT 3000 MM FROM FFL
LOADING/ UNLOADING PLATFORM	HEAVY DUTY CEMENT CONCRETE FLOORING	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER & ACRYLIC DISTEMPER
TRANSFORMERS	GRAVEL FILLING	CEMENT PLASTER, EXTERIOR ACRYLIC PAINT	CEMENT PLASTER & ACRYLIC DISTEMPER
STAIRCASE /STEPS	KOTA STONE	CEMENT PLASTER & ACRYLIC DISTEMPER	CEMENT PLASTER & ACRYLIC DISTEMPER
EXTERNAL WALL	PLAIN CEMENT PLASTER AND EXTERIOR ACRYLIC PAINT		
ROOF	OVERDECK INSULATION CUM WATER PROOFING SYSTEM		

LEGEND :-

A.R.L. - TOP OF APPROACH ROAD LEVEL
F.F.L. - FINISHED FLOOR LEVEL

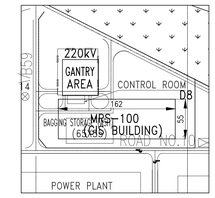
AC | FC
AC = AIR CONDITIONED
FC = FALSE CEILING

= 345 THK BRICK WALL AROUND TRANSFORMER AREA
= 230 THK BRICK WALL
= 115 THK BRICK WALL

RS - MOTORISED ROLLING SHUTTER
FD - 2 HRS FIRE RATED DOOR
ALD - ALUMINIUM DOOR
ALW - ALUMINIUM WINDOW
V - ALUMINIUM VENTILATOR
SD - STEEL DOOR
WD - WOODEN DOOR

BUILDING AREA:

BUILDING AREA	=	5750 SQM
TRANSFORMERS (PART OF BUILDING)	=	1510 SQM
TOTAL AREA	=	**7260 SQM**



KEY PLAN

REV.	DATE	DESCRIPTION	BY	CHKD	APPD	PM
E	30.10.24	RE-ISSUED FOR TENDER	BK	PD	AG	
D	30.10.24	RE-ISSUED FOR TENDER	BK	PD	AG	
C	17.10.24	ISSUED FOR TENDER	BS	PD	AG	
B	15.10.24	REVISED & RE-ISSUED FOR COMMENTS	BS	AG	AK	
A	10.10.24	ISSUED FOR COMMENTS	BK	AG	AK	

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

BHARAT PETROLEUM

BHARAT PETROLEUM CORP. LTD.

बीना पैट्रोकेमिकल एवं रिफाईनरी एक्सपैन्शन परियोजना

BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

SUBSTATION - MRS 100

GROUND FLOOR & FIRST FLOOR PLAN

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:200	B957	710	81	46	02470	E

3-1641-0500 REV.4 / 06.03.2024 A0-1189 x 841

LIST OF DRAWINGS
(ARCHITECTURAL)

220 KV SWITCHYARD & GIS PACKAGE

PROJECT : **BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP), MADHYA PRADESH**

UNIT : **000**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED (BPCL)**

PMC : **ENGINEERS INDIA LIMITED**

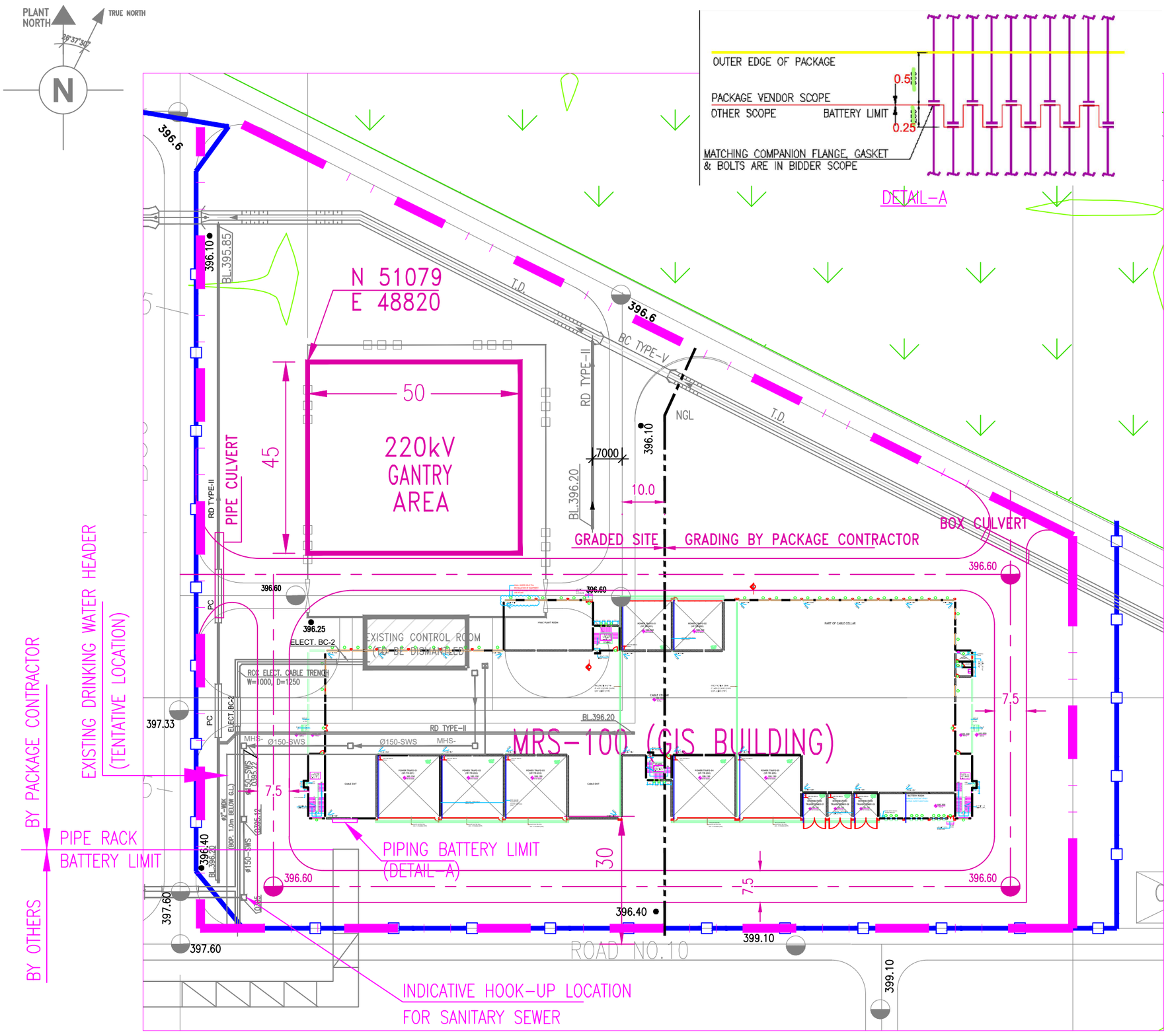
JOB NO. : **B957**

TENDER NO. : **B957-000-16-50-EB-T-0020**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	11.11.2024	ISSUED FOR BIDS	PC	AG	AK

LIST OF DRAWINGS
(ARCHITECTURAL)

S.NO	TITLE	DRAWING NO.
1	Sub-Station MRS-100, Ground floor & First Floor plan	B957-710-81-46-02470
2	Sub-Station MRS-100, Terrace floor plan & Sections	B957-710-81-46-02471

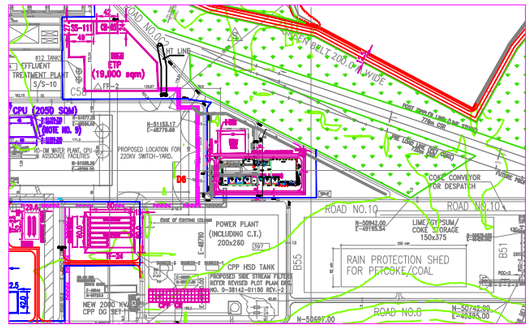


NOTES:-

1. All dimensions, levels and co-ordinates are in metre.
2. This drawing shall be read in conjunction with scope of work, specifications etc.
3. Partly graded site shall be handed over to package contractor as per the indicated levels. The contractor shall carry out the grading of the balance area in the scope limit of the package contractor to match with the existing levels of graded area. Also, micro grading with in the scope limit shall be carried out by the package contractor.
4. Approach roads including road crossing such as Pipe Culverts, Box culverts, ERC, IRC's etc. are in scope of Package Contractor.
5. All temporary approaches etc. required for erection purpose is in the scope of package contractor.
6. Storm water drainage for gantry area of GIS is in the scope of package contractor including connecting the same to nearest offsite drain as shown.
7. This drawing indicates scope outside Substation building & 220 kv Gantry area. For scope inside substation building refer elsewhere in the bid document.
8. The existing building (Existing Control Room) in the plot shall be dismantled by others.
9. Package Contractor shall provide the roads all around the MRS building.
10. For scope of Fire Protection, refer documents given elsewhere in the tender document.
11. Package Contractor shall provide RCC paved area for transformer maintenance/ placement within his Scope limit as per the requirement.
12. All Electrical Trenches within the scope limit shall be in the scope of Package contractor.
13. The pipes shall be provided at the Piping Battery limit and further piping within the package scope area shall be in the scope of Package Contractor.
    - 13.1. All high point vent & low point drain coming in the package shall be provided by the contractor.
    - 13.2. All valves, instrument connections etc. inside the package shal be accessible & platform to be provided for operation & maintenance.
    - 13.3. Supports for lines inside the Package to be supported by contractor including supply of all materials.
    - 13.4. Flanges shall be staggered at Battery limit interface.
    - 13.5. Details as shown in the drawing are indicative only to show battery limit piping in staggered manner. The contractor shall develop & submit the detailed battery limit drawings showing total number of lines, sequence, elevation etc.
14. The location of existing Sanitary sewer & drinking water is tentative & the shall be verified by the package contractor at the site.

LEGENDS:

- SCOPE LIMIT FOR PACKAGE CONTRACTOR
- FACILITIES BY OTHERS
- CHAIN LINK FENCING (BY OTHERS)



KEY PLAN

ENGINEERS INDIA LIMITED
NEW DELHI

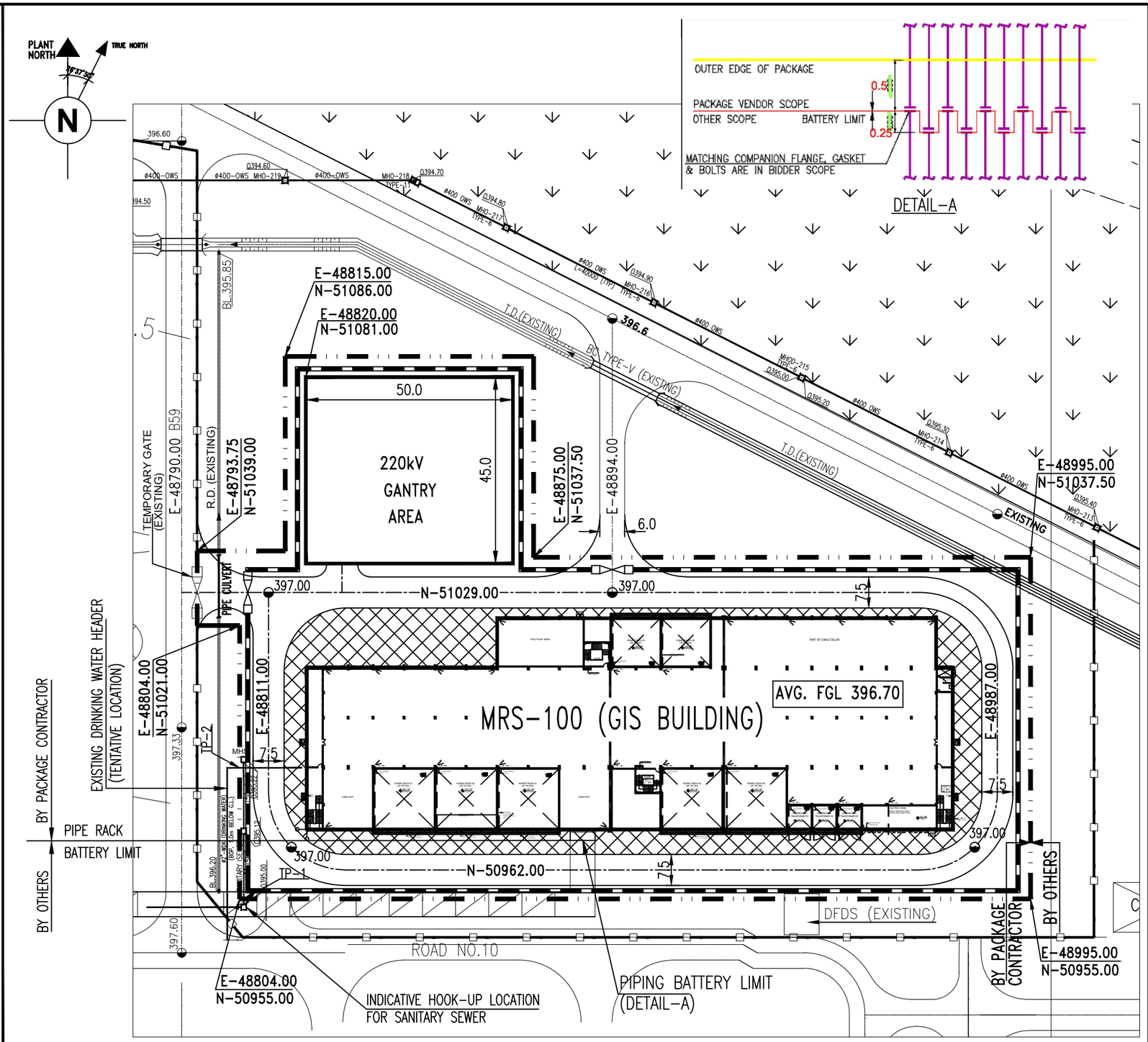
BHARAT_PETROLEUM_CORP._LTD.
BINA_PETROCHEMICAL_&
REFINERY_EXPANSION
PROJECT_(BPREP)

REV.	DATE	DESCRIPTION	BY	CHK	APPROVED	APPROVED
D	11-11-2024	REVISED & ISSUED FOR TENDER	ANIL	NS	AK	
C	08-11-2024	ISSUED FOR TENDER	ANIL	NS	AK	
B	05-11-2024	REVISED & ISSUED FOR COMMENTS	ANIL	NS	AK	
A	05-11-2024	ISSUED FOR COMMENTS	ANIL	NS	AK	

SCOPE DRAWING
220 KV SWITCHYARD & GIS PACKAGE

DRAWING NO.	REV.
B957-000-81-45-30571	D

TA01



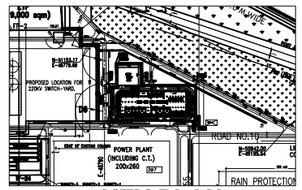
NOTES:-

1. All dimensions, levels and co-ordinates are in metre.
2. This drawing shall be read in conjunction with scope of work, specifications etc.
3. Graded site shall be handed over to package contractor as per the indicated levels. Micro grading with in the scope limit shall be carried out by the package contractor.
4. Approach roads including road crossing such as Pipe Culverts, Box culverts, ERC, IRC's etc. are in scope of Package Contractor.
5. All temporary approaches etc. required for erection purpose is in the scope of package contractor.
6. Storm water drainage for gantry area of GIS is in the scope of package contractor including connecting the same to nearest offsite drain.
7. This drawing indicates scope outside Substation building & 220 kv Gantry area. For scope inside substation building refer elsewhere in the bid document.
8. Package Contractor shall provide the roads all around the MRS building.
9. For scope of Fire Protection, refer documents given elsewhere in the tender document.
10. Package Contractor shall provide RCC paved area for transformer maintenance/ placement within his Scope limit as per the requirement.
11. All Electrical Trenches/trays including structural supports (if applicable) within the package battery limit shall be in the scope of Package contractor.
12. The pipes shall be provided at the Piping Battery limit and further piping within the package scope area shall be in the scope of Package Contractor.
    - 12.1. All high point vent & low point drain coming in the package shall be provided by the contractor.
    - 12.2. All valves, instrument connections etc. inside the package shal be accessible & platform to be provided for operation & maintenance.
    - 12.3. Supports for lines inside the Package to be supported by contractor including supply of all materials.
    - 12.4. Flanges shall be staggered at Battery limit interface.
    - 12.5. Details as shown in the drawing are indicative only to show battery limit piping in staggered manner. The contractor shall develop & submit the detailed battery limit drawings showing total number of lines, sequence, elevation etc.
13. The location of existing Sanitary sewer & drinking water is tentative & the shall be verified by the package contractor at the site.
14. The extent of rcc pavement marked is tentative. Contractor to provide pavement as per tender requirement.
15. Any damage to the existing facilities shall be corrected to original shape by the contractor without any cost implication.
16. Boundary wall location shown here is indicative and shall be finalized during detailed engineering.

LEGENDS:

- SCOPE LIMIT FOR PACKAGE CONTRACTOR
- BOUNDARY WALL (2.0M HIGH)
- GATE
- EXISTING FACILITIES (BY OTHERS)
- CHAIN LINK FENCING (BY OTHERS)
- RCC PAVEMENT TYPE-I (MINIMUM)
- ROAD TOP LEVEL (RTL)
- FINISHED GRADE LEVEL (FGL)
- TP-1 TAPPING POINT (SANITARY)
- TP-2 TAPPING POINT (DRINKING WATER)

KEY PLAN



ENGINEERS INDIA LIMITED
NEW DELHI

BHARAT_PETROLEUM_CORP._LTD.
BINA_PETROCHEMICAL_&
REFINERY_EXPANSION
PROJECT_(BPREP)

REV.	DATE	DESCRIPTION	BY	CHK	APPROVED	APPROVED
E	04.03.2025	REVISED & ISSUED FOR TENDER	ANIL	UF/NS	AK	
D	11-11-2024	REVISED & ISSUED FOR TENDER	ANIL	NS	AK	
C	08-11-2024	ISSUED FOR TENDER	ANIL	NS	AK	
B	05-11-2024	REVISED & ISSUED FOR COMMENTS	ANIL	NS	AK	
A	05-11-2024	ISSUED FOR COMMENTS	ANIL	NS	AK	

SCOPE DRAWING
220 KV SWITCHYARD & GIS PACKAGE

DRAWING NO.	REV.
B957-000-81-45-30571	E

1-1641-0503 REV.1 A3-420x297

B957-000-16-50-0011

OUTDOOR SWITCHYARD

220KV LINE-1 FROM SEB

220KV LINE-2 FROM SEB

LA 198KV, 10KA

CVT 220kV / 110V 3 CORES

METERING PT 220kV / 110V 3 CORES

METERING CT 2000/1A 2 CORES

GANTRY / WT

ISOLATOR WITH E/S 2000A CR TYPE

BY OWNER/OTHERS ←→ BY CONTRACTOR

LOC : MRS SUBSTATION(SS-100)

220KV (E) CABLES

100-EHV-101 GIS

2000A

220 KV, 50 KA (3sec.) TP BUS 2000 A

220 KV, 50 KA (3sec.) TP BUS, 2000 A

BUS PT 1A BUS PT 1B

BUS PT 2A BUS PT 2B

220kV CABLES

TRAFO FEEDER 100-TR-021

TRAFO FEEDER 100-TR-022

100-TR-011 220/66kV 160/200 MVA ONAN/ONAF, YNYn0 OLTC +10% TO -10% IN STEPS OF 1.25% Z= * %

100-TR-012 220/66kV 160/200 MVA ONAN/ONAF, YNYn0 OLTC +10% TO -10% IN STEPS OF 1.25% Z= * %

100-TR-013 220/66kV 160/200 MVA ONAN/ONAF, YNYn0 OLTC +10% TO -10% IN STEPS OF 1.25% Z= * %

100-BD-01 GIBO

100-BD-02 GIBO

100-BD-03 GIBO

100-HV-102

3150A

66 KV, 3150A, 40 KA (3sec.) TP BUS, 3150 A

66 KV, 40 KA (3sec.) TP BUS, 3150 A

630A

800A

TRAFO FEEDER 100-TR-021

PLANT FEEDER-4 100-MV-111 EOI SS-102

PLANT FEEDER-4 100-MV-111 LUBE/HOPE SS-103

PLANT FEEDER-4 100-MV-111 PFU SS-105

PLANT FEEDER-4 100-MV-111 CT-02 SS-106

PLANT FEEDER-4 100-MV-111 CT-02 SS-109

PLANT FEEDER-4 100-MV-112 RMP+MOM SS-110

PLANT FEEDER-4 100-MV-112 LUBE/HOPE SS-103

SPARE TWPD FEEDER

SPARE PLANT FEEDER-1 (1 NOS.)

PLANT FEEDER-1 100-MV-113 LUBE/HOPE SS-103

PLANT FEEDER-4 100-MV-113 PFU SS-105

PLANT FEEDER-4 100-MV-113 CT-02 SS-106

PLANT FEEDER-4 100-MV-113 CT-02 SS-109

TRAFO FEEDER 100-TR-022

PLANT FEEDER-4 100-MV-121 EOI SS-102

PLANT FEEDER-4 100-MV-121 LUBE/HOPE SS-103

PLANT FEEDER-4 100-MV-121 PFU SS-105

PLANT FEEDER-4 100-MV-121 CT-02 SS-106

PLANT FEEDER-4 100-MV-121 CT-02 SS-109

PLANT FEEDER-2 100-MV-122 RMP+MOM SS-110

PLANT FEEDER-4 100-MV-122 LUBE/HOPE SS-103

SPARE PLANT FEEDER-2 (1 NOS.)

PLANT FEEDER-1 100-MV-123 LUBE/HOPE SS-103

SPARE PLANT FEEDER-2 (1 NOS.)

PLANT FEEDER-4 100-MV-123 CT-02 SS-106

PLANT FEEDER-4 100-MV-123 CT-02 SS-109

66/6.9 KV * MVA Dyn1, Z= *% ONAN/ONAF,OLTC +10% TO -10% IN STEPS OF 1.25% (TYP.)

100-TR-021

100-TR-022

100-BD-04

100-BD-05

100-MV-201

MRS AUX SWBD.

6.6 kV, *A, 40 KA (1 sec.) TP BUS

MANUAL TRANSFER

APFC

CAPACITOR

SPARE FEEDER

FEEDERS FOR OWNER'S USE (REFER NOTE-8)

6.6/0.433 KV * MVA Z= *, Dyn11 OLTC +/-5 % 2.5 % STEPS

100-PCC-301

PMCC

415 V, * A, 50Hz, 65 KA (1 Sec.), TPN

MOTOR FEEDERS (RATING >37KW) (TYP.)

MOTOR FEEDERS (RATING >=3.7KW & UPTO 45kW TYP.)

MCCB+CONTACTOR OUTGOING>=250A (TYP.)

MCCB OUTGOING FEEDER (TYP.)

OUTGOING BREAKER FEEDER (TYP.)

MCCB+CONTACTOR OUTGOING=<250A (TYP.)

MOTOR FEEDERS (RATING >=37KW & UPTO 132kW TYP.)

NORMAL LTG. TRAFO. 415V/415V * kVA Z= *, Dyn1

100-LB-331

LDB

100-ELB-332

ELDB

E/M INTERLOCK

415V, *A, 25kA(1Sec.), 50Hz, TPN

INDOOR

OUTDOOR

LP/ELP (TYP.)

FROM EMG. HV SWBD (SS-109)

100-MV-211 6.6 kV ISOLATING BREAKER PANEL

6.6/0.433 KV * MVA Z= *, Dyn11 OLTC +/-5 % 2.5 % STEPS

FROM 100-PCC-301 (PMCC)

100-EPC-302

EPMCC

A/M TRANSFER

415 V, * A, 50Hz., 65 KA (1 Sec.), TPN

MCCB+CONTACTOR OUTGOING>=250A (TYP.)

OUTGOING FEEDER (TYP.)

OUTGOING BREAKER FEEDER (TYP.)

MCCB+CONTACTOR OUTGOING=<250A (TYP.)

EMG. LTG. TRAFO. 415V/415V * kVA Z= *, Dyn1

FROM EPMCC 100-EPC-302

FROM PMCC 100-PCC-301

FROM PMCC 100-PCC-301

2x150Ah BATTERY BANKS

230V AC UPS SYSTEM LOC: SS-100

LDB

ELDB

LEGEND-

MCCB

LOAD BREAK SWITCH

2P STATIC BYPASS SWITCH

MC MAINTENANCE BYPASS SWITCH

OUTGOING FEEDERS FOR VFD, THYRISTOR PANEL, ECS, LAN ETC.

FROM PMCC FROM EPMCC

110V DC SYSTEM LOC.: SS-100

2x150Ah

110V DCDB

DC LOADS FOR SWGR. CONTROL INCLUDING SPARE FEEDERS

1x150Ah

DC LOADS CRITICAL LIGHTING INCLUDING SPARE FEEDERS

FROM PMCC FROM PMCC

PDB-01, (MRS S/S AIR CONDITIONING) (BY PACKAGE VENDOR)

INTERLOCK

*A

NC NO

415V,*A, 50HZ, *KA (1 Sec.), AL.

LOAD DISTRIBUTION

- S/S AIRCONDITIONING PACKAGE

REF. DWG. NO.	REFERENCE DRAWING TITLE

NOTES :-

1. THIS SINGLE LINE DIAGRAM IS INDICATIVE ONLY. IT IS INTENDED TO HIGHLIGHT THE POWER DISTRIBUTION PHILOSOPHY AND BROADLY DEFINE THE MAJOR ELECTRICAL EQUIPMENTS. THE EXACT DETAILS OF EQUIPMENT SHALL BE FINALISED DURING DETAILED ENGINEERING AS PER PROJECT SPECIFICATIONS.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DEVELOP THE SINGLE LINE DIAGRAM INTO DETAILED DIAGRAM BASED ON BID PACKAGE REQUIREMENTS.
3. THE RATING & QUANTITY OF ELECTRICAL EQUIPMENT SHOWN IN THE SINGLE LINE DIAGRAM ARE INDICATIVE. THE QUANTITIES & RATING OF THESE EQUIPMENTS SHALL BE DECIDED & FINALISED DURING DETAIL ENGINEERING MEETING AS PER BID PACKAGE REQUIREMENT WITH NO COST AND TIME IMPLICATION.
4. TYPICAL OUTGOING FEEDERS ARE SHOWN IN FOR ALL SWITCHBOARDS. REQUIRED NUMBER OF OUTGOING FEEDERS INCLUDING SPARES AS PER ENGINEERING DESIGN BASIS AND JOB SPECIFICATION SHALL BE PROVIDED BY THE CONTRACTOR IN LINE WITH BID DOCUMENT.
5. RELAYS, METERS AND OTHER COMPONENTS SHALL BE PROVIDED FOR FEEDERS AS PER FEEDER DATASHEETS, RESPECTIVE FEEDER HARDWARE DATASHEETS, ENGINEERING DESIGN BASIS & JOB SPECIFICATION ENCLOSED WITH THE BID DOCUMENT.
6. ANY OTHER EQUIPMENT AS REQUIRED FOR MEETING STATUTORY REQUIREMENT SHALL BE PROVIDED BY CONTRACTOR.
7. SCOPE LINE MARKED ON THE KEY SLD IS INDICATIVE AND DOES NOT DEFINE TOTAL ELECTRICAL SCOPE OF CONTRACTOR FOR THE PACKAGE. FOR DETAILED SCOPE, REFER BID DOCUMENT AND OTHER DRAWINGS.
8. FOLLOWING FEEDERS SHALL BE PROVIDED IN 6.6KV SWITCHBOARD FOR OWNER PURPOSE:
   A. 2 NOS., 1250A FEEDERS FOR ETP
   B. 2 NOS., 1250A FEEDERS FOR BUTENE-1
   C. 2 NOS., 1250A FEEDERS FOR PETCHEM MCR, LAB & FWPH
   D. 2 NOS., 1250A FEEDERS FOR STEAM BLOCK
   E. 2 NOS., 1250A FEEDERS FOR POLYMER WAREHOUSE & GANTRY
9. 6.6KV SWITCHBOARD & 415V PMCC/EPMCC SHALL BE PROVIDED WITH TWO BUS COUPLERS. HOWEVER SECOND BUS COUPLER SHALL BE WITHOUT ANY NUMERICAL RELAY AND SHALL BE PROVIDED WITH ELECTROMECHANICAL TYPE TRIP CIRCUIT SUPERVISION RELAY.

LEGENDS

- EHV/HV CIRCUIT BREAKER
- AIR CIRCUIT BREAKER
- NEUTRAL GROUNDING RESISTOR
- TRANSFORMER
- GAS/AIR INSULATED BUSDUCT
- BUSBAR
- FUSE
- ON LOAD ISOLATOR/ HEAVY DUTY SWITCH
- MINIATURE CIRCUIT BREAKER
- RESIDUAL CURRENT CIRCUIT BREAKER
- I/L INTERLOCK
- A/M AUTO/MANUAL
- PUSH BUTTON STATION WITH AMMETER
- PUSH BUTTON STATION
- POTENTIAL TRANSFORMER
- CAPACITOR BANK
- TRANSFORMER TRIP PB (BREAK GLASS TYPE)
- CURRENT TRANSFORMER
- MFM MULTI FUNCTION METER
- CBCT
- ELR EARTH LEAKAGE RELAY
- 3 POSITION MOTORISED ISOLATOR FOR GIS
- 2 POSITION MOTORISED ISOLATOR FOR GIS
- HIGH SPEED EARTH SWITCH
- MOTOR
- RECTIFIER/CHARGER
- INVERTER
- SS STATIC SWITCH
- BATTERIES
- CONTACTOR
- DRAWOUT FEATURE
- CABLE GLAND TERMINATION
- MPR MOTOR PROTECTION RELAY
- T SYNCHRONOUS TIMER

REV.	DATE	REVISIONS	BY	CHKD	APPD	PEMPC
D	28.04.25	REVISED & ISSUED WITH TA-2	SK	RSR	HK	
C	18.03.25	REVISED & ISSUED WITH TA-1	SK	RSR	HK	
B	18.10.24	REVISED & ISSUED WITH BID PACKAGE	SK	RSR	HK	
A	10.10.24	ISSUED WITH BID PACKAGE	SK	RSR	HK	

ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

CLIENT: BHARAT PETROLEUM CORP. LTD.

BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)

KEY SINGLE LINE DIAGRAM
220KV GIS PACKAGE (SS-100)

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
NTS	B957	000	16	50	000011	D

3-1641-0500 REV.2 A0-1189 x 841

ANNEXURE: BOQ 220kV GIS SUPPLY BPCL Bina
REV No: 01
DATE: 29.05.2025

Sl. No.	Item Description	Unit	Qty.	Remarks
1.0	**SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two/ Double bus scheme)**			
1.01	GIS SUPPLY: 220KV, 2000A, 50kA, SF6 GIS BUS BAR MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	4	
1.02	GIS SUPPLY: 220KV, 50kA, SF6 BUS PT/ VT BAY MODULE WITH BUS EARTH SWITCH (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	4	220kV PT/ VT BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (b) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (c) 3 NO- 1 phase multi winding Voltage Transformer with residual Current Circuit Breaker arrangement In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable shall be included, however, Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.
1.03	GIS BAY SUPPLY: 220kV, 2000A, 50 kA, SF6 INCOMING GIS LINE FEEDER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	220kV INCOMING GIS LINE FEEDER BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Circuit Breaker, compatible for Controlled Switching Facility (if applicable), complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (c) 1 SET- 1 NO x3 phase Disconnector without Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer. (f) 6 NO- Cable connection module suitable upto 2Rx1600sqmm XLPE Cable. (additional requirement, if any shall be payable as per other line item) In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.
1.04	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 GIS BUS COUPLER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	220kV GIS BUS COUPLER BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Circuit Breaker, compatible for Controlled Switching Facility (if applicable), complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (c) 6 NO- 1 phase multi ratio Current Transformer. In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System (OPMS), Local Control Cubicle (LCC) and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.
1.05	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 GIS BUS SECTIONALISER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	220kV GIS BUS SECTIONALIZAER BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Circuit Breaker, compatible for Controlled Switching Facility (if applicable), complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (c) 6 NO- 1 phase multi ratio Current Transformer. In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System (OPMS), Local Control Cubicle (LCC) and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.

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1.06	GIS BAY SUPPLY: 220kV, 2000A, 50 kA, SF6 OUTGOING GIS TRANSFORMER FEEDER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	3	220kV GIS TRANSFORMER FEEDER BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Circuit Breaker, compatible for Controlled Switching Facility (if applicable), complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (c) 1 SET- 1 NO x3 phase Disconnector without Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer. (f) 6 NO- Cable connection module suitable upto 2Rx1600sqmm XLPE Cable. (additional requirement, if any shall be payable as per other line item) In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.
1.07	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 OUTGOING GIS SPARE TRANSFORMER FEEDER BAY (FULLY EQUIPPED) MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	1	220kV OUTGOING GIS SPARE FEEDER BAY MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Circuit Breaker, compatible for Controlled Switching Facility (if applicable), complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector with Maintenance Grounding Switch, complete with operating mechanism. (c) 1 SET- 1 NO x3 phase Disconnector without Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer. (f) 6 NO- Cable connection module suitable upto 2Rx1600sqmm XLPE Cable. (additional requirement, if any shall be payable as per other line item) In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 220kV GIS)- Technical Specification.
1.08	GIS SUPPLY: 220KV, 1 PHASE SURGE ARRESTER WITH SURGE COUNTER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	30	Please refer section-2 (TS for 220kV GIS)- Technical Specification. It is considered for INCOMING BAYS, BUS BAR MODULE, OUTGOING BAYS (INCLUDING SPARE BAY) only.
1.09	GIS SUPPLY: 220KV, 1 PHASE CABLE CONNECTION MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification. This is an optional item and shall be used, as per requirement. Cable connection module shall be suitable upto 1Rx1600sqmm XLPE Cable.
1.10	GIS SUPPLY: 220KV, 1 PHASE VOLTAGE TRASNFORMER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification. This is an optional item and shall be used, as per requirement.
1.11	GIS SUPPLY: LOCAL CONTROL CUBICLES	SET	10	Please refer section-2 (TS for 220kV GIS)- Technical Specification. It is considered for ALL BAYS only.
1.12	GIS SUPPLY: 220KV, CONTROLLED SWITCHING DEVICE (CSD) FOR 220KV, 3- PH CIRCUIT BREAKER	SET	2	Please refer section-2 (TS for 220kV GIS)- Technical Specification. It is considered for LINE BAYS only.
~~1.13~~	~~GIS SUPPLY: ONLINE PARTIAL DISHCARGE (PD) MONITORING SYSTEM~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
2.0	**SUPPLY- GIS: SPECIAL TOOLS AND TESTING & MAINTENANCE INSTRUMENTS AS PER TS**			
2.01	GIS SUPPLY: PORTABLE SF6 GAS LEAKAGE DETECTOR	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.02	GIS SUPPLY: ONLINE PORTABLE SF6 GAS FILLING AND EVACUATION	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.03	GIS SUPPLY: SF6 GAS ANALYSER	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.04	GIS SUPPLY: PORTABLE PARTIAL DISCHARGE (PD) MONITORING	NO	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.05	GIS SUPPLY: HANDLE FOR DISCONNECTOR SWITCH DRIVE, IF	NO	4	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.06	GIS SUPPLY: HANDLE FOR EARTHING SWITCH DRIVE, IF APPLICABLE	NO	4	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.07	GIS SUPPLY: TRIPPING COIL	NO	2	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.08	GIS SUPPLY: CLOSING COIL	NO	2	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.09	GIS SUPPLY: DENSITY MONITORING DEVICE (1 SET= 2 NO OF EACH	SET	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.10	GIS SUPPLY: PRESSURE GAUGE (1 SET= 2 NO OF EACH TYPE)	SET	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.11	GIS SUPPLY: ETHERNET SWITCH (1 SET= 1 NO OF EACH TYPE)	SET	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
2.12	GIS SUPPLY: CAPACITIVE TYPE VOLTAGE DETECTORS	SET	1	Please refer section-2 (TS for 220kV GIS)- Technical Specification.
~~2.01~~	~~GIS SUPPLY: PORTABLE GAS FILLING EQUIPMENT/ SF6 GAS CART~~	~~NO~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.02~~	~~GIS SUPPLY: HANDLE FOR DISCONNECTOR SWITCH DRIVE~~	~~NO~~	~~4~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.03~~	~~GIS SUPPLY: HANDLE FOR EARTHING SWITCH DRIVE~~	~~NO~~	~~4~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.04~~	~~GIS SUPPLY: PRE SELECTION/ MECHANICAL KEY~~	~~NO~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~

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~~2.05~~	~~GIS SUPPLY: POWER CABLE TERMINATION KIT ALONG WITH PLUG AND SOCKET (R, Y, B PHASES)~~	~~SET~~	~~2~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.06~~	~~GIS SUPPLY: TRIPPING COIL~~	~~NO~~	~~2~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.07~~	~~GIS SUPPLY: CLOSING COIL~~	~~NO~~	~~2~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.08~~	~~GIS SUPPLY: CAPACITIVE TYPE VOLTAGE DETECTORS~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.09~~	~~GIS SUPPLY: CONTROL FUSES/ MCB (1 SET= 10 NO OF EACH RATING & TYPE)~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.10~~	~~GIS SUPPLY: DENSITY MONITORING DEVICE (1 SET= 2 NO OF EACH~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.11~~	~~GIS SUPPLY: INDICATING LAMP COVERS (1 SET= 5 NO OF EACH~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.12~~	~~GIS SUPPLY: INDICATING LAMPS (1 SET= 20% OR 3 NO (MIN), WHICHEVER IS MORE)~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.13~~	~~GIS SUPPLY: PORTABLE SF6 GAS LEAKAGE DETECTOR~~	~~NO~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.14~~	~~GIS SUPPLY: ETHERNET SWITCH (1 SET= 1 NO OF EACH TYPE)~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.15~~	~~GIS SUPPLY: PRESSURE GAUGE (1 SET= 2 NO OF EACH TYPE)~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.16~~	~~GIS SUPPLY: SF6 GAS ANALYSER~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.17~~	~~GIS SUPPLY: PORTABLE PARTIAL DISCHARGE (PD) MONITORING~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
~~2.18~~	~~GIS SUPPLY: ONLINE SF6 GAS FILLING SYSTEM~~	~~SET~~	~~1~~	~~Please refer section-2 (TS for 220kV GIS)- Technical Specification.~~
3.0	**SPARES- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS**			
3.01	GIS SPARES: RECOMMENDED SPARES FOR 2 YEARS OF NORMAL OPERATION AND MAINTENANCE	SET	1	
4.0	**SUPPLY- GIS: REFERENCE UNIT PRICE FOR ADDITION/ DELETION OF SUPPLY ITEMS** (Unit Prices of Individual Equipment included here or in manadatory spares are required for any Addition/Deletion of Equipment and replacement of damaged items. Bidder to ensure that the unit prices have a logical relationship with prices of assemblies in main items. Quoting for unit prices is mandatory and shall be considered for evaluation)			
4.01	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR CIRCUIT BREAKER COMPLETE IN ALL RESPECT	SET	1	
4.02	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR DISCONNECTOR COMPLETE IN ALL RESPECT	SET	1	
4.03	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	SET	1	
4.04	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL	SET	1	
4.05	SUPPLY- GIS: SPARES: 220KV, MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	SET	1	
4.06	SUPPLY- GIS: SPARES: 220KV, FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL RESPECT	SET	1	
4.07	SUPPLY- GIS: SPARES: 220KV, SINGLE PHASE BUS BAR	MTRS	1	Complete in all respect.
4.08	SUPPLY- GIS: SPARES: 220KV, GIS METALLIC ENCLOSURE	KGS	50	
4.09	SUPPLY- GIS: SPARES: 220KV, EXPANSION JOINTS	SET	1	1set= 1 nos. of each type and each rating.
4.10	SUPPLY- GIS: SPARES: 220KV, FLEXIBLE CONNECTIONS	SET	1	1set= 1 nos. of each type and each rating.
4.11	SUPPLY- GIS: SPARES: 220KV, BARRIER INSULATOR	SET	1	1set= 1 nos. of each type and each rating.
4.12	SUPPLY- GIS: SPARES: 220KV, NON-BARRIER INSULATOR	SET	1	1set= 1 nos. of each type and each rating.
4.13	SUPPLY- GIS: SPARES: 220KV, GAS SEALS	SET	1	1set= 1 nos. of each type and each rating.
4.14	SUPPLY- GIS: SPARES: 220KV, GAS DENSITY MONITOR SWITCH	SET	1	1set= 1 nos. of each type and each rating.
4.15	SUPPLY- GIS: SPARES: 220KV, GAS PRESSURE SWITCH	SET	1	1set= 1 nos. of each type and each rating.
4.16	SUPPLY- GIS: SPARES: 220KV, TEE BEND	SET	1	1set= 1 nos. of each type and each rating.
4.17	SUPPLY- GIS: SPARES: 220KV, ANGLE BEND	SET	1	1set= 1 nos. of each type and each rating.
4.18	SUPPLY- GIS: SPARES: 220KV, L-BEND	SET	1	1set= 1 nos. of each type and each rating.
4.19	SUPPLY- GIS: SPARES: 220KV, VOLATGE DETECTORS	SET	1	1set= 1 nos. of each type and each rating.

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Sl. No.	Description	Unit	Quantity	Remarks
5.0	**SERVICES- GIS : 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS**			
5.01	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF GIS	Bays	10	Supervision of erection of GIS with main bus including BUS VT Bays, complete as per TS in all respect including LCC and its accessories. It also includes verification of materials for proper storage at site for final storage. Earthing, SF6 Gas Filing works, Internal Cabling from GIS to LCC, including Structure Works are covered under this item. Surge Arrester, Voltage Transformer, Cable Connection Module are not covered in this BOQ item.
5.02	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE SURGE ARRESTER WITH SURGE COUNTER	SET	30	Supervision of erection of Surge Arrester complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.03	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE CABLE CONNECTION MODULE	NO	36	Supervision of erection of Additional Cable Connection Module complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.04	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE VOLTAGE TRANSFORMER	SET	1	Supervision of erection of Voltage Transformer complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.05	SERVICES- 220kV GIS: TESTING & COMMISSIONING OF GIS	Bays	10	Testing and commissioning of complete GIS system including main bus, LCC and associated system (LA, VT, CSD, Cable Connection Module etc.) is to be executed by bidder. All the special testing instruments, kits, T&P etc. are to be arranged by bidder on returnable basis. Please refer relevant section of technical specification for details.
5.06	SERVICES- 220kV GIS : FINAL SUCCESSFUL HV/ POWER FREQUENCY TESTING OF GIS INCLUDING ARRANGING OF HV TEST KIT ALONG WITH OPERATOR	Bays	10	Carrying out successful HV/ Power Frequency Testing of GIS as per IEC including Arrangement of HV Test kit with operator (on returnable basis) shall be in scope of bidder, which includes charges of HV test kit with operator, accessories & tools required for completion of HV testing. The quoted price shall include GIS bays including Main Bus, GIB, SAB/SOB and other common items as per TS complete in all respect. In this BOQ item, mobilization and demobilization for HV test kit is considered for once. In case of more, for reasons not attributable to bidder, same shall be paid extra as per BOQ Item.
5.07	SERVICES- 220kV GIS : 3D MODEL FOR 220KV GIS	LOT	1	Please refer TS.
5.08	SERVICES- 220kV GIS : INSULATION CO-ORDINATION STUDIES FOR GIS SYSTEM	LOT	1	1 Lot means Complete study report as per technical specification, Including VFTO report.
5.09	SERVICES- 220kV GIS : TRAINING FOR GIS AT SITE (GIS/ ONLINE PARTIAL DISCHARGE MONITORING SYSTEM)	DAY	7	Training of ten OWNER's personnel & two BHEL's personnel for a period of at least Seven days at site
5.10	SERVICES- 220kV GIS : TRAINING FOR GIS AT MANUFACTURER WORKS	DAY	7	Training of two OWNER's personnel & two BHEL's personnel for a period of at least Seven days at manufacturer's works

6.0	**SERVICES- GIS : REFERENCE UNIT PRICE FOR ADDITION / DELETION OF SERVICES:** (UNIT PRICES OF INDIVIDUAL SERVICES INCLUDED HERE ARE REQUIRED FOR ANY ADDITION/DELETION OF EQUIPMENT AND REPLACEMENT OF DAMAGED ITEMS. VENDOR TO ENSURE THAT THE UNIT PRICES HAVE A LOGICAL RELATIONSHIP WITH PRICES OF ASSEMBLIES IN MAIN ITEMS. QUOTING FOR UNIT PRICES IS MANDATORY AND SHALL BE CONSIDERED FOR EVALUATION)			
6.01	SERVICES- 220kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - SERVICES FOR SUPERVISION OF ERECTION OF GIS	MANDAY	10	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.
6.02	SERVICES- 220kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - SERVICES FOR TESTING & COMMISSIONING OF GIS	MANDAY	10	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.
	DEMOBILIZATION AND REMOBILIZATION CHARGES			
6.03	SERVICES- 220kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS ERECTION SUPERVISION TEAM	Set	2	THIS BOQ ITEM SHALL BE PAYABLE IF REQUIRED FOR REASONS NOT ATTRIBUTABLE TO BIDDER.

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Sl. No.	Description	Unit	Quantity	Remarks
6.04	SERVICES- 220kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS TESTING & COMMISSIONING TEAM	Set	2	BOQ ITEM SHALL BE PAYABLE IF REQUIRED FOR REASONS NOT ATTRIBUTE TO BIDDER. HV TESTING IS NOT PART OF THIS ITEM.
6.05	SERVICES- 220kV GIS: DEMOBILIZATION & REMOBILIZATION CHARGES OF HV TEST KIT ALONG WITH OPERATOR	Lot	1	In this BOQ item, mobilization and demobilization chages for HV test kit is considered for second time or more , for reasons not attributable to bidder. HV testing charges shall be paid per bay basis as per main HV testing charge.

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	**Client**	BPCL		
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957	**Unit No.**	000

PURCHASER'S DATA

A	**Site Conditions**		
1	Maximum Ambient Temperature	°C	48
2	Minimum Ambient Temperature	°C	1.1
3	Design Ambient Temperature	°C	45
4	Relative Humidity	%	86
5	Altitude Above MSL	m	<1000
6	Environment		Hot, humid & corrosive
B	**Operating Conditions**		
1	System Voltage		220 +/- 10% kV ± TP %
2	Frequency		50 Hz ± 5 %
3	Number of Phases		Three
4	System Fault Level	kA(for 1 sec)	50KA for 3 Sec
5	System Earthing		Solidly Earthed
6	Auxilliary Power Suppy		
i.	- for space heaters,cubicle lamps etc		240 V AC TPN 10 %
ii	- for protection metering and control		110 V DC- -10/+ 10 %
iii	- circuit breaker spring charging motor		110 V DC- 10/+ 10 %
iv	- Motor drive for disconnectors and earth switches		110 V DC- 10/+ 10 %
v	- high speed earth switch spring charging motor		110 V DC- 10/+ 10 %
vi	- gas handling and filling unit / cart		415 V AC TPN ± 10%
7	Installation		
i.	GIS		Airconditioned
ii	LCC		Airconditioned
iii	CRP		Airconditioned
C	**Electrical Data**		
1	Bus Bar System		Double
2	Bus bar rated current	A	2000
3	1 sec short circuit withstand capacity	kA	50
4	Rated peak withstand current	kA	135
5	Internal arc rating		50 kA for 0.3
6	Circuit Breaker		
i	Type of circuit breaker		SF6
ii	Duty cycle of Circuit Breaker		0-3 min-co-3 min-co
iii	Breaking capacity	kA	50
iv	Making capacity	kA	135
v	CB Operating Mechanism		Spring Charged or Electro Hydraulic 6-51-0066
vi	Shunt trip coil-1	V DC	110V DC
	Shunt trip coil -2 (see note-1)	V AC UPS	230V AC (UPS)
vii	Mechanical indicator for breaker status		Required
viii	Pre-insertion resistor		Not Required
7	Dissconnector & Earthing Switch		
i	Operating Machanism		Motorised
ii	Mechanical indicator for disconnector & earthswitch status		Required
iii	Viewing windows for disconnector and earthswitch		Required
iv	Mechanical interlock for disconnector & earthswitch		Required
v	Electrical interlock with associated circuit breaker		Required
8	High speed make-proof Earthing switch		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	30-APR-2025	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

i	Operating Machanism		Motorised
ii	Mechanical indicator for High speed earthswitch status		Required
iii	Electrical interlock with associated circuit breaker		Required
D	**Miscellaneous**		
1	Paint Shade		RAL-7032
2	Interface with ECS		Required
3	SF6 Gas monitoring system		Required
4	SF6 Gas Handling /filling unit		Required
5	Spare SF6 gas		Required
6	Quality of spare gas	%	10% of total gas as per 6.9.4 of 6-51-0066
7	Mimic on LV compartment		Required
8	Voltage Detectors		Not Required

MANUFACTURER'S DATA

A	**General**		
1	Name of manufacture		
2	Place of manufacture		
3	Type designation		
4	LCC		
5	Degree of protection		
i	Gas compartment		
ii	LCC		
iii	CRP		
6	Enclosure		
7	Enclosure material		
i	Gas compartment		
ii	LCC		
iii	CRP		
9	Rated Voltage	kV	
10	1 min. power frequency withstand (rms)	kV	
11	Lighting impulse withstand voltage	kV	
12	Switching impulse withstand voltage		
13	Rated current		
i	Busbar	A	
ii	Incomers and outgoing feeders	A	
14	1 sec short ckt. withstand capacity	kA	
15	Peak dynamic withstand capacity	kA	
16	Bus bar material		
17	Main Busbar size		
18.	Bus bar size for incomers and outgoing feeders	sqmm	
19	Insulating material (busbar support)		
20	Eath busbar material / size	sqmm	
B	**SF6 Gas**		
1	Average leakage rate of SF6 gas	% / year	
2	Gas monitoring devices (density guages/pressure switch		
3	Gas handling and filling arrangement /cart		
	- maximum power requirement	kW	
4	Whether GIS are dispatched filled with SF6 gas		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	30-APR-2025	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

5	SF6 gas pressure for each gas compartment		
i	Design Pressure		
ii	Operating Pressure		
iii	Alarm Pressure		
iv	Lockout Pressure		
6	Pressure of relief device		
7	Spare gas (no. of cylinders,volume/pressure of cylinder)		
C	**Circuit Breaker**		
1	Type of circuit breaker		SF6
2	Make		
3	Place of manufacture		
4	Type designation		
5	Encloser		
6	Number of poles per phase		
7	Number of interrupting chambers per pole		
8	Number of trip coils		
9	Rated continuous current for I/C and O/G fdrs		
10	Duty cycle		
11	CB Operating mechanism		
12	Short circuit withstand capacity	kA	
13	Breaking capacity	kA	
14.	Peak making capacity	kA	
15	% DC component		
16	First pole to clear factor		
17	Power required for opening	W	
18	Power required for closing	W	
19	Power required for spring charging motor	W	
20	Closing time	sec	
21	Opening time	sec	
22	Provision of manual spring charging		
23	Manual trip device		
24	Mechanical ON/OFF indicator for breaker		
25	Mechanical indication for spring status		
26	Operation counter		
27	Number of auxiliary contacts and their rating		
28	Breaker is trip free		
D	**Disconnector / Earthing switch**		
1	Make		
2	Place of manufacture		
3	Type designation		
4	Rated continuous current of dissconnector/earth switch for I/C and O/G fdr		
5	Short circuit withstand capacity		
6	Short circuit making capacity of high speed earth switch		
7	Operating mechanism		
8	Type of motor drive		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	30-APR-2025	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

9	Number of auxiliary contacts and their rating		
10	Mechanical ON/OFF indicator		
11	Manual operation handle		
12	Manual spring charging		
13	Power required for spring charging motor		
E	**Instrument Transformers**		
1	Current Transformer		
i	Make		
ii	Place of manufacture		
iii	Type designation		
iv	CT ratio,accuracy & VA burden		
v	Knee point voltage / secondary voltage,accuracy & VA burden		
2	Voltage Transformer		
i	Make		
ii	Place of manufacture		
iii	Type designation		
iv	Primary Voltage / Secondary Voltage ,accuracy & VA burden		
F	**Surge Arrestors**		
1	Make		
2	Type designation		
3	Place of manufacture		
4	Rated Voltage	kV	
5	MCOV(Max. Continuous voltage, accuracy & VA burden	kV	
6	Line discharge class	kA	
7	Nominal discharge current	kA	
8	High current withstand capacity	kA	
9	Temporary overvoltage for 1 sec		
10	Temporary overvoltage for 10 sec		
G	**Mechanical**		
1	Feeder / Bay		
	Max. overall weight		
	overall Dimensions(Width X Depth X Height)		
2	LCC		
	overall Dimensions(Width X Depth X Height)		
3	CRP		
	overall Dimensions(Width X Depth X Height)		
4.	Largest shipping section		
	Max overall weight		
	overall Dimensions(Width X Depth X Height)		
5	Gas handling & filling plant / service cart		
	Overall dimensions(Width X Depth X Height)		
6	Recommended clearances		
	GIS (Front / rear / above)	mm	
	LCC (Front / rear / above)	mm	
	CRP (Front / rear / above)	mm	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

7	Shock loading on foundation	
8	Requirement of EOT crane for GIS	
9	Capacity of EOT crane required	
10	Clear height recommended for EOT crane	
11	Dispatch for each feeder / bay	
H	**Copies of following test certificates enclo**	
	For each type of offered feeder/bay with circuit breaker, dissconnector and earthswitch	
1	Short circuit tests(peak and 1 sec withstand)	
2	Making and breaking tests	
3	Temperature rise test	
4	Internal arc test	
5.	Dielectric tests	
6	Operation and mechanical endurance tests	

Notes

1 Disconnector class shall be M2

2 Rated line charging interrupting current of breaker shall be as per IEC on 21 kM of transmission Over-head Line.

3 SF6 gas handling/filling unit mentioned in D.4 of purchaser data is already covered as part of mandatory spares as defined elsewhere.

4 Although the equipment shall be installed in Air Conditioned GIS/ Switchgear hall, but same shall be suitable for installation and satisfactory operation in a non air conditioned, tropical, humid and corrosive environment

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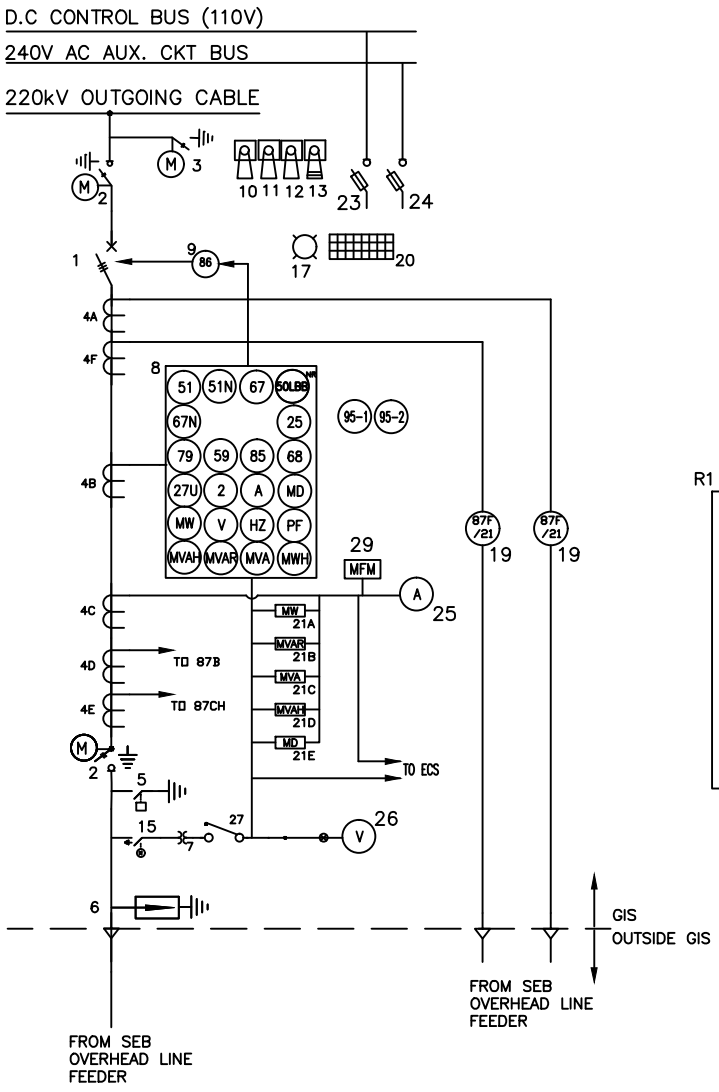
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

PROJECT: BPREP PROJECT

CLIENT: M/S BPCL, BINA

REV	DATE	PURPOSE	BY	CHKD	APPRV
B	25.04.25	REVISED&ISSUED WITH TENDER	SK	RSR	RSR
A	11.11.24	ISSUED WITH TENDER	SK	RSR	RSR



R1 ▭ PART OF NUMERICAL RELAY-1

R2 ▭ PART OF NUMERICAL RELAY-2

NOTES:

1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
3. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY. SEPARTE ANALOGUE METERING DEVICES SHALL ALSO BE PROVIDED AS INDICATED.
4. VA BURDEN OF CT & PT SHALL BE DECIDED BY THE SWITCHGEAR VENDOR CONSIDERING VA BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL..
5. MIMIC DIAGRAM FOR OPERATION AND STATUS INDICATION OF CIRCUIT BREAKER AND ASSOCIATED DISCONNECTORS & EARTH SWITCH SHALL BE PROVIDED ON LCC. FOR CRP MIMIC SHALL BE PROVIDED IN RELAY/BCU.
6. THE COMPONENTS & EQUIPMENTS TO BE LOCATED ON GIS, LCC & CRP RESPECTIVELY SHALL BE AS SPECIFIED IN THE TENDER DOCUMENT.
7. THREE CORE PT SHALL BE PROVIDED. PT WITH ACCURACY CLASS 1.0 SHALL BE USED FOR MEASURING, PT WITH ACCURACY CLASS 3P SHALL BE USED FOR PROTECTION & OPEN DELTA PT SHALL BE USED FOR DETECTING EARTH FAULT AND PREVENTION OF FERRO RESONANCE.
8. 87F/21 RELAY OF SAME MAKE/ MODEL SHALL BE LOOSE SUPPLIED AND INSTALLED IN SEB SWITCHYARD CRP BY VENDOR.
9. INTERCONNECTING CABLING BETWEEN GIS, LCC AND CRP SHALL BE SUPPLIED BY VENDOR AND SHALL BE ARMOURED CABLE.
10. 220 KV CABLE TERMINATION KITS ARE ALSO INCLUDED IN SCOPE OF VENDOR.

EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	52	1	SF6 CIRCUIT BREAKER (TWO TRIP COILS)
2	--	2	3 POSN. DISCONNECTOR SWITCH WITH MOTORIZED/MANUAL OPERATION & MECHANICAL POSITION INDICATOR -ON/ISOLATED/EARTHED ONE FOR BUS SIDE ONE FOR LINE SIDE
3	--	1	2 POSN. DISCONNECTOR SWITCH WITH MOTORIZED/MANUAL OPERATION & MECHANICAL POSITION INDICATOR -ISOLATED/EARTHER
4A	--	3	CT FOR 87F/21 CLASS PS
4B	--	3	CT CLASS-5P10
4C	--	3	CT CLASS-1 (MIN. 10VA)
4D	--	3	CT FOR 87B CLASS PS
4E	--	3	CT FOR 87CH CLASS PS
4F	--	3	CT FOR 87F/21 CLASS PS
5	--	1	HIGH SPEED MAKE PROOF EARTHING SWITCH
6	--	1	SURGE ARRESTOR
7	--	1	PT 220/√3/110/√3, WITH 4 POLE MCB (REFER NOTE-07)
R1 8	67	2	DIRECTIONAL IDMTL O/C RELAY
	51N		IDMTL E/F RELAY (10-40%)
	25		SYNCHRONISING CHECK RELAY
	50LBB		LOCAL BREAKER BACKUP
	59		OVERVOLTAGE RELAY
	27		UNDERVOLTAGE RELAY
	79		AUTO RECLOSE FUNCTION
	85		CARRIER AIDED INTER TRIP
	68		BLOCKING RELAY
	2		TIMER
	67N		DIRECTIONAL IDMTL E/F RELAY
	51V		VOLTAGE RESTRAINED OVERCURRENT RELAY
	51		IDMTL O/C RELAY (50-200%)
	95-1 /2		TRIP CIRCUIT SUPERVISION RELAY
9	86	1	TRIPPING RELAY - CONVENTIONAL TYPE
10	--	1	UPSTREAM BREAKER TRIP SWITCH (2 POSITION)(STAYPUT & LOCKABLE)
11	--	6	CONTROL SWITCH FOR DISCONNECTORS & EARTH SWITCHES
12	--	1	LOCAL/OFF/REMOTE SELECTOR SWITCH
13	52C/ S	1	BREAKER CONTROL SWITCH (TNC) (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
14	--	1	SOCKET AT PANEL BACK FOR CABLE TESTING,CURRENT & VOLTAGE INJECTION
15	--	1	3 POSN. DISCONNECTOR SWITCH WITH MOTORIZED/MANUAL OPERATION & MECHANICAL POSITION INDICATOR -ON/ISOLATED/EARTHED
16	--	AS REQD	SF6 GAS MONITORING, ALARMS AND INDICATIONS
17	--	AS REQD	CLUSTER LED TYPE INDICATION LAMP
18	--	AS REQD	AUXILARY RELAY
R2 19	87F/ 21	4	FEEDER DIFFERENTIAL PROTECTION RELAY OR DISTANCE PROTECTION RELAY (EACH OF TWO DIFFERENT MAKES) (REFER NOTE-8)
20	--	AS REQD	WINDOW ALARM ANNUNCIATIONS
21A	--	1	MW METER
21B	--	1	MVAR METER
21C	--	1	MVA METER
21D	--	1	MVAH METER
21E	--	1	MAXIMUM DEMAND METER
22	--	2 SET	CUBICLE LAMP WITH MCB, DOOR SWITCH, PANEL SPACE HEATER & 3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
23	--	2	DP SWITCH 10A WITH FUSE FOR DC CONTROL SUPPLY FOR LCC & CRP
24	--	2	LV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
25	--	3	AMMETER
26	--	3	VOLTMETER
27	--	3	4 POLE MCB, 10A, (FOR EACH PT CORE)
28	--	1	3 POSN. DISCONNECTOR SWITCH WITH MOTORIZED/MANUAL OPERATION & MECHANICAL POSITION INDICATOR -ON/ISOLATED/EARTHED
29	MFM	1	MULTI FUNCTION METER

ENGINEERS INDIA LIMITED
NEW DELHI

220KV GIS DATA SHEET

HARDWARE DATASHEET FOR INCOMER FROM OVERHEAD LINE

DATA SHEET

B957-000-16-50-DS-6604

Sht.1 OF 1

REV B

आपूर्तिकर्ताओं से प्रलेखन अपेक्षाओं हेतु विनिर्देश

SPECIFICATION FOR DOCUMENTATION REQUIREMENTS FROM SUPPLIERS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committe Convener	Standards Bureau Chairman
					Approved by	
1	12.03.15	General Revision	QMS Standards Committee	QMS Standards Committee	MPJ	SC
0	04.06.09	Issued as Standard Specification	QMS Standards Committee	QMS Standards Committee	SCT	ND

Abbreviations:

DCI	-	Document Control Index
eDMS	-	Electronic Document Management System
FOA	-	Fax of Acceptance
HOD	-	Head of Division / Department
IC	-	Inspection Certificate
IRN	-	Inspection Release Note
ITP	-	Inspection and Test Plan
LOA	-	Letter of Acceptance
MOU	-	Memorandum of Understanding
MR	-	Material Requisition
PO	-	Purchase Order
PR	-	Purchase Requisition
PVC	-	Polyvinyl Chloride
QMS	-	Quality Management System
TPIA	-	Third Party Inspection Agency
URL	-	Universal Resource Locator

QMS Standards Committee

Convener: Mr. M.P. Jain

Members:
Mr. A.K. Chaudhary (Insp.)
Mr. S.K. Kaul (C&P)
Mr. R.K. Trivedi (Engg.)
Mr. Ravindra Kumar (Const.)
Mr. Tilak Raj (Projects)
Mr. Vinod Kumar (CQA)

CONTENTS

Attachments

Format for completeness of Final Documentation : Format No. 3-78-0004

1.0 SCOPE

This specification establishes the Documentation Requirements from Suppliers.

All documents/data against the PO / PR / MR shall be developed and submitted to EIL/Owner by the suppliers for review / records, in line with this specification.

2.0 DEFINITIONS

2.1 Supplier

For the purpose of this specification, the word "SUPPLIER" means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word is considered synonymous to bidder, contractor or vendor.

2.2 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

6-78-0001	Specification for Quality Management System Requirements from Bidders

4.0 DOCUMENTATION REQUIREMENTS

4.1 Documents/Data to be Submitted by the Supplier

4.1.1 The Supplier shall submit the documents and data against the PO/PR/MR as per the list given in respective PO/PR/MR.

4.1.2 Review of the supplier drawings by EIL would be only to review the compatibility with basic designs and concepts and in no way absolve the supplier of his responsibility/contractual obligation to comply with PR requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/installation shall be promptly corrected by the supplier without any time and cost implications, irrespective of comments on the same were received from EIL during the drawing review stage or not.

4.1.3 Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent / Letter of Intent/ Fax of Acceptance (FOA)/ Letter of Acceptance (LOA):

QMS	- 1 week
Drawing/Document Control Index	- 2 weeks
Other Documents/Drawings	- As per approved Drawing/Document Control Index/Schedule

4.1.4 Documents as specified in PO/PR/MR are minimum requirements. Supplier shall submit any other document/data required for completion of the job as per EIL/Owner instructions.

4.2 Style and Formatting

4.2.1 All Documents shall be in ENGLISH language and in M.K.S System of units.

4.2.2 Before forwarding the drawings and documents, contractor shall ensure that the following information are properly mentioned in each drawing:

Purchase Requisition Number
Name of Equipment / Package
Equipment / Package Tag No.
Name of Project
Client
Drawing / Document Title
Drawing / Document No.
Drawing / Document Revision No. and Date

4.3 Review and Approval of Documents by Supplier

4.3.1 The Drawing/Documents shall be reviewed, checked, approved and duly signed/stamped by supplier before submission. Revision number shall be changed during submission of the revised supplier documents and all revisions shall be highlighted by clouds. Whenever the supplier require any sub-supplier drawings to be reviewed by EIL, the same shall be submitted by the supplier after duly reviewed, approved and stamped by the supplier. Direct submission of sub-supplier's drawings without contractor's approval shall not be entertained.

4.4 Document Category

4.4.1 Review Category

Following review codes shall be used for review of supplier Drawings/Documents:

Review Code 1	-	No comments. Proceed with manufacture/ fabrication as per the document.
Review Code 2	-	Proceed with manufacture/fabrication as per commented document. Revised document required.
Review Code 3	-	Document does not conform to basic requirements as marked. Resubmit for review
R	-	Document is retained for Records. Proceed with manufacture/fabrication.
V	-	Void

4.5 Methodology for Submission of Documents to EIL/Owner

4.5.1 Document Control Index (DCI)

Supplier shall create and submit Document Control Index (DCI) for review based on PO/PR/MR along with schedule date of submission of each drawing/document on EIL eDMS. The DCI shall be specific with regard to drawing/document no. and the exact title. Proper sequencing of the drawings/documents should be ensured in schedule date of submission.

4.5.2 **Submission of Drawings/Documents**

Drawings/documents and data shall be uploaded on the EIL eDMS Portal as per DCI. The detail guidelines for uploading documents on EIL eDMS Portal are available on following URL

http://edocx.eil.co.in/vportal

4.5.3 **Statutory Approvals**

Wherever approval by any statutory body is required to be taken by Supplier, the Supplier shall submit copy of approval by the authority to EIL.

4.5.4 **Details of Contact Persons of Supplier**

After placement of order supplier shall assign a Project Manager for that order. The details are to be filled online through the portal. The details include e-mail address, mailing address, telephone nos., fax nos. and name of Project Manager. All the system generated emails pertaining to that order shall be sent to the assigned Project Manager.

4.5.5 **Schedule and Progress Reporting**

Supplier shall submit monthly progress report and updated procurement, engineering and manufacturing status (schedule vs. actual) every month, beginning within 2 weeks from FOA/LOA. In case of exigencies, EIL/Owner can ask for report submission as required on weekly/fortnightly/adhoc basis depending upon supply status and supplier shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Supplier during kick off meeting or within one week of receiving FOA/LOA, whichever is earlier.

4.5.6 **Quality Assurance Plan/Inspection and Test Plan**

Inspection and test plans (ITP) attached if any, to the MR/PR are to be followed. However for cases wherein ITPs have not been attached with MR/PR, Supplier shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for manufacturing, covering quality control of critical bought out items/materials, inspection & testing at various stages of production, quality control records and site assembly & testing as may be applicable to the specific order and obtain approval from concerned Regional procurement Office of EIL/third party inspection agency, as applicable.

For Package equipment contracts, the supplier shall prepare a list of items/ equipments and their inspection categorization plan for all items included in the scope of supply immediately after receipt of order and obtains approval for the same from EIL. The items shall be categorized into different categories depending upon their criticality for the scope of inspection of TPIA and/or EIL.

4.5.7 **Inspection Release Note (IRN)/ Inspection Certificate (IC)**

IRN/ IC shall be issued by EIL Inspector/ third party inspection agency on the basis of successful inspection, review of certificates as per specifications & agreed quality plan (as applicable) and only after all the drawings/documents as per DCI are submitted and are accepted under review code-1 or code R. Supplier shall ensure that necessary documents/manufacturing and test certificates are made available to EIL/TPIA as and when desired.

Note: Non fulfilling above requirement shall result into appropriate penalty or with-holding of payment as per conditions of PO/PR/MR.

4.5.8 Transportation Plan

Transportation Plan for Over Dimensional Consignments (ODC), if any, shall be submitted within 2 weeks of receiving FOA/LOA, for approval. Consignment with parameters greater than following shall be considered as over dimensional.

Dimensions: 4 meters width x 4 meters height x 20 meters length

Weight : 32 MT

4.6 Final Documentation

4.6.1 As Built Drawings

Shop changes made by Supplier after approval of drawings under 'Code 1' by EIL and deviations granted through online system , if any, shall be marked in hard copies of drawings which shall then be stamped 'As-built' by the supplier. These 'As-built' drawings shall be reviewed and stamped by EIL Inspector/ TPIA also. Supplier shall prepare scanned images files of all marked – up 'As – built' drawings. Simultaneously Supplier shall incorporate the shop changes in the native soft files of the drawings also.

4.6.2 As Built Final Documents

As built final documents shall be submitted as listed in PO/PR/MR.

4.6.3 Packing/Presentation of Final Documents

Final Documents shall be legible photocopies in A4, A3 size only. Drawings will be inserted in plastic pockets (both sides transparent, sheet thickness minimum 0.1 mm) with an extra strip of 12 mm wide for punching so that drawings are well placed.

Final Documentation shall be bound in Hard board Plastic folder(s) of size 265 mm x 315 mm ($10^{1}/_{2}$ inch x $12^{1}/_{2}$ inch) and shall not be more that 75 mm thick. It may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume. Where number of volumes are more, 90mm thickness can be used. Each volume shall have top PVC sheet of minimum 0.15 mm thick duly fixed and pressed on folder cover and will have 2 lever clip. In case of imported items documents, 4 lever clip shall also be accepted. All four corners of folders shall be properly metal clamped. Indexing of contents with page numbering must be incorporated by supplier. Spiral/Spico bound documents shall not be acceptable. As mentioned above, books should be in hard board plastic folders with sheets punched and having 2/4 lever clips arrangement.

Each volume shall contain on cover a Title Block indicating package Equipment Tag No. & Name, PO/Purchase Requisition No., Name of Project and Name of Customer. Each volume will have hard front cover and a reinforced spine to fit thickness of book. These spines will also have the title printed on them. Title shall include also volume number (say 11 of 15) etc.

4.6.4 Submission of Soft Copies

Supplier shall submit to EIL, the scanned images files as well as the native files of drawings/documents, along with proper index.

In addition to hard copies, Supplier shall submit electronic file (CD-ROM) covering soft copies of all the final drawings and documents, all text documents prepared on computer, scanned images of all important documents (not available as soft files), all relevant catalogues, manuals available as soft files (editable copies of drawings/text documents, while for catalogues/manuals/proprietary information and data, PDF files can be furnished).

All the above documents shall also be uploaded on the EIL eDMS portal.

4.6.5 Completeness of Final Documentation

Supplier shall get the completeness of final documentation verified by EIL/TPIA and attach the Format for Completeness of Final Documentation (Format No. 3-78-0004) duly signed by EIL Inspector or TPIA as applicable to the document folder.

COMPLETENESS OF FINAL DOCUMENTATION

Name of Supplier/Contractor	:	
Customer	:	
Project	:	
EIL's Job No.	:	
Purchase Order No./ Contract No.	:	
Purchase Requisition No./ Tender No.	:	Rev. No. :
Name of the Work/ Equipment	:	
Tag. No.	:	
Supplier's/ Contractor's Works Order No.	:	

Certified that the Engineering Documents/ Manufacturing & Test Certificates submitted by the supplier are complete in accordance with the Vendor Data Requirements of Purchase Requisition.

Signature	:	Signature	: .....
Date	:	Date	: .....
Name	:	Name	: .....
Designation	:	Designation	: .....
Department	:	Department	: .....

Supplier/Contractor

EIL/TPIA

अनुमोदित/APPROVED
हस्ताक्षर/Sign: .....
नाम/Name: M.P. JAIN
दिनांक/Date: 12-3-2015

PROCEDURE FOR SMART INTEGRATED ENGG., DIGITAL HANDOVER OF DRAWING/DOCUMENT/ 3D MODEL AND DIGITAL INTERVENTION BY EPC CONTRACTOR

PROJECT : **BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT, BPREP**

OWNER : **M/s BHARAT PETROLEUM COOPERATION LIMITED.**

CONSULTANT : **M/s ENGINEERS INDIA LTD.**

JOB NO. : **B957**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
C	08/03/2025	REVISED AND REISSUED FOR ENGINEERING	MS	MK/KB	SV
B	04/02/2025	REVISED & RE-ISSUED FOR ENGINEERING	MS	MK/KB	SV
A	26/11/2024	ISSUED FOR ENGINEERING	MS	MK	SV

1. GENERAL

This chapter details the requirements pertaining to various drawings, documents and 3D model to be generated at various stages during the course of execution of the project by the EPC Contractor for activities associated with Smart Integrated engineering and digital handover. These stipulations are supplementary to following specifications (enclosed elsewhere in the contract):

S. No.	Spec. No.	Specification detail
1.	6-78-0001	Specification for quality management system requirements from bidders
2.	6-78-0002	Specification for documentation requirements from contractors
3.	6-78-0003	Specification for documentation requirements from suppliers

The EPC Contractor shall recognize that efficient handling of drawings and documents to be prepared by him under the contract is the key to the timely completion of the plant.

The EPC Contractor shall ensure that all drawings and documents to be submitted by him to the OWNER/CONSULTANT shall be of professional quality and conforming to the contractual requirements.

The EPC Contractor shall submit the drawings through the defined document management system for the project for review by OWNER /CONSULTANT, and shall maintain a record of drawings submitted till date at all times. Access to document management system shall be provided by client/consultant to the successful EPC Contractor which shall be utilized by the EPC Contractor for their smart engineering activities without any deviation.

Compliance of this chapter on drawings and documents is mandatory and is non-negotiable.

A pre-defined document numbering philosophy will be provided to successful EPC Contractor which shall be adopted and implemented by EPC Contractor for documents generated for this project. Document number shall also be shown in each deliverable as “Client Document Number”.

Computer aided design and drafting shall only be used. Standard, approved and well-established PC based computer programs/software packages, available in market shall only be used by the EPC Contractor and its sub-vendors etc.

All documents, before forwarding to OWNER /CONSULTANT shall be vetted in detail by EPC Contractor. Documents received without vetting will be returned without review. Also, any in accuracies/mistakes found will not only be rectified by the EPC CONTRACTOR but the EPC CONTRACTOR shall remain liable for bearing charges towards efforts spent by OWNER/CONSULTANT for discussing the same. Delay owing to these shall be to the account of EPC CONTRACTOR.

Review of the drawings/documents by OWNER/CONSULTANT would be only limited to the review of compatibility with basic designs and concepts. The review by the OWNER/CONSULTANT shall not be construed by the EPC CONTRACTOR as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

All drawings, datasheets, specification & model etc. shall be generated by the use of authoring tools specified elsewhere in the contract document. The digital handover shall be in soft native files along with associated database.

EPC CONTRACTOR shall furnish 3D model (with complete details with respect to equipment, Piping, Civil, Structure, Electrical & Instrumentation in line with scope of work for 3D modeling) of plant with dynamic walk-through facility to check any interference, requirement of safety, operation and maintenance for getting approval from OWNER/CONSULTANT with input data. Associated data base files along with library shall also be furnished at 30%, 60% and 90% model reviews.

Each drawing submitted by the EPC CONTRACTOR shall be clearly marked with the name of the Owner, the unit designation, the specifications, title, the specification number and the name of the Project with revision No. and date. If standard catalogue pages are submitted the applicable items shall be indicated there in. All titles, notings, markings and writings on the drawings shall be in English. The template shall be approved by the consultant/client. All documents shall be prepared on the approved template.

All the Engineering design and specifications shall be normally prepared in MKS system excepting for Civil/Structural wherein, the SI system is in vogue based on applicable design codes. Upon receiving comments on Drawings/Documents, the EPC CONTRACTOR shall provide compliance report/comment resolution sheet, separately on each of the comments, document-wise, along with the subsequent submission. Comments given by OWNER/CONSULTANT shall be discussed, if required, and finalized within the agreed schedule.

The schedule of submission of Drawings/Documents shall be in accordance with project plans only. The detailed list under different category, document-wise, shall be prepared by EPC CONTRACTOR for review/records of OWNER/CONSULTANT.

The EPC CONTRACTOR shall maintain up-to-date record of drawings & document status and make regular issue of drawing/documents index **discipline wise, on monthly basis, with copies to OWNER /CONSULTANT Site &, H.O.** indicating schedule date of submission, submission date of various revisions and date of review with code of review/ approval.

2. Category of Documents and Cycle Time

The handling of documents by OWNER/CONSULTANT /EPC CONTRACTOR shall be as follows:

2.1 OWNER /CONSULTANT's Review/Records

A detailed document list clearly identifying review/records category against each document shall be developed. Following may please be noted for all the documents engineered by the EPC CONTRACTOR:

a) Review

EPC CONTRACTOR can proceed if OWNER/CONSULTANT's comments are not received within 10 working days of its receipt by OWNER /CONSULTANT. However, if major deviation to contract specification for any design deficiency is detected in the course of review after stipulated period, it shall be the responsibility of the EPC Contractor to see that such deviations and deficiencies are corrected to ensure compliance to contract without any cost and time implication to Owner.

b) Records

EPC CONTRACTOR shall submit documents for OWNER/CONSULTANT's information and proceed with the work. OWNER/CONSULTANT comments, If any, which relates any cost and/or time implication to the owner due to inadequacies/inaccuracies may be brought to the attention of EPC CONTRACTOR at any stage for incorporation without any cost or time impact to owner.

The documents falling under review category shall in general, except for drawings requiring multi-disciplinary review, be returned with comments within 10 working days.

Documents submitted without meeting pre-requisite requirements will be returned without review.

However, documents like equipment layout etc. where multi-disciplinary activity is involved, the EPC CONTRACTOR, after submission for OWNER/CONSULTANT's review, shall visit OWNER/CONSULTANT for discussion for expeditious review of documents.

In absence of visit of EPC CONTRACTOR'S engineering team at OWNER/CONSULTANT office, review time shall be 15 working days. The information category document will be retained for records only. It is EPC CONTRACTOR'S responsibility to correct the deviation, if any, to the stipulation in the bid document, without any cost or time implication to Owner.

2.2 EPC CONTRACTOR'S Review

EPC CONTRACTOR shall furnish compliance statement to OWNER /CONSULTANT's comments while submitting the next revision within 10 days from the date of release of drawings and documents by OWNER/CONSULTANT.

2.3 Control and Monitoring of documents review and submission

Drawing schedule shall indicate the following:

- Schedule/Actual submission date to owner
- Category of submission
- Receipt of comments from Owner
- Category of return status from Owner
- Issue date for Construction

This updated schedule shall be issued on fortnightly/monthly basis, as agreed, and compared with Owner's log.

Detailed listing of documents (discipline wise) which are scheduled to be submitted or re-submitted incorporating OWNER/CONSULTANT's comments shall be provided by EPC CONTRACTOR in the weekly meetings. EPC Contractor shall ensure that drawings /documents are submitted as per the agreed schedule only. Bunching of documents/out of sequence submissions and consequential delay of documents and its review thereof shall be exclusively attributable to EPC CONTRACTOR.

2.4 Pre-Requisites from EPC Contractor

2.4.1 At the kick-off meeting, the EPC CONTRACTOR must submit discipline wise list of documents and drawings index.

2.4.2 The Drawing Index (discipline wise) shall include description of drawings/ documents, category of drawings, scheduled date of submission, actual date of submission, review code received with dates. This shall be updated fortnightly/monthly, as agreed by EPC CONTRACTOR and copies issued to OWNER /CONSULTANT site and H.O. as well as Owner. Drawings submitted before finalization of drawing index shall be rejected.

2.4.3 EPC CONTRACTOR shall separately submit list of drawings/documents involving multi-disciplinary reviews, considering the OWNER /CONSULTANT departmental activities (furnished in the contract) during the kick off meeting itself. They are also highlighted in the discipline- wise document list.

2.4.4 Critical and typical drawings/documents having impact on schedule and quality should only be identified for such timely reviews in Document Control Index. This shall be adopted after receipt of drawings/documents indexes from the EPC CONTRACTOR at the kick-off meeting with mutual understanding of the EPC CONTRACTOR/concerned specialist/Owner.

2.4.5 Any deviation on Record category drawings/documents and on review category drawings observed later or in execution at site during site visit/technical review by OWNER/CONSULTANT shall be taken seriously. EPC Contractor shall rectify the same at his own cost and time.

2.4.6 EPC CONTRACTOR shall plan submission progressively so that no bunching takes place in any discipline.

2.4.7 Review period shall be reckoned from the “Date of Receipt” of documents/drawings at OWNER /CONSULTANT to the “Date of Receiving” the reviewed documents by the EPC CONTRACTOR from OWNER /CONSULTANT office. EPC CONTRACTOR shall monitor submission and receipt.

2.4.8 Documents/drawings received prior to holiday/week end shall be accounted as received on the following working day and the review period committed shall include only working days.

2.4.9 Quality of drawings/documents is the essence for a timely review. If major comments/deviations to the contract document are noticed, the drawing shall be returned in Code-3.

2.4.10 Sequence of submission of drawings is essential for proper review of documents and timely completion of the project and the same is to be adhered to. In case sequence is not maintained, the documents submitted shall not be reviewed by OWNER/CONSULTANT and the responsibility of timely execution of the plant shall remain with EPC CONTRACTOR.

2.4.11 Piping/Instrument & other engineering drawings/documents shall be issued only after the corresponding P&IDs & Process documents coming under review category are first reviewed by the concerned department in code-2 as a minimum.

2.4.12 In principle. EPC CONTRACTOR is not expected to revise drawings/documents already reviewed in Code-1.

a) If it is of utmost necessity to revise or add some minor details in Code-1 drawings, EPC CONTRACTOR shall highlight such revisions by marking “CLOUD” and providing appropriate revision nos. to such additions/alterations. EPC CONTRACTOR is also needed to provide a “BLOCK” in the drawing indicating reasons of such changes and to insert another “Review Block”. OWNER /CONSULTANT shall put relevant code for such revisions only. Code

marking given by OWNER /CONSULTANT on such revisions shall not change the category of drawing.

b) Any major change in Code-1 drawing shall call for preparation of new drawing.

2.4.13 Based on the confidence gained on EPC CONTRACTOR'S quality of drawings/documents already submitted, "Review Category" drawings could be retained as Information/Records and vice versa at the discretion of OWNER/CONSULTANT. This however, does not change the category of drawings.

2.4.14 Once a document is already reviewed in Code-2, subsequent submission due to non-incorporation of comments shall not be accounted for any contractual commitment of review period from OWNER /CONSULTANT. EPC CONTRACTOR is expected to comply with OWNER /CONSULTANT's comments in the next revision after Code-2 and is required to submit a compliance report accordingly

2.4.15 Deviation permit, submitted for seeking deviation in vendor document management system, shall be separately identified and shall not be considered as a document for timely approval/review.

2.4.16 When OWNER/CONSULTANT deploys engineers at the EPC CONTRACTOR'S work center following shall be satisfied:

- Review is limited to identified long delivery/schedule critical items only.
- Readiness of documents/drawings shall be ensured by the EPC CONTRACTOR.
- Presence of lead engineers of all disciplines of the EPC CONTRACTOR.

2.4.17 If OWNER/CONSULTANT highlights any necessary rectifications required in the construction at the time of Technical Review/Audit, construction executed based on record category drawings not complying with Bid requirement, EPC CONTRACTOR shall rectify without any impact of time and cost to Owner.

2.4.18 EPC CONTRACTOR shall submit designs drawings for review only after the corresponding GA/Equipment datasheets etc. have been coordinated in his office and reviewed by OWNER/CONSULTANT engineers at least in Code-2. Such OWNER/CONSULTANT reviewed drawings shall be furnished along with drawings/designs for timely review.

2.4.19 EPC CONTRACTOR shall open an engineering office in India for speedy document submission and to help faster review of the drawings & documents.

2.5 Approved for Construction Drawings

Drawings reviewed under Code1 & Code2 required for execution at site shall be decided by EPC CONTRACTOR and copies need to be sent to OWNER /CONSULTANT (RCM), EPC CONTRACTOR'S RCM and BPREP (site).

- "**Approved for Construction**" stamped/sticker drawings shall be issued by EPC CONTRACTOR for execution.

- "**Approved for Construction"** stamped/sticker shall be done separately on the reviewed print and not on the Title block.

- Without changing Revision **Number**, EPC CONTRACTOR to arrange adequate number of prints of documents and drawings to EPC CONTRACTOR'S RCM, OWNER/CONSULTANT RCM and BPREP (site) with transmittal.

- Copies of only reviewed or final documents like design calculations, design basis etc. shall be sent to OWNER /CONSULTANT site for records.

- Copy of such transmittal shall be sent to OWNER /CONSULTANT (HO) & BPREP (HO) for records.

2.6 Critical Drawing/documents shall be reviewed by Licensor during the course of Project execution, list of Licensor mandatory review document is enclosed elsewhere in the contract.

2.7 Mandatory compliance to the smart engineering activities at EPC Contractor's end

2.7.1 Plant Breakdown Structure (PBS) supplied by EIL to be adhered to. The SEED file and Plant Breakdown Structure (PBS) shall be provided by consultant to the successful EPC Contractor which shall be utilized by the EPC Contractor for their smart integrated engineering activities without any deviation. For any deviation in this regard prior approval need to be taken by EPC Contractor from EIL.

2.7.2 For residual engineering (process), work share to be followed. In case any new symbol is required, same shall be obtained from/ authorized by EIL.

2.7.3 All P&IDs need to be smartly developed. All the constituents of P&ID need to be intelligently mapped with database/database driven. There shall not be any graphics/symbols/texts in the smart P&IDs. There shall not be any dummy graphics/symbols/texts in main body of the P&ID.

2.7.4 3D Modeling for Piping, Equipment, Instruments & Electrical need to be database driven. Dummy graphics need to be avoided. Quality check & data connectivity shall be ensured at EPC Contractor's end before submitting the data files/documents/3D Model to the Consultant.

2.7.5 All the applicable deliverables shall be extracted from 3D model without any manual rework done thereafter. This is to maintain the consistency between 3D model and extracted deliverables.

2.7.6 Deliverables from 3D model shall be extracted only on conforming the alignment of interfaces with client model and clash free design.

C 2.7.8 For consolidation of engineering data, critical attribute metadata excel file to be filled and submitted by vendor. Template will be provided during detailed engineering.

2.8 Digital handover of Engineering Information

Smart Integrated engineering shall be utilized to carry out engineering activities. Intelligent Systems shall be used for the management of P&ID, Equipment layout, 3D Model, Piping, Electrical and Instrumentation design & deliverables including P&IDs, Reports, MTO, procurement etc.

The data in each such intelligent system, including the 3D Model and Intelligent P&ID's to be submitted by the EPC Contractor in a predefined Software version/format, as tabulated below.

The same shall be submitted by the respective LSTK vendor/equipment suppliers strictly without any deviation.

Software versions/Format Requirements

The definition is in general terms containing (native (N), image (I), portable document format (D)) the formats in which EPC Contractor shall provide electronic versions of Documents. Acceptable applications for each format type are listed in the table below.

Data/Document Types	Authoring Software*	Version
2D CAD	S3D, AutoCAD	*/2018
Intelligent P&IDs	SPID	*
Instt. Index, Datasheet etc.	SI	*
Electrical load list/Single line diagram/Interconnection details/Cable Schedule	SEL	*
3D Model	S3D#	*
2D Documents from the 3D model	S3D#	*
Text Documents/Reports	MS Word 2013 or as agreed with Company	*
Datasheets/Lists	MS Excel 2013 or Adobe Acrobat as agreed with Company	*
Email	Rich Text Format	
Schedules	Primavera	*
Organization Charts/diagrams	Visio 2013, Microsoft power point or as agreed with Company	
Portable Document Format Files	PDF files shall always be directly generated from the authoring application. Scanned documents/Images which are converted to Adobe Acrobat format do not qualify as Portable Document Format files and shall be treated as image files for the purpose of format compliance.	

*Version shall be finalized during KOM.

In case documentation submitted is of authoring software mentioned below, the data has to be submitted comprehensively including native files, databases, catalogs etc., as detailed here.

SMART 3D[#]	Project DBs in oracle/sql** (version shall be compatible with latest version of SMART 3D) along with Reference project for Catalogues, Standards, customization develop for the job etc.
INTERGRAPH SMART P&ID	SPID Project Backup along with deliverables extracted from SPID (P&ID, PDS, Line list) and database in oracle/sql** (version shall be compatible with latest version of SMART PID)
AUTOCAD	DWG/DXF files
SMART Instrumentation	SPI Project Backup (DWG + Datasheets + Tags & Attributes in excel format) and database in oracle/sql** (version shall be compatible with latest version of SMART Instrumentation)
SMART Electrical	SE Project Backup (DWG + Tags & Attributes in excel format) and database in oracle/sql** (version shall be compatible with latest version of SMART Electrical)

**Database (oracle/sql) and Version shall be finalized during KOM.

[#] It is suggestive to use the defined 3D modelling platform for seamless integration and data exchange with smart authoring tools (SPID, SPI & SEL) and further downstream correlation with defined document management system for smart engineering and digital handover. However, if EPC Contractor choose to use any other 3D modelling software, they can do so but they need to ensure and demonstrate the capabilities (within 45 days after Kick off meeting) of converting their model into S3D format, fulfilling below project requirements, before starting the modelling activities.

- Following same PBS as being defined by consultant.
- 3D model capable of generating isometrics, GAD, MTO etc, shall have consistent and correlated data with other smart authoring tools of P&ID, instrumentation and electrical design.
- The converted 3D model data shall also be consolidated and correlated with data and document in client document management system and thus there should not be any lack of features/ data output in the converted model with respect to the model being made in S3D originally.
- Any other functionality as required.

Approval for initiation of modelling activities will be provided once the above-mentioned capabilities is fulfilled and successfully demonstrated to Consultant/Client. Also, when bidder is delivering the 3D model at any stage of the project, they have to convert all the files/database etc. to S3D format meeting above stated requirement. Validation and correctness of converted model shall be ensured by bidder before submitting the model to consultant/client.

No model review shall be done without submission of 3D model file/database in S3D format and subsequent acceptance by consultant/client.

2.9 Real Time Tracking of Major Shipments for BPREP Project and Data Sharing for Use on BPREP Control Tower

2.9.1 General Requirements

The EPC Contractor (directly and/or through their transport agency) shall provide real-time tracking information for all consignments as per the following:

1. Tracking information of all shipments through all modes of transport vs. Air, Land and Sea
2. GPS tracking for all shipments exceeding INR 10 lakhs in value
3. Electronic sharing of GPS tracking data (as applicable) and consignment tracking data (through Transport Agency's Transport Management System) via REST API and on web portal of EPC Contractor or transport agency, including depiction of location of consignments on map where GPS tracking is applicable
4. Tracking details for both international and domestic shipments.

For International Shipments mandatory vessel tracking through AIS (Automatic Identification System)

2.9.2 Mandatory Tracking Information

The EPC Contractor must provide the following information for each consignment:

1. Unique consignment identifier
2. Real-time GPS coordinates for in-transit shipments
3. Scheduled, Estimated and actual departure times from point of origin
4. Scheduled, Estimated and actual arrival times at destination
5. Current location and status updates on a daily basis (GPS Status updates shall be live)
6. Total Distance, Cumulative Actual Distance Travelled, Daily Distance Travelled to be updated on Daily basis.
7. Any deviation from planned route or schedule
8. Detailed consignment route details with GPS coordinates for key touchpoints like ports, terminals and warehouses.

2.9.3 Data Sharing Protocol

The EPC Contractor shall:

1. Provide access credentials for their tracking platform as applicable
2. Share tracking data in real-time for GPS tracking and daily basis
3. Provide notification of any tracking system failures/ downtime or data gaps

2.9.4 Security and Confidentiality

1. All tracking data shall be treated as confidential information
2. Data transmission must use secure protocols
3. EPC Contractor shall comply with relevant data protection regulations

3.0 Project Monitoring and Reporting for BPREP Project and Data Sharing for Use on BPREP Control Tower

3.0.1 Client is deploying a Project Monitoring System and Control Tower for the project. The EPC Contractor shall have the following obligations wrt Project Planning, Scheduling

and Monitoring. This will be read in conjunction with project management clauses specified elsewhere in the Tender/MR.

3.0.2 The EPC Contractor shall submit a comprehensive monthly progress report via the PMIS, which will include the following:

1. Executive Summary: A high-level overview of the reporting period's progress, summarizing key accomplishments and major issues encountered.

2. Progress Monitoring: Progress Monitoring/ Earned Value Management (Planned vs Actual) at project and Functional Level based on underling Deliverable List/DCI, Sub-ordering/ Material Control Index (MCI), Manufacturing Milestones and actual progress against planned schedules.

3. Project Schedule: EPC Contractor shall submit the Critical Path Method Schedule (CPM) Project Scheule in Primavera P6 or MS Project Format on a monthly basis.

4. Areas of Concern: A detailed description of any issues or risks impacting project timelines, Engineering, Manufacturing, or Sub-ordering activities. The EPC Contractor must identify bottlenecks, supply chain delays, and potential risks that may affect overall project progress.

5. Engineering Status: Detailed progress reports on engineering tasks, including design, technical drawings, and any engineering-related milestones, document approval status, pending approvals, revisions, or rejections etc. Any delays or issues affecting these deliverables must be clearly reported. EIL VDMS data shall may be available to EPC Contractor for reference.

6. Sub-ordering Status (MCI): A summary of all sub-ordering activities, including key milestones, supplier performance, and delivery timelines. Any delays or issues affecting suborders must be clearly outlined.

7. Manufacturing Status: A detailed update on the manufacturing process, including the production schedule, quality checks, and any deviations from planned timelines.

8. Dispatch Status: Detailed status of items dispatched, Packing Lists, LR Details, Transporter Details, Tracking Details etc.

3.0.3 Data Integration: The EPC Contractor shall ensure that all required data, including schedules, deliverables, and KPI inputs, are entered (manual entry, predefined templates) accurately into the PMIS system. EPC Contractor will be provided access to the PMIS System. The EPC Contractor is responsible for ensuring data integrity and timely submission.

3.0.4 Compliance with Workflows: The EPC Contractor must adhere to the defined workflows in the PMIS system for report submission, review, and approval. The EPC Contractor's reports will undergo review at multiple levels and the EPC Contractor shall address any feedback or corrections promptly.

3.0.5 Earned Value Management (EVM): The EPC Contractor is responsible for providing inputs that align with the Earned Value Management methodology, including schedule and cost data, weighted WBS, and progress updates, which contribute to the generation of project S-curves and EVM reports.

3.0.6 The reports will be submitted in PMIS predefined templates, reviewed through the PMIS workflows, and updated in the system on a monthly basis. The EPC Contractor shall

ensure all data is accurate and up to date to allow for timely review and integration into the overall project progress monitoring system.

3.0.7 Failure to provide data/ info on timely basis may be considered a breach of contract.

3.0.8 Contractor shall comply with cybersecurity guidelines/advisories/acceptable use policy issued by BPCL/EIL.

3.0.9 In case, any of the systems are not deployed, or are stopped during the course of the contract; executing, reporting and monitoring of the work will continue through traditional methods, other platforms as directed by the Engineer-in-Charge.

3.0.10 Non availability of platforms will not be a reason for seeking time extension, change orders pertaining to time and/ or cost.

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP	**Client**	BPCL		
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957	**Unit No.**	000

PURCHASER'S DATA

A	**Site Conditions**		
1	Maximum Ambient Temperature	°C	48
2	Minimum Ambient Temperature	°C	1.1
3	Design Ambient Temperature	°C	45
4	Relative Humidity	%	86
5	Altitude Above MSL	m	<1000
6	Environment		Hot, humid & corrosive
B	**Operating Conditions**		
1	System Voltage		220 +/- 10% kV ± TP %
2	Frequency		50 Hz ± 5 %
3	Number of Phases		Three
4	System Fault Level	kA(for 1 sec)	50KA for 3 Sec
5	System Earthing		Solidly Earthed
6	Auxilliary Power Suppy		
i.	- for space heaters,cubicle lamps etc		240 V AC TPN 10 %
ii	- for protection metering and control		110 V DC- -10/+ 10 %
iii	- circuit breaker spring charging motor		110 V DC- 10/+ 10 %
iv	- Motor drive for disconnectors and earth switches		110 V DC- 10/+ 10 %
v	- high speed earth switch spring charging motor		110 V DC- 10/+ 10 %
vi	- gas handling and filling unit / cart		415 V AC TPN ± 10%
7	Installation		
i.	GIS		Airconditioned
ii	LCC		Airconditioned
iii	CRP		Airconditioned
C	**Electrical Data**		
1	Bus Bar System		Double
2	Bus bar rated current	A	2000
3	1 sec short circuit withstand capacity	kA	50
4	Rated peak withstand current	kA	135
5	Internal arc rating		50 kA for 0.3
6	Circuit Breaker		
i	Type of circuit breaker		SF6
ii	Duty cycle of Circuit Breaker		0-3 min-co-3 min-co
iii	Breaking capacity	kA	50
iv	Making capacity	kA	135
v	CB Operating Mechanism		Spring Charged or Electro Hydraulic 6-51-0066
vi	Shunt trip coil-1	V DC	110V DC
	Shunt trip coil -2 (see note-1)	V AC UPS	230V AC (UPS)
vii	Mechanical indicator for breaker status		Required
viii	Pre-insertion resistor		Not Required
7	Dissconnector & Earthing Switch		
i	Operating Machanism		Motorised
ii	Mechanical indicator for disconnector & earthswitch status		Required
iii	Viewing windows for disconnector and earthswitch		Required
iv	Mechanical interlock for disconnector & earthswitch		Required
v	Electrical interlock with associated circuit breaker		Required
8	High speed make-proof Earthing switch		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	30-APR-2025	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

i	Operating Machanism		Motorised
ii	Mechanical indicator for High speed earthswitch status		Required
iii	Electrical interlock with associated circuit breaker		Required
D	**Miscellaneous**		
1	Paint Shade		RAL-7032
2	Interface with ECS		Required
3	SF6 Gas monitoring system		Required
4	SF6 Gas Handling /filling unit		Required
5	Spare SF6 gas		Required
6	Quality of spare gas	%	10% of total gas as per 6.9.4 of 6-51-0066
7	Mimic on LV compartment		Required
8	Voltage Detectors		Not Required

MANUFACTURER'S DATA

A	**General**		
1	Name of manufacture		
2	Place of manufacture		
3	Type designation		
4	LCC		
5	Degree of protection		
i	Gas compartment		
ii	LCC		
iii	CRP		
6	Enclosure		
7	Enclosure material		
i	Gas compartment		
ii	LCC		
iii	CRP		
9	Rated Voltage	kV	
10	1 min. power frequency withstand (rms)	kV	
11	Lighting impulse withstand voltage	kV	
12	Switching impulse withstand voltage		
13	Rated current		
i	Busbar	A	
ii	Incomers and outgoing feeders	A	
14	1 sec short ckt. withstand capacity	kA	
15	Peak dynamic withstand capacity	kA	
16	Bus bar material		
17	Main Busbar size		
18.	Bus bar size for incomers and outgoing feeders	sqmm	
19	Insulating material (busbar support)		
20	Eath busbar material / size	sqmm	
B	**SF6 Gas**		
1	Average leakage rate of SF6 gas	% / year	
2	Gas monitoring devices (density guages/pressure switch		
3	Gas handling and filling arrangement /cart		
	- maximum power requirement	kW	
4	Whether GIS are dispatched filled with SF6 gas		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
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B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

5	SF6 gas pressure for each gas compartment		
i	Design Pressure		
ii	Operating Pressure		
iii	Alarm Pressure		
iv	Lockout Pressure		
6	Pressure of relief device		
7	Spare gas (no. of cylinders,volume/pressure of cylinder)		
C	**Circuit Breaker**		
1	Type of circuit breaker		SF6
2	Make		
3	Place of manufacture		
4	Type designation		
5	Encloser		
6	Number of poles per phase		
7	Number of interrupting chambers per pole		
8	Number of trip coils		
9	Rated continuous current for I/C and O/G fdrs		
10	Duty cycle		
11	CB Operating mechanism		
12	Short circuit withstand capacity	kA	
13	Breaking capacity	kA	
14.	Peak making capacity	kA	
15	% DC component		
16	First pole to clear factor		
17	Power required for opening	W	
18	Power required for closing	W	
19	Power required for spring charging motor	W	
20	Closing time	sec	
21	Opening time	sec	
22	Provision of manual spring charging		
23	Manual trip device		
24	Mechanical ON/OFF indicator for breaker		
25	Mechanical indication for spring status		
26	Operation counter		
27	Number of auxiliary contacts and their rating		
28	Breaker is trip free		
D	**Disconnector / Earthing switch**		
1	Make		
2	Place of manufacture		
3	Type designation		
4	Rated continuous current of dissconnector/earth switch for I/C and O/G fdr		
5	Short circuit withstand capacity		
6	Short circuit making capacity of high speed earth switch		
7	Operating mechanism		
8	Type of motor drive		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
C	30-APR-2025	ISSUED WITH MR/TENDER	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR
B	30-JAN-2025	ISSUED WITH MR	SONALI KANU	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR
A	19-NOV-2024	ISSUED WITH MR	KANUGUTTA SUMITH	RASHMI SINGH RATHAUR	RASHMI SINGH RATHAUR

Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

9	Number of auxiliary contacts and their rating		
10	Mechanical ON/OFF indicator		
11	Manual operation handle		
12	Manual spring charging		
13	Power required for spring charging motor		
E	**Instrument Transformers**		
1	Current Transformer		
i	Make		
ii	Place of manufacture		
iii	Type designation		
iv	CT ratio,accuracy & VA burden		
v	Knee point voltage / secondary voltage,accuracy & VA burden		
2	Voltage Transformer		
i	Make		
ii	Place of manufacture		
iii	Type designation		
iv	Primary Voltage / Secondary Voltage ,accuracy & VA burden		
F	**Surge Arrestors**		
1	Make		
2	Type designation		
3	Place of manufacture		
4	Rated Voltage	kV	
5	MCOV(Max. Continuous voltage, accuracy & VA burden	kV	
6	Line discharge class	kA	
7	Nominal discharge current	kA	
8	High current withstand capacity	kA	
9	Temporary overvoltage for 1 sec		
10	Temporary overvoltage for 10 sec		
G	**Mechanical**		
1	Feeder / Bay		
	Max. overall weight		
	overall Dimensions(Width X Depth X Height)		
2	LCC		
	overall Dimensions(Width X Depth X Height)		
3	CRP		
	overall Dimensions(Width X Depth X Height)		
4.	Largest shipping section		
	Max overall weight		
	overall Dimensions(Width X Depth X Height)		
5	Gas handling & filling plant / service cart		
	Overall dimensions(Width X Depth X Height)		
6	Recommended clearances		
	GIS (Front / rear / above)	mm	
	LCC (Front / rear / above)	mm	
	CRP (Front / rear / above)	mm	

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Project	Overall Project Management as MPMC and PMC/EPCM Services for Ethylene Cracker Unit and U&O for BPREP			**Client**	BPCL
Unit	Bulk Procurement	**Location**	Bina, Madhya Pradesh	**Job No.**	B957

Unit No. 000

7	Shock loading on foundation	
8	Requirement of EOT crane for GIS	
9	Capacity of EOT crane required	
10	Clear height recommended for EOT crane	
11	Dispatch for each feeder / bay	
H	**Copies of following test certificates enclo**	
	For each type of offered feeder/bay with circuit breaker, dissconnector and earthswitch	
1	Short circuit tests(peak and 1 sec withstand)	
2	Making and breaking tests	
3	Temperature rise test	
4	Internal arc test	
5.	Dielectric tests	
6	Operation and mechanical endurance tests	

Notes

1 Disconnector class shall be M2

2 Rated line charging interrupting current of breaker shall be as per IEC on 21 kM of transmission Over-head Line.

3 SF6 gas handling/filling unit mentioned in D.4 of purchaser data is already covered as part of mandatory spares as defined elsewhere.

4 Although the equipment shall be installed in Air Conditioned GIS/ Switchgear hall, but same shall be suitable for installation and satisfactory operation in a non air conditioned, tropical, humid and corrosive environment

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Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By

GIS Comments/Clarifications

Sl. No.	Document name	Reference clause No.	Page No.	Reference clause & Specifications	Queries / Clarifications to Client'	Queries / Clarifications to EPC	Clarifications by BHEL
1	NIT	1.01	59 of 86	GIS SUPPLY: 220KV, 2000A, 50kA, SF6 GIS BUS BAR MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS		The supply of Hardware required for earthing and earthing material shall be excluded from GIS OEM Scope. However only earthing drawings for GIS shall be provided during detailed engg. We request your kind acceptance.	Kindly comply TS/ BOQ & subsequent Corrigendum.
2	NIT	1.02	59 of 86	1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism.	The High Speed Earthing Switch is required only in the case of Line Feeders to earth long line trapped charges. However, work-in Progress earthing switch is suffice to earth trapped line charges due to short line length in Trafo Feeders and Bus Earthing. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.
3	NIT	1.02	59 of 86	3 NO- 1 phase multi winding Voltage Transformer with residual Current Circuit Breaker arrangement	The VT shall be provided with miniature circuit breaker (MCB). Also, the supply of RCCB in VT is not envisaged. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
4	NIT	-	59 of 86	GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for EHV GIS)- Technical Specification.		The supply of walkways shall be excluded from GIS OEM scope. However the mobile type ladder shall be provided for accessing GIS. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
5	NIT	-	59 of 86	In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System (OPMS), Local Control Cubicle (LCC) and End Terminations, if applicable shall be covered separately.		The suplly of Controlled switching Device shall be excluded from GIS OEM Scope. Please Note	Kindly comply TS/ BOQ & subsequent Corrigendum.
6	TS	5	9 of 257	The GIS Equipment shall be complete with all necessary supports, ladders, galleries, staircases, catwalks, movable platforms or walkways (for accessing the equipment above two meters for maintenance and operation), mechanism cabinets, internal cable raceways etc for each bay and it shall be of modular construction and extendable design. All structures, galleries, staircases and walkways shall conform to the relevant Occupational Safety and Health Administration (OSHA).		The supply of only structure for GIS, cable trays and Mobile type ladder shall be provided. However, supply of any other materials will be excluded from GIS OEM Scope.	Kindly comply TS/ BOQ & subsequent Corrigendum.
7	TS	4	10 of 257	The switchgear shall be of the freestanding, self-supporting dead-front design, with all high-voltage equipment installed inside gas-insulated, metallic grounded enclosures, and suitably sub-divided into individual arc and gas proof compartments, preferably for: (1) Bus bars (2) Intermediate compartment (3) Circuit breakers (4) Line dis-connectors (5) Voltage transformers (6) Gas Insulated bus duct section between GIS and, (7) Gas insulated bus section between GIS and oil filled transformer. (8) Current Transformers.	The gas compartment shall be as per **Gas SLD enclosed.** Also, the Gas insulated Bus shall be three phase encapsulated as per type tested design. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
8	TS	9	12 of 257	9. Online Partial Discharge (PD) monitoring system for GIS, if applicable		The Supply of Online PD monitoring system shall be excluded from GIS OEM Scope. However, PD sensors of adepuate no.s shall be provided for the same.	Kindly comply TS/ BOQ & subsequent Corrigendum.
9	TS	XXXIX.	29 of 257	Contractor shall provide controlled switching device/synchronous switching device in each of the 220kV outgoing transformer feeders (including at all spare feeders) at 220kV GIS substation (MRSS-100) to limit voltage dip during closing of transformer incomer breaker. Details of CSD along with reference list of past executed projects & filed proven test record shall be furnished by the contractor for review/approval of EIL/owner. Contractor shall carry out transformer inrush current study for all EHV transformer under various operating conditions & shall submit the report to EIL/owner for review/approval.		The supply of CSD/ Synchronous switching device will be excluded from GIS OEM Scope. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
10	TS	6.2	167 of 257	COMMISSIONING SPARES	The spares required for commissioning shall be provided on returnable basis.		Kindly comply TS/ BOQ & subsequent Corrigendum.
11	TS	6.3	167 of 257	RECOMMENDED SPARE FOR NORMAL OPERATION & MAINTAINENCE	We do not recommend any spares. However, Spares as per **Annexure-I** will be provided.		Kindly comply TS/ BOQ & subsequent Corrigendum.
12	TS	-	176 of 257	-	**66kV GIS** From Datasheet B957-000-16-50-DS-6611, we understand that there is requirement of Bus duct in incomer bay. Hence, Please share the Layout of Substation for the same. However if there is requirement of cable termination please confirm the requirement of no. of runs in cable.		Not related with 220kV GIS.

GIS Comments/Clarifications

Sl. No.	Document name	Reference clause No.	Page No.	Reference clause & Specifications	Queries / Clarifications to Client'	Queries / Clarifications to EPC	Clarifications by BHEL
13	TS	-	176 of 257	-	**220k GIS** In line with Data sheet B957-000-16-50-DS-6604 VT and SA both are part of incomer bay and as per data sheet B957-000-16-50-DS-6607 SA is only part of all outgoing feeder. Kindly confirm. **66kV GIS** In line with Data sheet B957-000-16-50-DS-6612 VT and SA both are part of incomer bay and as per data sheet B957-000-16-50-DS-6615 SA is only part of all outgoing feeder. Kindly confirm. We also understand the bay with configuration depicted in Data sheet B957-000-16-50-DS-6617 is not applicable for subject Package. Kindly confirm.		Kindly comply TS/ BOQ & subsequent Corrigendum.
14	TS	-	176 of 257	-	In line with Data sheet B957-000-16-50-DS-6604 & B957-000-16-50-DS-6612 VT is with motorized isolation. The motorized isolation for VT is normally pursued for busbar. Line VT Is always connected to line and the isolation is done only during maintenance of line which is very rare occurrence. Hence, isolation requirement is generally not required. However, if isolation is envisaged we propose to provide manual isolation link for 66/220kV GIS in place of motorized in line with earlier executed EIL Projects. Kindly confirm.		Kindly comply TS/ BOQ & subsequent Corrigendum.
15	TS	-	176 of 257	-	As per Data sheet B957-000-16-50-DS-6611 GIBD is asked for in incoming line bay of 66kV, however as per Data sheet B957-000-16-50-DS-6612 cable requirement is envisaged. Kindly confirm the actual requirement. If requirement is with GIBD then kindly share the layout showing busduct routing. If the bays are with cable termination kindly re confirm the number of runs required in case of 66kV GIS.		Kindly comply TS/ BOQ & subsequent Corrigendum.
16	TS	-	209 of 257	Voltage detector = Required	As per Document No. B957-000-16-50-DS-6601 Rev. C of Technical ammendment-02, Voltage Detector in case of 66/220kV GIS is not required.		Kindly comply TS/ BOQ & subsequent Corrigendum.
17	TS	3.3 VIII)	26 of 257	20 Nos. of 66 kV, 630 Amps, 40 kA (3 Sec), Gas insulated Isolating Breaker Panel with SF6 circuit breaker complete with disconnector, earth switch, power cable termination kits, surge arrestor, numerical relay, metering and protection as per enclosed specification and datasheet. This panels shall also include supply of transformer differential relays for both ends. Note that Internal Arc Classification (IAC) rating of switchboard shall be 40 kA for 3 sec.	As per Document No. B957-000-16-50-TA-0020-02 Rev. A (Technical Ammendment-02), Supply of 26 Nos. 630 Amps & 02 nos. 800 Amps, 40 kA (3 Sec) Indoor GIS Line in Line Out Bays are Considered. The Installation, Testing and Commissioning of the same shall be excluded from GIS OEM Scope.		Not related with 220kV GIS.
18	TS	5.7.VII.12	50 of 257	The GIS shall be designed, so as to take care of the Very Fast Transients (VFT) over voltages generated as a result of pre-strikes and re-strikes during isolator operation. Maximum VFT over voltages peak shall not be higher than rated lightning impulse withstand voltage of the equipment.	VFTO studies are applicable for system 300kV and above. So for subject package we understand requirement is not envisaged. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
19	TS	5.7.VII.22	51 of 257	Isolating/ removable link shall be provided on both side of each busbar so that future extension can be done. Also, dedicated gas compartment shall be provided at both ends. However, connecting complete busbar is permitted for shut down for safety purpose.	In case of 66/220 kV GIS isolating link for future extension can be part of future bays. Supply of isolating link in present scope is not envisaged. Further for 220kV GIS we can meet service continuity requirement of keep one bus and adjacent bay in service without supplying isolating link. Kindly confirm.		Kindly comply TS/ BOQ & subsequent Corrigendum.
20	TS	5.7.VII.23	51 of 257	Dedicated gas compartment shall be provided in between two adjacent bays.	We shall provide GIS configuration as per the earlier executed EIL project which meets the functional requirement of service continuity. The requirements shall be as follows: In case of 220kV GIS PROPOSDED GAS sld fulfills below clauses A) MRE01: for fault in circuit breaker compartment B) MRE10: for future extension of GIS C) MRE11: for fault in GIS other than circuit breaker In case of 66kV GIS PROPOSDED GAS sld fulfills below clauses A) MRE01: for fault in circuit breaker compartment B) MRE10: for future extension of GIS C) MRE11: Specification of EHV GIS 6-51-0066 Rev. 1 Clause 5.3.2.b suggest that "For fault in one bus bar & disconnector compartment, at the maximum the adjacent feeders are permitted to be out of service during maintenance and repair". We confirm to follow the same. Hence MRE11 Requirement is not envisaged. We would like to take up further discuss on this point during post bid meeting with consultant and end customer.		Kindly comply TS/ BOQ & subsequent Corrigendum.

GIS Comments/Clarifications

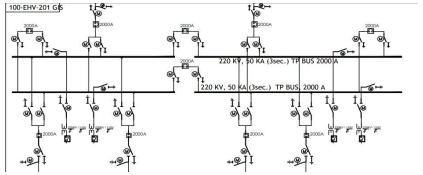
Sl. No.	Document name	Reference clause No.	Page No.	Reference clause & Specifications	Queries / Clarifications to Client'	Queries / Clarifications to EPC	Clarifications by BHEL
21	TS	5.7.VII.34	53 of 257	All portions of the earthing switch and operating mechanism required for earthing shall be connected together utilizing flexible copper conductors having a minimum cross-sectional area of 100 sq. mm.	The requirement calls for connection of earthing switch with earth mat via 100 sq.mm cable. For our specific design the earthing switch are grounded via GIS enclosure separate earthing is not required.	The Supply and installation of earthing material shall be excluded from GIS OEM Scope. However we shall provide earthing drawings during detailed engg. We request your kind acceptance.	Kindly comply TS/ BOQ & subsequent Corrigendum.
22	TS	5.7.VII.35	54 of 257	Earthing switches located at the beginning of the line/ transformer feeder bay modules shall be of the high speed, make proof type and will be used to discharge the respective charging currents, trapped charge in addition to their safety earthing function.	The High Speed Earthing Switch is required only in the case of Line Feeders to earth long line trapped charges. However, work-in Progress earthing switch is suffice to earth trapped line charges due to short line length in Trafo Feeders. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.
23	TS	5.7.VII.40	55 of 257	For SF6 gas site tests for moisture, air content, flash point and dielectric strength to be done during commissioning of GIS.	Flash point is not appliable for sf6 Gas as it is non-flammable insulating medium. Dielectric Strength test(Power Frequency test) shall be conducted at site. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
24	TS	5.7.VII.42	55 of 257	In case gas leakage under specified conditions is found to be greater than 0.5% after one year of commissioning, the manufacturer will give additional warranty for FIVE years.	We shall assure you that the leakage will not exceed limit over 0.5%. However, if in rare case the leakage happens then we shall repair the same within warranty tenure at free of cost. Additional warranty cannot be provided.		Kindly comply TS/ BOQ & subsequent Corrigendum.
25	TS	5.7.X.6	56 of 257	Calculations to show that there is no Ferro resonance due to capacitance of GIS for the voltage transformers	Ferro resonance generally applicable for 400kV voltage level and long length lines. Hence, we understand for subject package the same is not applicable.		Kindly comply TS/ BOQ & subsequent Corrigendum.
26	TS	XI.	56 of 257	All transport packages containing critical units viz. Circuit breakers and Voltage transformers shall be provided with sufficient number of electronic impact recorders (on returnable basis) during transportation to measure the magnitude and duration of the impact in all three directions.	Impact recorder is normally envisaged when there are no firm bolted connection. Since, GIS module are bolted joints hence critical component like VT shall be provided with Shock recorder. As a OEM standard practice we assure to you that shock indicator suffice the requirement.		Kindly comply TS/ BOQ & subsequent Corrigendum.
27	TS	5.7.XIII.5	58 of 257	SF6 topping system.	We understand since we are quoting SF6 gas cart. Requirement of SF6 topping system is not envisaged. since filling provision is part of cart features.		Kindly comply TS/ BOQ & subsequent Corrigendum.
28	TS	5.6.3	188 of 257	Further suitable arrangements of test plug / socket shall be provided which will permit full dielectric testing for outgoing cable of all cable feeders including primary current injection test for current transformers. The voltage rating of test plug / socket shall be as specified in data sheet / job specification.	We confirm to provide insulated earthing switch on the outgoing side of the bay from where dielectric testing of cables can be conducted up to 10kV. We hope the same shall suffice the requirement.		Kindly comply TS/ BOQ & subsequent Corrigendum.
29	TS	5.6 Cable Termination	188 of 257	Isolating links shall be provided in cable termination module for disconnection between GIS and cable during cable testing.	We confirm to provide isolating link within cable enclosure. This link can be isolated by accessing the aperture in the cable enclosure by removing the gas.	The Supply or Design of Male and Female Part of Cable termination Kit shall be Excluded from GIS OEM Scope. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
30	TS	5.10 Nameplates	189 of 257	Engraved nameplates shall preferably be of 3-ply (Black-White-Black) limacoid sheets or anodised aluminum. However back engraved Perspex sheet nameplates are also acceptable. Nameplates shall be fastened by screws and not by adhesives.	The stainless steel type of rating name plate is provided. However these are accepted by many customer. This is for your information only.		Kindly comply TS/ BOQ & subsequent Corrigendum.
31	TS	5.12.1	190 of 257	Owner interface for remote control, metering, indication, alarm etc. of complete GIS equipment shall be at CRP only. Further external AC & DC control & auxiliary power supplies interface for complete GIS equipment shall be at designated LCC only.		The Supply or design of CRP shall be excluded from GIS OEM Scope. However control,metering, indication, alarm of individual feeder shall be provided in front of GIS Bay. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
32	TS	5.12.2	190 of 257	All cables required amongst various components of GIS i.e. circuit breaker, disconnectors, earth switches, CT, VT, LCC, CRP etc. along with the cable glands & lugs shall be provided by the vendor. The cables shall be Cu conductor, FRLS, armoured type. These shall be suitable for directly laying in cable trays/ lined RCC trenches. Maximum distance between GIS/LCC and corresponding CRP shall be considered as 150 meters unless otherwise specified. Exact distances shall be informed during vendor drawing review based on the final locations of GIS/LCC and CRP.	The armoured cables are very rigid and bending of the same is not possible, also it is difficult to take it through cable glands. Hence the requirement of armoured is not possible. However FRLS cables can be provided in 66kV and 220kV GIS. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
33	TS	5.12.2	190 of 257	Exact distances shall be informed during vendor drawing review based on the final locations of GIS/LCC and CRP.	As mentioned in above point that the scope for LCC shall be excluded from GIS OEM Scope. We can say that the presence of CRP in Layout provided by GIS OEM will be excluded. Please Note	The supply or design of Control Relay Panels is excluded from GIS OEM Scope. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.

GIS Comments/Clarifications

Sl. No.	Document name	Reference clause No.	Page No.	Reference clause & Specifications	Queries / Clarifications to Client'	Queries / Clarifications to EPC	Clarifications by BHEL
34	TS	6.1.6 iii)	194 of 257	For all HV Variable frequency drive feeders, breaker shall be additionally provided with under voltage release. However, in case it is not possible to provide under voltage release in the standard design, as an alternative, one shunt trip coil shall be suitable for DC control supply while second shunt trip coil shall be suitable for external AC control supply. The control supply voltage level shall be as specified in datasheet.	Under Voltage release is not applicable and same cannot be provided. Further we confirm that at 70% rated DC voltage CB can be tripped. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
35	TS	6.2.2 Constructional Features	196 of 257	Arrangement shall be provided to permit manual operation of the disconnectors & earthing switches. Whenever the manual handle is inserted into the drive mechanism, it shall not be possible to control the device electrically. Manual operating handle shall be provided with pad lock. The contacts shall be both mechanically and electrically disconnected during the manual operation.	Mechanical interlocks provided in the disconnector switch. however electrical interlocks shall be provided in LCC to prevent operation of disconnector without opening CB. Please Note		Kindly comply TS/ BOQ & subsequent Corrigendum.
36	TS	6.4.8	198 of 257	Over pressure for each gas compartment of the bay.	As per our GIS design, differential pressure between compartment is less, However, the substantial increase in pressure will be very less. Hence, the Switchgear without overpressure signaling is proposed. This is in line with earlier executed EIL Projects		Kindly comply TS/ BOQ & subsequent Corrigendum.
37	TS	6.5.8	199 of 257	Measuring Instruments	Only CT, VT as Measuring instruments shall be Provided. However relevant data for CT VT shall be provided or else vendor to propose CT VT datasheet with customer's Approval. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.
38	TS	6.5.9	200 of 257	Relays		The Supply or Design of any type of Relays will be excluded from GIS OEM Scope. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
39	TS	6.5.10	200 of 257	Potential free electrical contacts shall be provided for remote alarm / indication of all alarm/trip condition. These contacts shall be in addition to those required for local indication at LCC. These shall be wired to the terminal blocks in the CRP.	The Cabling for GIS provided from GIS Modules to LCC or up to LCC. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.
40	TS	6.6 Current Transformers	201 of 257	The CT short time rating shall be equal to that of the switchgear. The CT ratings shall be as shown in the data sheet. Protective CTs shall have an accuracy class of 5P and an accuracy limit factor greater than 10. CTs for instruments shall have an accuracy class of 1.0 and an accuracy limit factor less than 5.0. For numerical relays having protection and metering functions, dual rated CT shall be provided suitable for protection class and metering class. One leg of CTs shall be earthed.		The Study of CT sizing calculation, Insulation co-ordination, Knee Point Voltage Calculation shall be excluded from GIS OEM Scope. Please Note. Also, the CT-VT parameters are misssing. Kindly provide the same in the CT-VT Sheet enclosed.	Kindly comply TS/ BOQ & subsequent Corrigendum.
41	TS	6.10 c)	202 of 257	High pressure interlock and monitoring device shall be provided.	Please Note that as per the type tested design, pressure difference between the two compartments is substantially low. Thus the scenario of overpressure is highly unlikely to arise. Hence, the requirement of overpressure signaling is not envisaged. This is in line with earlier executed EIL Projects We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
42	TS	6.11	203 of 257	SF6 Gas Handling Unit / Service Cart		Excluded from OEM scope of supply	Kindly comply TS/ BOQ & subsequent Corrigendum.
43	TS	6.13	204 of 257	Voltage detector	Voltage Detector in case of 66/220kV GIS is not applicable, since same is normally applicable in 33kV panels.	Voltage Detector shall be excluded from GIS OEM Scope. Please Note.	Kindly comply TS/ BOQ & subsequent Corrigendum.
44	TS	6.14.4	205 of 257	All current carrying parts shall be of Copper.	As per the latest type tested design conductors are made up of aluminum alloy.This is in line with earlier executed EIL Projects. We request your kind acceptance.		Kindly comply TS/ BOQ & subsequent Corrigendum.
45	TS	7.4	206 of 257	Type test certificates / reports shall be considered acceptable if they are in compliance with the latest applicable relevant Standards and conducted at recognized laboratory. If the type test reports submitted are not in accordance with the above requirements, Owner/EIL reserves the right to ask for the type tests to be repeated in the vendor's premises or other recognized place. The recognized laboratory shall issue the relevant type test certificates upon successful testing.	Type test report are valid as per CEA guidelines and shall be shared for review.		Kindly comply TS/ BOQ & subsequent Corrigendum.
46	TS	7.5	206 of 257	Switchgears and their components shall be subjected to routine tests as per the relevant IEC standards. Routine test certificates shall be submitted for EIL/Owner's review and approval before shipment of the switchgear components. The routine tests for the switchgear shall also include the functional tests for the associated LCC & CRP.	The insulators routine test certificates conducted at vendor's premised shall be submitted for review.		Kindly comply TS/ BOQ & subsequent Corrigendum.
47	TS	5.14	208 of 257	Interlocks	The electrical interlocks in LCC shall be Provided. Also the Padlocking for the respective modules are provided. However, the Mechanical Interlocking for the Modules can't be provided. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.

GIS Comments/Clarifications

Sl. No.	Document name	Reference clause No.	Page No.	Reference clause & Specifications	Queries / Clarifications to Client'	Queries / Clarifications to EPC	Clarifications by BHEL
48	TS	6.5.8	213 of 257	Measuring Instruments	The Supply or Design of measuring Instruments like kW/kWh meters, Frequency meters, power factor meters shall be excluded from GIS OEM scope. However only CT and PT as measuring instrument shall be provided as measuring instrument. Please Note.		Kindly comply TS/ BOQ & subsequent Corrigendum.
49	TS	-	208 of 257	Shunt trip coil -2 (see note-1): 230V AC (UPS)	As per Page No. 1 of 5 of B957-000-16-50-DS-6601 Rev. A, We understand that there is requirement of Shunt trip coil of 230V AC (UPS). However, 2 No.s of 110V DC or 220 V DC can be envisaged due to reliability of DC Power Supply. We request your kind acceptance for the same in 66kV/ 220kV GIS.		Kindly comply TS/ BOQ & subsequent Corrigendum.
50	TS	-	41 of 461	Maximum Ambient Temperature: 48 Deg C	We confirm 3150A at design ambient of 40 Deg for 66kV GIS busbar. Kindly confirm the same.		Kindly comply TS/ BOQ & subsequent Corrigendum.

Pre Bid clarifications for 220kV GIS Bina refinery, BPCL.				
Sl no	**Reference**	**Customer Requirement**	**Bidder Comments**	
Technical Clarification				**Clarifications by BHEL**
1	**ANNEXURE:BOQ_220kV GIS_SUPPLY_BPCL Bina**	**1.0 SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two/ Double bus scheme)**		
		Sl no. 1.02 (c) 3 NO- 1 phase multi winding Voltage Transformer with residual Current Circuit Breaker arrangement	As per TS clause 6.4.9 , Specification For EHV GIS (6-51-0066) transformer leads shall be terminated and protected by MCB. We have considered Voltage transformer secondary leads terminated by MCB	Kindly comply TS/ BOQ & subsequent Corrigendum.
2	**ANNEXURE:BOQ_220kV GIS_SUPPLY_BPCL Bina**	**1.0 SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two/ Double bus scheme)**		
		1.08 GIS SUPPLY: 390KV, 1 PHASE SURGE ARRESTER WITH SURGE COUNTER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) NO 18 Please refer section-2 (TS for 220kV GIS)- Technical Specification. It is considered for INCOMING BAYS & BUS BAR MODULE only. 	Specified Rated voltage of SA, 390kV is for 400kV system voltage. Kindly clarify the SA rating corresponding to 220V system voltage Additionally, We wish to inform you there is a contradiction of BoQ with the SLD, regarding SA. As per BoQ, SA is applicable for bus-bars, however as per SLD, there is no SA indicated for bus-bars. Kindly clarify	Noted and revised the details.
3	**ANNEXURE:BOQ_220kV GIS_SUPPLY_BPCL Bina**	**1.0 SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two/ Double bus scheme)**		
		1.13 GIS SUPPLY: ONLINE PARTIAL DISHCARGE (PD) MONITORING SYSTEM	We have considered the following a)UHF PD sensors on GIS equipment for On line Partial discharge monitoring b)Portable On-line PD measuring equipment 1no (Not continuous on-line type)	Kindly comply TS/ BOQ & subsequent Corrigendum.
4	**ANNEXURE:BOQ_220kV GIS_SUPPLY_BPCL Bina**	**2.0 SUPPLY- GIS: SPECIAL TOOLS AND TESTING & MAINTENANCE INSTRUMENTS AS PER TS**		
		2.17 GIS SUPPLY: PORTABLE PARTIAL DISCHARGE (PD) MONITORING SYSTEM SET 1	We have considered Portable Off-line PD measuring equipment 1 no	Kindly comply TS/ BOQ & subsequent Corrigendum.
5	**Engineering Design Basis (Electrical)**	**5.6.1.2 EHV SWITCHBOARD**		
		4. Local Control Cabinet Mounted on GIS As per TS clause 6.4.1 , Specification For EHV GIS (6-51-0066) LCCs shall be either separate free standing floor mounted type panel or mounted on GIS assembly as per vendor's standard design.	We have considered standalone LCC as per OEM standard design.	Kindly comply TS/ BOQ & subsequent Corrigendum.
6	**ANNEXURE:BOQ_220kV GIS_SUPPLY_BPCL Bina**	**2.0 SUPPLY- GIS: SPECIAL TOOLS AND TESTING & MAINTENANCE INSTRUMENTS AS PER TS**		
		2.08 GIS SUPPLY: CAPACITIVE TYPE VOLTAGE DETECTORS	Supply of Capacitive type voltage detectors (CVD) is not envisaged in GIS manufacturer scope	Kindly comply TS/ BOQ & subsequent Corrigendum.
		2.05 GIS SUPPLY: POWER CABLE TERMINATION KIT ALONG WITH PLUG AND SOCKET (R, Y, B PHASES)	We wish to inform that as per "1.0 SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS)", Power cable termination kit (plug and socket) is not applicable. We have considered Power cable connection/termination interface module only (in accordance with IEC 62271-209). Power cable termination kit (plug and socket) as per "2.05 GIS SUPPLY: POWER CABLE TERMINATION KIT ALONG WITH PLUG AND SOCKET (R, Y, B PHASES)" is excluded from GIS manufacturer scope	Kindly comply TS/ BOQ & subsequent Corrigendum.
		2.14 GIS SUPPLY: ETHERNET SWITCH (1 SET= 1 NO OF EACH TYPE) SET 1	We wish to inform you that ethernet switch is not a part of GIS or LCC scope of suply, and is excluded from GIS manufacturer scope. Same shall be included in CRP/SAS supplier scope.	Kindly comply TS/ BOQ & subsequent Corrigendum.

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Item Wise BoQ

Tender Inviting Authority: BHEL TBG NOIDA

Name of Work: BPCL Bina (220kV GIS)

Enquiry/NIT No:NIT No.91323_Enquiry No._61Q2600057 Dated 17-05-2025

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

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Sl. No.	Item Description	Item Code / Make	Quantity	Units	Quoted Currency in INR / Other Currency	Unit RATE In Figures To be entered by the Bidder in Rs. P	GST (in Percentage)	GST Amount (Unit Rate*Quantity* GST) Rs. P	Unit Freight & Insurance Charges in Rs. P	GST (in Percentage)	GST Amount on F&I (Unit Rate*Quantity*GST) Rs. P	HSN / SAC Code	TOTAL Ex-Works + F & I AMOUNT excluding GST in Rs. P	TOTAL Ex-Works + F & I AMOUNT including GST in Rs. P	TOTAL AMOUNT In Words
1	2	3	4	5	12	13	14	15	16	20	21	51	53	54	55
1.01	**SUPPLY- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two/ Double bus scheme) (For item sl. No. 1.01-1.12):** GIS SUPPLY: 220KV, 2000A, 50kA, SF6 GIS BUS BAR MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item1	4	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.02	GIS SUPPLY: 220KV, 50kA, SF6 BUS PT/ VT BAY MODULE WITH BUS EARTH SWITCH (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item2	4	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.03	GIS BAY SUPPLY: 220kV, 2000A, 50 kA, SF6 INCOMING GIS LINE FEEDER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item3	2	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.04	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 GIS BUS COUPLER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item4	2	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.05	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 GIS BUS SECTIONALISER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item5	2	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.06	GIS BAY SUPPLY: 220kV, 2000A, 50 kA, SF6 OUTGOING GIS TRANSFORMER FEEDER BAY MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item6	3	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.07	GIS BAY SUPPLY: 220kV, 2000A, 50kA, SF6 OUTGOING GIS SPARE TRANSFORMER FEEDER BAY (FULLY EQUIPPED) MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	item7	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.08	GIS SUPPLY: 220KV, 1 PHASE SURGE ARRESTER WITH SURGE COUNTER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	item8	30	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.09	GIS SUPPLY: 220KV, 1 PHASE CABLE CONNECTION MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	item9	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.10	GIS SUPPLY: 220KV, 1 PHASE VOLTAGE TRASNFORMER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	item10	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.11	GIS SUPPLY: LOCAL CONTROL CUBICLES	item11	10	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
1.12	GIS SUPPLY: 220KV, CONTROLLED SWITCHING DEVICE (CSD) FOR 220KV, 3- PH CIRCUIT BREAKER	item12	2	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.01	**SUPPLY- GIS: SPECIAL TOOLS AND TESTING & MAINTENANCE INSTRUMENTS AS PER TS (For item sl. No. 2.01-2.12):** GIS SUPPLY: PORTABLE SF6 GAS LEAKAGE DETECTOR	item13	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.02	GIS SUPPLY: ONLINE PORTABLE SF6 GAS FILLING AND EVACUATION CART	item14	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only

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Item Wise BoQ

Tender Inviting Authority: BHEL TBG NOIDA

Name of Work: BPCL Bina (220kV GIS)

Enquiry/NIT No:NIT No.91323_Enquiry No._61Q2600057 Dated 17-05-2025

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

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Sl. No.	Item Description	Item Code / Make	Quantity	Units	Quoted Currency in INR / Other Currency	Unit RATE In Figures To be entered by the Bidder in Rs. P	GST (in Percentage)	GST Amount (Unit Rate*Quantity* GST) Rs. P	Unit Freight & Insurance Charges in Rs. P	GST (in Percentage)	GST Amount on F&I (Unit Rate*Quantity*GST) Rs. P	HSN / SAC Code	TOTAL Ex-Works + F & I AMOUNT excluding GST in Rs. P	TOTAL Ex-Works + F & I AMOUNT including GST in Rs. P	TOTAL AMOUNT In Words
1	2	3	4	5	12	13	14	15	16	20	21	51	53	54	55
2.03	GIS SUPPLY: SF6 GAS ANALYSER	item15	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.04	GIS SUPPLY: PORTABLE PARTIAL DISCHARGE (PD) MONITORING SYSTEM	item16	1	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.05	GIS SUPPLY: HANDLE FOR DISCONNECTOR SWITCH DRIVE, IF APPLICABLE	item17	4	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.06	GIS SUPPLY: HANDLE FOR EARTHING SWITCH DRIVE, IF APPLICABLE	item18	4	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.07	GIS SUPPLY: TRIPPING COIL	item19	2	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.08	GIS SUPPLY: CLOSING COIL	item20	2	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.09	GIS SUPPLY: DENSITY MONITORING DEVICE (1 SET= 2 NO OF EACH TYPE)	item21	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.10	GIS SUPPLY: PRESSURE GAUGE (1 SET= 2 NO OF EACH TYPE)	item22	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.11	GIS SUPPLY: ETHERNET SWITCH (1 SET= 1 NO OF EACH TYPE)	item23	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
2.12	GIS SUPPLY: CAPACITIVE TYPE VOLTAGE DETECTORS	item24	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
3.01	**SPARES- GIS: 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (For item sl. No. 3.01):** GIS SPARES: RECOMMENDED SPARES FOR 2 YEARS OF NORMAL OPERATION AND MAINTENANCE	item25	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.01	**SPARES- GIS: REFERENCE UNIT PRICE FOR ADDITION/ DELETION OF SUPPLY ITEMS (Unit Prices of Individual Equipment included here or in manadatory spares are required for any Addition/Deletion of Equipment and replacement of damaged items. Bidder to ensure that the unit prices have a logical relationship with prices of assemblies in main items. Quoting for unit prices is mandatory and shall be considered for evaluation) (For item Sl. No. 4.01-4.19):** SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR CIRCUIT BREAKER COMPLETE IN ALL RESPECT	item26	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.02	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR DISCONNECTOR COMPLETE IN ALL RESPECT	item27	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.03	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	item28	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.04	SUPPLY- GIS: SPARES: 220KV, OPERATING MECHANISM FOR FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL RESPECT	item29	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.05	SUPPLY- GIS: SPARES: 220KV, MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	item30	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.06	SUPPLY- GIS: SPARES: 220KV, FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL RESPECT	item31	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only

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Item Wise BoQ

Tender Inviting Authority: BHEL TBG NOIDA

Name of Work: BPCL Bina (220kV GIS)

Enquiry/NIT No:NIT No.91323_Enquiry No._61Q2600057 Dated 17-05-2025

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

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1	2	3	4	5	12	13	14	15	16	20	21	51	53	54	55
4.07	SUPPLY- GIS: SPARES: 220KV, SINGLE PHASE BUS BAR	item32	1	MTRS	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.08	SUPPLY- GIS: SPARES: 220KV, GIS METALLIC ENCLOSURE	item33	50	KGS	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.09	SUPPLY- GIS: SPARES: 220KV, EXPANSION JOINTS	item34	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.10	SUPPLY- GIS: SPARES: 220KV, FLEXIBLE CONNECTIONS	item35	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.11	SUPPLY- GIS: SPARES: 220KV, BARRIER INSULATOR	item36	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.12	SUPPLY- GIS: SPARES: 220KV, NON-BARRIER INSULATOR	item37	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.13	SUPPLY- GIS: SPARES: 220KV, GAS SEALS	item38	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.14	SUPPLY- GIS: SPARES: 220KV, GAS DENSITY MONITOR SWITCH	item39	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.15	SUPPLY- GIS: SPARES: 220KV, GAS PRESSURE SWITCH	item40	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.16	SUPPLY- GIS: SPARES: 220KV, TEE BEND	item41	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.17	SUPPLY- GIS: SPARES: 220KV, ANGLE BEND	item42	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.18	SUPPLY- GIS: SPARES: 220KV, L-BEND	item43	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
4.19	SUPPLY- GIS: SPARES: 220KV, VOLATGE DETECTORS	item44	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.01	**SERVICES- GIS : 220KV, 50KA FOR 3S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (For item Sl. No. 5.01-5.12):** SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF GIS	item45	10	Bays	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.02	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE SURGE ARRESTER WITH SURGE COUNTER	item46	30	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.03	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE CABLE CONNECTION MODULE	item47	36	NO	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.04	SERVICES- 220kV GIS: SUPERVISION OF ERECTION OF 1 PHASE VOLTAGE TRANSFORMER	item48	1	SET	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.05	SERVICES- 220kV GIS: TESTING & COMMISSIONING OF GIS	item49	10	Bays	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.06	SERVICES- 220kV GIS : FINAL SUCCESSFUL HV/ POWER FREQUENCY TESTING OF GIS INCLUDING ARRANGING OF HV TEST KIT ALONG WITH OPERATOR	item50	10	Bays	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.07	SERVICES- 220kV GIS : 3D MODEL FOR 220KV GIS	item51	1	LOT	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.08	SERVICES- 220kV GIS : INSULATION CO-ORDINATION STUDIES FOR GIS SYSTEM	item52	1	LOT	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.09	SERVICES- 220kV GIS : TRAINING FOR GIS AT SITE (GIS/ ONLINE PARTIAL DISCHARGE MONITORING SYSTEM)	item53	7	DAY	INR			0.00			0.00		0.000	0.000	INR Zero Only
5.10	SERVICES- 220kV GIS : TRAINING FOR GIS AT MANUFACTURER WORKS	item54	7	DAY	INR			0.00			0.00		0.000	0.000	INR Zero Only

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Item Wise BoQ

Tender Inviting Authority: BHEL TBG NOIDA

Name of Work: BPCL Bina (220kV GIS)

Enquiry/NIT No:NIT No.91323_Enquiry No._61Q2600057 Dated 17-05-2025

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

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1	2	3	4	5	12	13	14	15	16	20	21	51	53	54	55
6.01	**SERVICES- GIS : REFERENCE UNIT PRICE FOR ADDITION / DELETION OF SERVICES: (UNIT PRICES OF INDIVIDUAL SERVICES INCLUDED HERE ARE REQUIRED FOR ANY ADDITION/DELETION OF EQUIPMENT AND REPLACEMENT OF DAMAGED ITEMS. VENDOR TO ENSURE THAT THE UNIT PRICES HAVE A LOGICAL RELATIONSHIP WITH PRICES OF ASSEMBLIES IN MAIN ITEMS. QUOTING FOR UNIT PRICES IS MANDATORY AND SHALL BE CONSIDERED FOR EVALUATION) (For item Sl. No. 6.01-6.05):** SERVICES- 220kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - SERVICES FOR SUPERVISION OF ERECTION OF GIS	item55	10	MANDAY	**INR**			**0.00**			**0.00**		**0.000**	**0.000**	INR Zero Only
6.02	SERVICES- 220kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - SERVICES FOR TESTING & COMMISSIONING OF GIS	item56	10	MANDAY	**INR**			**0.00**			**0.00**		**0.000**	**0.000**	INR Zero Only
6.03	SERVICES- 220kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS ERECTION SUPERVISION TEAM	item57	2	Set	**INR**			**0.00**			**0.00**		**0.000**	**0.000**	INR Zero Only
6.04	SERVICES- 220kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS TESTING & COMMISSIONING TEAM	item58	2	Set	**INR**			**0.00**			**0.00**		**0.000**	**0.000**	INR Zero Only
6.05	SERVICES- 220kV GIS: DEMOBILIZATION & REMOBILIZATION CHARGES OF HV TEST KIT ALONG WITH OPERATOR	item59	1	Lot	**INR**			**0.00**			**0.00**		**0.000**	**0.000**	INR Zero Only
Total in Figures													**0.000**	**0.000**	Zero Only
oted Rate in Words		**INR Zero Only**													