MANGALORE REFINERY & PETROCHEMICALS LTD.
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Addendum-1 dated 28.11.2023

To

Tender No. 3200000752 dated 31.10.2023

For

Main EPC Package For MRPL Refinery Complex

Power System Upgradation Project

With reference to the above tender, bidders are requested to note the following:

The items, conditions, specification and stipulations of the Bidding Documents and the modified portion to the extent indicated in

a) Annexure-I: Commercial Addendum
b) Annexure-II: Technical Addendum
c) Annexure-III: Reply to Pre-bid Queries

The implications of the same, elsewhere in the tender shall be taken care of appropriately by the bidders. All other terms and conditions, stipulations and specifications of tender shall remain unaltered.

Note:

Bidder shall submit copy of these documents along with the techno-commercial bid, **duly signed and stamped**, as a token of having read and understood the same.

Addendum-1

Annexure-I: Commercial Addendum

Sl. No.	Reference Section No./ Clause No.	Addition/Deletion/Modification
1.	Vol. I of II; Page 1 of 490; Tender Download End Date & Time	The Tender Download End Date & Time shall be read as 14.12.2023, 15.00 Hrs
2.	Vol. I of II; Page 1 of 490; Bid Closing Date & Time	The Bid Closing Date & Time shall be read as 14.12.2023, 15.00 Hrs
3.	Vol. I of II; Page 1 of 490; Un-Priced Bid Opening Date & Time	The Un-Priced Bid Opening Date & Time shall be read as 14.12.2023, 15.30 Hrs

Addendum-1

Annexure-II: Technical Addendum

Sl. No.	Reference Section No./ Clause No.	Addition/Deletion/Modification
1.	Vol. II of II; Clause No. 2.1.1 Electrical Scope of Work, Item no. 5	"Interconnection between ICT-2 & existing 33 kV Generation Switchboard (Panel-41) located in CPP-3 by means of free issued 33 kV power cables" should be replaced by "Interconnection between ICT-2 & existing 33 kV Generation Switchboard (Panel-42) located in CPP-3 by means of free issued 33 kV power cables".
2.	Vol. II of II; Clause No. 2.1.4 C&I Scope of Work, Item no. 2	The Public Address System shall be excluded from the scope of work of the bidder. All relevant clauses in the tender document shall stand null and void.
3.	Vol. II of II; Clause No. 4.5.12 Control Philosophy	The SCADA in the new 220/33 kV Substation shall have interface with the existing plant DCS (through redundant MODBUS RS485 protocol) located in CPP-2 control room.
4.	Vol. II of II; Clause No. 4.6.3 Grid Power Transformers	The three 220/34.5 kV Grid Power Transformers shall be provided with continuous DGA monitoring through installed DGA kits on transformer.
5.	Vol. II of II; Clause No. 7.2 Fire Detection and Alarm System	The proposed fire detection and alarm system for the new 220/33 kV Substation must be compatible with the existing fire detection and alarm system of the plant. The existing fire detection and control system is of Honeywell ESSER system. The bidder needs to interface the new system with the existing system at CPP-2 control room.

Sl. No.	Reference Section No./ Clause No.	Addition/Deletion/Modification
6.	Vol. II of II; Attachment-8: MRPL Engineering Design Basis for Electrical	The Attachment-8: "Engineering Design Basis for Electrical" of the Tender Document should be replaced by the one being attached with this Addendum-I.
7.		The Attachment-10: "Overall Plot Plan" for MRPL Refinery Complex is being attached in the Addendum-I for reference only.
8.		The Attachment-11: "Earthing Layout of 110/33 kV Switchyard" for existing 110 kV Switchyard and adjacent area for proposed location of new 220/33 kV Substation is being attached in the Addendum-I for information.
9.		The Attachment-12: "Existing Geotech Report CPP-1&2" is being attached in the Addendum-I for reference purpose only.

Addendum-1

Annexure-III: Reply to Pre-bid Queries

Please refer to the next sheets

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for

Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
1	GIS/SLD	The busbar shall be made of copper conductors.	Deviation	As per our standard and type tested design, we can only provide Aluminum conductors for GIS. Same is provided across all indian utilities and customers. Request you to accept the same.	Cu/ Aluminum busbar is acceptable for 220 kV GIS as per OEM standard.
2	GIS	Mandatory Spares	Clarification	Optional Rates of Mandatory spares to be provided. Kindly Clarify.	Mandatory spares are to be supplied. Price list of recommended spares to be provided.
3	SLD	CT at both sides of the Circuit breaker	Clarification	We propose CT only on one side of the circuit breaker, since all the protection philosophies associated with the GIS bays can be fulfilled keeping CTs on one side only.	To be discussed at execution stage.
4	General	For Spare and future bays	Clarification	Kindly confirm whether the cable housing for Spare Trafo and Future incoming bays are to be considered now or shall be supplied later at the time of extension.	Those should be considered/ supplied now.
5	17.2.3	Alternatively, the Contractor may submit the reports of the type tests listed for the respective equipment which must have been carried out within last five (5) years from the date of bid opening	Clarification	As per CEA guidelines, the type test validity of GIS shall be 15 years. Request you to accept the same.	CEA guidelines are acceptable.
6	18.3.1	Breaker pole of each rating	Clarification	Only 1 Interruptor pole shall be provided.	1 Interruptor pole shall be provided for each rating.
7	18.3.13	Stationary (Fixed) Contact	Clarification	Please clarify the requirement, such kind of requirement is not there in case of GIS.	OEM recommendation is acceptable.
8	GIS	Bay mounted LCC	Clarification	We propose to provide LCC on the GIS Bays which will reduce the footprint of the building, in this solution all the cables will be pre-fabricated in the factory which in turn will reduce the time of cabling at site drastically. Request you to accept the same.	OEM recommendation is acceptable.
9	GIS	Future extension	Clarification	Request you to confirm how many bays will be added in future extension.	At least two bays are envisaged.
10	GIS	Busbar	Clarification	As per our standard model, we will be offering 3 phase encapsulated bus-bar. This is for your information only.	Acceptable as per OEM standard design.
11	GIS	Since there is no dedicated specification for GIS, we shall follow our standard model of 220 kV GIS.	Clarification	Request you to accept the same.Technical offer will be submitted with the bid. Request your acceptance.	Acceptable as per OEM standard design.
12	CRP	CRP		Please provide the Technical specification for Control & Relay Panel for Protection functions to be considered.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
13	CRP	CRP_Trafo		We shall propose 1 no Differential Relay for Transformer with Inbuilt REF & Overexcitation protection	Differential relay must have separate core of CT having class PS accuracy.
14	CRP	CRP_Trafo		Please clarify requirement of protection functions for Line Bay	Pl. refer to P&M diagram. However, this will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
15	CRP	Busbar Differential Panel		Please confirm the requirement for Busbar Differential Panel	Busbar differential protection will be applicable.
16	CRP	SAS		Please provide SAS system architecture	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
17	CRP	SAS		Please provide specification for SAS system	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
18	CRP	Signal list		Please provide the complete signal list (hardwired/Soft IO signals) required for each substations?	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
19	CRP	SAS		We shall propose RTU based gateway for SAS system please confirm your acceptance	Noted & accepted.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
20	CRP	SAS		As we understand supply of ethernet switches for 33kV SAS Integration shall not be in our scope.	Under EPC Contractor's scope.
21	CRP	SAS		Kindly count of IED's/Meters to be considered for 33kV GIS to be integrated with SAS	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
22	CRP	SAS		Please confirm redundancy required in SAS level switches	Redundancy required at each level, i.e., switches & FO network.
23	CRP	UPS		Please clarify supply scope of UPS for Scada at Central Location & Local HMI at Individual Substation? Also Please confirm the required rating and duration of battery backup	Under EPC Contractor's scope. Duration of battery is mentioned in tender document.
24	Volume II	Introduction Cl. No. 1.2, Site conditions	Creepage Distance	Please specify the creepage distance to be followed for the proposed station.	31 mm/kV
25	Volume II	Introduction, Cl. No. 1.5	Soil resistivity data	Kindly furnish the soil resistivity data to estimate earthing quantities for the bid submission.	The Contractor to conduct the test at execution stage before detail engineering.
26	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 1	Scope of work - Existing station.	We are not envisaging any works in existing 110kV substation. Please confirm.	Noted and confirmed.
27	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 2	Scope of work - ICT2	Kindly clarify/furnish the following in related to testing & commissioning of ICT 2: a) Scope of RTCC, NIFPS control panel(indoor) and control cabling works between these panels. b) Scope of power cables and Auxiliary supply (AC &DC) for these panels. c) Scope of cable trenches and cable trays from ICT 2 to RTCC, NIFPS control panel. If in scope, please furnish the cable routing and cable trench section details by indicating location of ICT 2, RTCC, NIFPS panels..	a) Scope of supply of ICT-2, its RTCC, NIFPS system including control panel is by Owner. Installation of these, except RTCC, are also by Owner. Installation of RTCC and all cabling system supply and installation shall be by Bidder. b) Auxiliary power supply shall be from the existing local panels. Cabling by Bidder. c) Other than ICT-2 foundation, there is no major civil work by Bidder with regard to ICT-2. Minor addition of raceway/existing cable trays may be used for cabling system.
28	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 5	Scope of work - ICT2 interconnection with Panel 41	Kindly clarify/furnish the following in related to interconnection of ICT 2 with Panel 41: a) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of ICT 2 and Panel 41 at CPP-3. b) As switchgear panel 41 is not in bidder scope, please clarify the type of control cabling to be considered for this transformer. If in bidder scope, whether sufficient provisions for alarms , indications and trips are available in Panel 41 control circuit (Relay & BCU)?. c) Scope of auxiliary supply and power cables for ICT 3. d) Scope of earthing conductor along the trays and availability of nearby earthing points?	**Bidder to consider Panel-42 instead of Panel-41 at CPP-3 end for this interconnection. Panel-42 is a transformer feeder.** a) Cables shall be routed through indoor cable cellar and approximate distance is as per tender document. The trays which will be proposed to be used, shall be inspected at site. If not found suitable, new trays to be added in the existing cellar. b) Panel-42 is an existing Transformer Feeder. The standard control cabling for transformer feeders having all mechanical protection alarm and trip contacts as well as neutral CT connections to be considered c) ICT-3 aux. power supply shall be arranged by Bidder in the new substation panels. d) New cable tray earthing shall be by Bidder. The existing 110 kV switchyard is having the earthing grid which will be connected with the proposed earthing grid of the new substation.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
29	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 6	Scope of work - ICT2 interconnection with Local adapter breaker panel	Kindly clarify/furnish the following in related to interconnection of ICT 2 with local adapter breaker panel: a) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of ICT 2 and local adapter breaker panel at CPP-3. b) Type of control cabling to be considered for this transformer and local adapter breaker panel (if any). c) Scope of auxiliary supply and power cables for local adapter breaker panel. d) We presume only circuit breaker exist in local adaptor breaker panel and it is of manual control for its operation. e) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) ICT-2 to local adapter panel shall not involve cable trench. It will be installed in cable trays within CPP-3 (SS-31) cable cellar. b) Interlocks are envisaged (to be detailed at detail engineering stage). c) Aux. power supply for local adaptor breaker panel shall be arranged by Bidder from the existing local panels of Owner (Switchboard module shall be made available). d) Your presumption is correct. e) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.
30	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 6	Scope of work - Local adapter breaker panel interconnection with Panel 9	Kindly furnish the RCC cable trench routing details and section details by indicating the location of local adapter breaker panel at CPP-3 and Panel 9 at CPP-1.	Local adaptor breaker panel shall be located indoor inside the existing switchboard room. Cable trench routing drawing is attached in the tender drawing. RCC detail drawing will be made available to the successful bidder.
31	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 7	Scope of work - ICT3 interconnection with Panel 23	Kindly clarify/furnish the following in related to interconnection of ICT 3 with Panel 23: a) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of ICT 3 and Panel 23 at CPP-2. b) Detailed protection SLD by indicating the type of protections to be considered for transformer. c) Existing panel drawings by indicating the type of relays available. If new relays to be supplied, whether sufficient space provision is available in the existing switchgear? d) As switchgear panel 23 is not in bidder scope, please clarify the type of control cabling to be considered for this transformer. If in bidder scope, whether sufficient provisions for alarms , indications and trips are available in Panel 41 control circuit (Relay & BCU)?. e) Scope of auxiliary supply and power cables for ICT 3. f) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) Cable routing details and sectional details shall be developed by the Bidder based on the information provided in the tender document. The ICT-3 will be located in the new 220/33 kV Substation and the Panel 23 is located in CPP-2 electrical building. The distance is also specified in the tender document. b) To be developed by the Bidder based on the Tender Document requirements. c) The existing panel drawing shall be handed over to the successful Bidder at execution stage. The existing O/G feeder is a non-trafo. feeder which needs to be modified to make a trafo. feeder. d) The standard control cabling for transformer feeders having all mechanical protection alarm and trip contacts as well as neutral CT connections to be considered. Bidder to note that the interconnection shall be made with Panel 23 (instead of Panel 41 as wrongly mentioned by Bidder). Please consider relay based scheme for quotation purpose. e) Aux. power supply along with its cabling system for ICT-3 shall be arranged by the Bidder itself. f) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.
32	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 7	Scope of work - ICT3	Kindly clarify/furnish the following in related to ICT 3: a) Scope of RTCC, NIFPS control panel(indoor) and control cabling works between these panels. b) Scope of power cables and Auxiliary supply (AC &DC) for these panels. c) Scope of cable trenches and cable trays from ICT 3 to RTCC, NIFPS control panel. If in scope, please furnish the cable routing and cable trench section details by indicating location of ICT 3, RTCC, NIFPS panels..	Everything related to ICT-3 shall be under Bidder's scope of supply and work.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
33	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 8	Scope of work - ICT3 interconnection with Panel 20	Kindly clarify/furnish the following in related to interconnection of ICT 3 with Panel 20: a) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of ICT 3 and Panel 20 at CPP-1. b) Detailed protection SLD by indicating the type of protections to be considered for transformer. c) Existing panel drawings by indicating the type of relays available. If new relays to be supplied, whether sufficient space provision is available in the existing switchgear? d) As switchgear panel 20 is not in bidder scope, please clarify the type of control cabling to be considered for this transformer. If in bidder scope, whether sufficient provisions for alarms , indications and trips are available in Panel 41 control circuit (Relay & BCU)?. e) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) Cables shall mostly be routed through existing pipe rack. The trays shall be designed and added by the Contractor. b) Please note that the existing breaker feeders to be modified to make them suitable for transformer feeder. c) Relay modification is required as per tender drawing. Aux. power supply for local adaptor breaker panel shall be arranged by Bidder from the existing local panels of Owner (Switchboard module shall be made available). d) To be engineered by Bidder at detail engineering stage. e) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.
34	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 9	Control Cum Annunciation Panel at CPP-2	Kindly clarify/furnish the following in related to Control Cum Annunciation Panel at CPP-2: a) Detailed specification with panel components b) List of control and annunciation signals in this panel c) Scope of cabling between this panel and respective bays(as per specification) in 220/33kV substation. d) Scope of cable trench/trays for this interconnection. If in bidder scope, please furnish cable routing details and section details(Tray size and no. of tiers) by indicating the location of Control Cum Annunciation Panel at CPP-2. e) Scope of auxiliary supply and power cables for Control Cum Annunciation Panel at CPP-2.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval. All cabling between new items and between new item & existing item shall be by bidder. Owner will only handover free issued 33 kV power cables to the Contractor.
35	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 11	Interconnection between 33 kV GIS at 220/33kV substation and existing 33 kV Panel-11 at CPP-1	Kindly clarify/furnish the following in related to interconnection of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-11 at CPP-1: a) Scope of cabling from CT cores 1 & 2. If in bidders scope, please furnish the existing panel drawings with protection and metering circuits. b) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-11 at CPP-1. c) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) Existing panel details will be made avaibale to the successful bidder. b) No cable trays shall be used inside cable trench. Trench shall be sand-filled after laying of cables. Location of 33 kV GIS in 220/33 kV SS is already shown in tender drawing. c) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.
36	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 12	Interconnection between 33 kV GIS at 220/33kV substation and existing 33 kV Panel-30 at CPP-2	Kindly clarify/furnish the following in related to interconnection of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-30 at CPP-2: a) Scope of cabling from CT cores 1 & 2. If in bidders scope, please furnish the existing panel drawings with protection and metering circuits. b) Cable routing details and section details(Tray size and no. of tiers) by indicating the location of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-30 at CPP-2. c) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) Existing panel details will be made avaibale to the successful bidder. b) No cable trays shall be used inside cable trench. Trench shall be sand-filled after laying of cables. Location of 33 kV GIS in 220/33 kV SS is already shown in tender drawing. c) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
37	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 13	Interconnection between 33 kV GIS at 220/33kV substation and existing 33 kV Panel-19 at CPP-3	Kindly clarify/furnish the following in related to interconnection of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-19 at CPP-3: a) Scope of cabling from CT cores 1 & 2. If in bidders scope, please furnish the existing panel drawings with protection and metering circuits. b) RCC cable trench routing details and section details by indicating the location of 33 kV GIS at 220/33kV substation and existing 33 kV Panel-19 at CPP-3. c) Scope of earthing conductor along the trays and availability of nearby earthing points?	a) Existing panel details will be made avaibale to the successful bidder. b) No cable trays shall be used inside cable trench. Trench shall be sand-filled after laying of cables. Location of 33 kV GIS in 220/33 kV SS is already shown in tender drawing. c) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor.
38	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 14	Modification of 33 kV cable connections of existing ICT-1	The given scope of work is not clear. Please elaborate the requirements with detailed sketch/steps.	It is basically reinforcement of a feeder by rearranging some existing facilities. The detail description is already made available in the tender document, which can again be discussed at detail engineering/execution stage.
39	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 15	Scope of work - Cable route from 220/33 kV Substation to CPP-3	Kindly clarify/furnish the following: a) We presume cable trays on overhead cable trestles from **220/33V substation to Bajpe MRSS** is also in bidder scope. b) Scope of earthing conductor along the trays and availability of nearby earthing points? c) Scope of RCC cable trench/duct/cable trestle and cable rack rom 220/33V substation to Bajpe MRSS.	a) No, it will be covered under a different package. b) New cable tray (wherever required) earthing shall be by Bidder. The entire existing plant is having underground earthing mat/conductor. c) Those will be covered under a different package.
40	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 16	Inter-tripping hardware between 220 kV Bajpe MRSS and new 220/33 kV Substation	Kindly clarify/furnish the following: a) Please elaborate the requirements for inter-tripping between 220 kV Bajpe MRSS and new 220/33 kV Substation b) Scope of FO cable between 220 kV Bajpe MRSS and new 220/33 kV Substation. If in bidder scope, please furnish the specification. c) Scope of 87L and LIU at 220 kV Bajpe MRSS	a) If 220 kV breaker at Bajpe MRSS opens, the 220 kV breaker at new SS end should also be opened. The downstream 220 kV breaker at new SS end can only be closed if the upstream 220 kV breaker at Bajpe MRSS is closed. b) Out of scope of this package. c) 87L relay only in 220/33 kV SS is included. The Make of the relay shall be informed to the Bidder at execution stage, in line with what is selected by KPTCL at 220 kV Bajpe MRSS end.
41	Volume II	Scope Of Work, Cl. No. 2.1.1, Sr.No. 16	220kV Cable Scope	Kindly clarify/furnish the following: a) As per BOQ furnished, We understand that 220kV Cable scope is limited within the new 220/33 kV Substation boundary. We are not envisaging any supply & installation of 220kV Cable and associated accessories(Termination kits, jointing kits & Joint bay, sheath bonding cable, link boxes etc.) between 220 kV Bajpe MRSS and new 220/33 kV Substation. b) Scope of termination kits (indoor and outdoor), sheath bonding cable and link boxes for 220kV cable to be laid within the substation boundary.	a) Your understanding is correct. b) Your understanding is correct.
42	Volume II	Scope Of Work, Cl. No. 2.1.3, Sr.No. 29	Cable Trench	As understood, the cable trench within substation boundary is only in bidder scope. In this regard, please furnish the typical section details(at various parts of layout) to be followed as per the furnished layout.	Your understanding is correct with regard to the scope of work. However, the trench sectional details shall be developed by the Bidder at execution stage.
43	Volume II	Scope Of Work, Cl. No. 2.1.4	C&I Scope of Work	Kindly furnish the SCADA architecture to be followed for the proposed station.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
44	Volume II	Terminal Points, Cl. No. 2.2.1, Sr.No. I	LV Switch board	Please furnish the LT AC & DC SLD of following by indicating feeder requirement: a) 415V AC SLD b) 110V DCDB with battery chargers c) 48V DCDB. d) 230V UPS DB.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
45	Volume II	Exclusions, Cl. No. 2.3.1, Sr.No. a	33kV cables	We presume 33kV termination kits(Indoor & outdoor),jointing kits and other accessories are not in bidder scope. Please confirm. If in bidder's scope, please specify the details by feeder/bay wise.	Only 33 kV power cables (and the ICT-2) shall be issued to the Contractor as free issued item. All other items shall be supplied by the Bidder. For termination kits and jointing kits, please refer to the Tender SLD/P&M Diagram and the route lengths mentioned in the tender documents, along with the Schedule of Quantity.
46	Volume II	Exclusions, Cl. No. 2.3.1, Sr.No. e	Scope of work - 415 V AC auxiliary power	Please Clarify/furnish the following in related to incoming 415V supply: a) Scope of power cable(2Rx1Cx400sq.mm, Al, XLPE) and terminations from remote station to proposed station. b) Scope of cable trench/trays from remote station to proposed 220/33kV station. c) If in bidder scope, please furnish cable routing details and section details(Tray size and no. of tiers) by indicating the location of remote end panel to 220/33kV substation.	a) By the Bidder. However, the cable sizing calculation should be submitted by the Bidder at execution stage. b) No cable trench is envisaged. Cable trays to be installed on the existing pipe rack to CPP-1/2 (The raceway may be merged with the ICT-3 interconnection route with separate trays). C) Please refer to the routing for ICT-3 interconnection cable.
47	Volume II	System design philosophy, Cl. No. 4.5.2	Area classification	As proposed station is part of Chemical & refinery plant, please specify the type of area (Hazardous or Non Hazardous) in the proposed 220/33kV station.	Non-Hazardous area.
48	Volume II	System design philosophy, Cl. No. 4.5.9	Insulation system	Please clarify the scope of insulation coordination study of proposed 220/33kV substation.	By Bidder.
49	Volume II	System design philosophy, Cl. No. 4.5.12	Control philosophy	Please clarify the following: a) Whether controlling of equipments(220kV & 33kV) required at BCU level or not. Also please clarify the requirement of BCU at 220kV & 33kV level. b) Communication protocol for meters	a) The most suitable solution to be decided by the Bidder, meeting all protection, control, metering philosophy as specified in tender document. b) The most suitable solution to be decided by the Bidder between Contractor supplied items. The existing DCS is having Modbus TCP/IP protocol for communication with SCADA/Substation.
50	Volume II	System design philosophy, Cl. No. 4.5.13	UPS	As per referred clause of specification, two sets of UPS with common battery bank is mentioned. However, as per BOQ, Sr.No. 7, e) only 1No. UPS is mentioned. In this regard, please clarify the exact requirements.	There will be 1 set of UPS having 2 x 100 redundant modules with common battery bank, as per tender document.
51	Volume II	System design philosophy, Cl. No. 4.5.14	Emergency power supply	We are not envisaging any supply & installation of Emergency Diesel Generator (EDG) in bidder's scope. Please confirm.	Confirmed.
52	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6	Type Tests	We request to accept the validity of type test reports inline with CEA guidelines. Please confirm.	CEA guidelines are acceptable.
53	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.1	Bus Post insulators	We are not envisaging any supply of bus post insulators in this package as the same are not indicated in layout. Please confirm.	Confirmed.
54	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.1	Fence	As per the furnished layout (Note 15), we understand that fence between proposed station and existing 110kV station is only in bidder's scope. Please confirm.	Confirmed. However, if any existing fence in 110 kV Station is damaged or modified by the Bidder, the same needs to be set right by the bidder.
55	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.1	Revenue/Tariff Metering system	a) Please clarify the scope of Revenue/Tariff Metering system at 220kV Bajpe MRSS. If in bidder scope, please furnish the SLD & Layout along with meter details. b) We are not envisaging any bay extension works at bajpe MRSS. Please confirm.	a) Revenue/tariff metering system at 220 kV Bajpe MRSS is not under the scope of this package. b) Confirmed.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
56	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.2	220 kV Gas Insulated Switchgear (GIS)	In the referred clause of specification both Cable and bus duct connection is mentioned for GIS bays. However, as per the furnished layout, all the bays with busduct connection and further connection with 220kV cables(by SF_6 to XLPE termination). As both the clauses are contradicting with each other, we presume the requirements as mentioned in layout shall be followed. Please confirm whether bidder understanding is inline with requirements or not.	Confirmed.
57	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.2	220 kV Gas Insulated Switchgear (GIS) - Future Expansion	Please clarify the following related to future expansion of GIS bays: a) AC & DC supply feeder provision b) Earthing provision for future bays in GIS Hall c) Cable trenches for future bays in GIS Hall d) Scope of illumination of future bays in GIS Hall e) Specify the no. of future GIS bays	a) AC/DC Panels shall have sufficient spare supply feeders for future bay requirement. b) Not to be considered under present scope. c) To be considered under present scope. d) To be considered under present scope. e) At least two bays are envisaged.
58	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.2	220 kV Gas Insulated Switchgear (GIS) -Local Control Cubicle (LCC)	In the furnished layout, only LCC and relay panels are indicated. In this regard, please clarify the location and requirement of BCU for each 220kV GIS bay.	The most suitable solution to be decided by the Bidder, meeting all protection, control, metering philosophy as specified in tender document.
59	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.3	Grid power transformers	Please specify the Maximum permissible losses to be considered for 220/33kV grid transformer.	The Grid Power Transformers shall have the following losses: a) No Load Loss = 30 kW Max. b) Load Loss = 300 kW Max. c) Auxiliary Loss = 3 kW Max. D) Total Losses = 333 kW Max.
60	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.7	48V DC system	a) We presume the requirements of 110V battery shall also applicable for 48V battery system. Please confirm. b) We understand that 48V battery system shall be required for communication purpose. Please specify, If any other loads to be considered on 48V battery system. c) Please specify the type of communications system (FOTE or PLCC) and furnish the specification of the same.	The requirement of 48 V DC system was envisaged only for communication system. However, presently, no communication system is needed with the 220 kV Bajpe MRSS. Accordingly, 48 V DC system is not required.
61	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.9	220kV Cables	Please specify the metallic sheath rating of 220kV cables.	System fault current carrying capacity for 1 s.
62	Volume II	Basic design criteria of electrical equipment, Cl. No. 4.6.9	220kV Cables	As per referred clause, it is mentioned as all 220kV cables are excluded from bidder scope. However, as per BOQ Sr.No. 14, a), 220kV cable quantity is mentioned. As both the clauses are contradicting with each other, please confirm the scope 220kV cable and termination kits (indoor and outdoor).	Tender document says that 220 kV cables from Bajpe MRSS to the new substation is only excluded. Other 220 kV cables within the substation is included (approximately 550 m length in total).
63	Volume II	Layout design philosophy, Cl. No. 4.7	220/33kV Layout	Please clarify whether building sizes indicated in the layout are minimum requirements or bidder can optimise the same without deviating specification requirements.	Bidder can optimize without deviating the specification requirements.
64	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.2	Cabling system	Please furnish the indoor cable trench details/Trench sections in proposed 220kV GIS Hall and 33kV switchgear building.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
65	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.3	Earthing and lightning protection system	a) As understood, main earth mat shall be laid only in the substation boundary (fenced area). Please confirm. b) From operator safety point of view, we presume, proposed earth mat at 220/33kV substation to be interconnected with existing earth mat at 110kV station. Please clarify, whether the bidder understanding is inline with requirements or not. c) If the same need to be interconnected with existing earth mat, please furnish the existing earth mat layout at 110kV substation.	a) Confirmed. b) Bidder's understanding is correct. However, for earthing system calculation of the new Substation, this interconnection to existing 110 kV SWYD should not be considered. c) Attached to the Addendum as Attachment-11. Bidder to note that the existing earth mat is also laid in the new & proposed 220/33 kV Substation area. The bidder to use/discard the same while designing the new earthing grid layout for the new substation.
66	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.3	Earthing	a) As utility / process pipelines and steel pipe racks are not in bidder's scope, we are not envisaging earthing of the same. Please confirm. b) Please clarify the scope of earthing for ICT 2 & ICT 3 at CPP-3 and CPP-2 stations respectively. If the same is in bidder's scope, please clarify, whether main earth mat is already available or not at the remote stations.	a) Confirmed. b) Bidder's undersICT-2 (in CPP-3) & ICT-3 (In new S/S) earthing shall be by the bidder. Main earth mat is already available in CPP-3. The same needs to be done in new S/S by the bidder.
67	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.3	Lightning protection system	We presume razevig methodology is also applicable for outdoor DSLP design in addition to IS 2309. Please confirm.	Confirmed.
68	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.4	Illumination system	We presume the scope of illumination is within the proposed substation boundary. We are not envisaging any illumination system at remote end stations. Please confirm.	Confirmed.
69	Volume II	Electrical equipment and system installation philosophy, Cl. No. 4.8.4, Sr. No. 9 & 10	Outdoor illumination	We presume the indicated LUX levels for 220 kV Air Insulated Switchyard & Transformer Area are at equipment level and 20 LUX at ground level. Please confirm.	Confirmed.
70	Volume II	Telecommunication system , Cl. No. 8.8	EPABX for voice communication	Please clarify from which remote stations (CPP-1, CPP-2 & CPP-3), the existing private automatic IP branch exchange board PABX (EPABX) to be extended.	PA system will no longer be required to be done by the bidder in the new S/S.
71	Volume II	Power transformers, Cl. No. 17.3, Sr. No. m	DGA	Please clarify the requirement of DGA for Grid transformers (3Nos) and ICT - 3.	Yes, required at site. All types of Pre commisioning Site testing per IS standards for all 4 transformers to be carried out. For Grid Power Transformers, Bidder to consider transformer with continuous DGA monitoring through installed DGA kits on transformer.
72	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	220kV VT	Please clarify type of VT (EM type or Capacitive type) to be considered in 220kV AIS switchyard bay.	As per bidder.
73	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	220kV Cable size - Bay 6, Bay 8	a) We presume 220kV cable size for bay 6 (spare bay) is same as bay 1. b) We presume 220kV cable size for bay 8 (future bay) is same as bay 3. Please confirm.	Confirmed.
74	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	33kV Cable size	We presume cable size for 33kV spare feeders in 33kV GIS is same as other outgoing feeders. Please confirm.	Confirmed.
75	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	ICT-3	We presume, technical parameters for ICT-3 shall be same as ICT-2 as per the GTP furnished.	Confirmed.
76	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	ICT-3 & ICT-2	Kindly furnish the, detailed protection SLD by indicating the type of protections to be considered for ICT-2 & ICT-3.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval.
77	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	Note-2	As per referred clause, Please specify the CT details of BAJPE MRSS substation to consider the same in proposed station.	Will be informed to the successful bidder.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
78	SLD	KEY SINGLE LINE DIAGRAM, P.020679-M-00041- E001	Note-5	Please specify the requirement of high speed earth switches (if any) for bid estimation.	Bidder to decide. However, it is envisaged at least in the incomer feeders.
79	SLD	220/33 kV SUBSTATION LAYOUT, P.020679-M-44315- E002	Layout requirements	We presume, any increase in building sizes or any new requirements other than the sizes/requirements mentioned in layout are paid additionally during detailed engineering. Please confirm.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval. Size of building shall be decided by the bidder.
80	SLD	220/33 kV SUBSTATION LAYOUT, P.020679-M-44315- E002	Transformers Oil tank	We are not envisaging any separate M.S. OIL (2000 LITERS) tank for the proposed transformers. Please confirm.	Query not clear. If it is intended to refer to the oil tank for the NIFPS, then the tank for only ICT-2 will be made available to you. For all other transformer under bidder's scope of supply, the said tank shall be supplied by the bidder.
81	SLD	220/33 kV SUBSTATION LAYOUT, P.020679-M-44315- E002	RTCC, NIFPS Panels	Please indicate the location of RTCC & NIFPS panels for grid power transformers and ICT-3.	Bidder to decide.
82	SLD	220/33 kV SUBSTATION LAYOUT, P.020679-M-44315- E002	AUTOCAD layout	Kindly furnish the AUTOCAD copy of proposed layout for estimation of lumpsum quantities.	Will be forwarded to the successful bidder.
83	SLD	CABLE ROUTING LAYOUT BETWEEN 220/33 kV SUBSTATION & CPP-3	P.020679-M-40014 - E005, Sheet 4 Of 6	We understand that, only trestle is required from Ch. 3203.47 to Ch. 3224.73. We are not envisaging any cable rack in this location. Please confirm.	Cable trench, cable trestle and cable rack between the new 220/33 kV substation and CPP-3 shall be constructed by by Owner separately. However, only the cable trays (not even the tray supporting system) on the trestle and cable rack shall be supplied and installed by the bidder. In this regard, bidder to note that the cable trench will not have any cable trays inside.
84	SLD	CABLE ROUTING LAYOUT BETWEEN 220/33 kV SUBSTATION & CPP-3	P.020679-M-40014 - E005, Sheet 5 Of 6	We understand that, only trestle is required from Ch. 3415.83 to Ch. 3419.08. We are not envisaging any cable rack in this location. Please confirm.	Cable trench, cable trestle and cable rack between the new 220/33 kV substation and CPP-3 shall be constructed by by Owner separately. However, only the cable trays (not even the tray supporting system) on the trestle and cable rack shall be supplied and installed by the bidder. In this regard, bidder to note that the cable trench will not have any cable trays inside.
85	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ	We understand that, the line items mentioned in BOQ are minimum requirements. If any new requirements or increase in quantity shall be paid additionally to the bidder. Please confirm.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval. The Schedule of Quantity is preliminary and only for reference. Bidder to estimate the actual quantity based on his detail engineering.
86	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 7, a)	As per referred line item, VRLA type battery is mentioned. However, as per specification, Cl. No. 4.6.7, Ni-Cd type battery is mentioned. As both clauses are contradicting with each other, we presume VRLA batteries to be considered(Including UPS) in this package.	Ni-Cd type battery should be considered.
87	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 9, a)	As per referred line item, 4 Nos of high masts are mentioned. However, only 3Nos of masts are indicated in the proposed layout. Please clarify.	This will be an EPC contract wherein the successful bidder needs to do detail engineering and the same will be subject to Owner's approval. The Schedule of Quantity is preliminary and only for reference. Bidder to estimate the actual quantity based on his detail engineering.
88	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 9, e), i)	As per standard requirements, earth pits are not required for body earthing. Please recheck and confirm the requirements.	Confirmed. You may consider the same as earth electrodes.
89	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 9, e), iii)	Please confirm the requirement of treated earth pits for transformer neutral. Further please furnish the typical earthing drawings for better understanding.	Treated earth pit is required for transformer neutral earthing. Details to be developed by the bidder.
90	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 11	Please clarify the requirement of High bay type LED fixtures in GIS Hall and post top lighting for gates.	Bidder to decide subject to Owner's approval.
91	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 14, b)	As per referred line item, 27No.s of 220kV outdoor type termination kits are mentioned. Please clarify the requirement by bay wise and station wise for better understanding as these items are not mentioned in scope of works.	Please refer to the SLD for understanding of the termination kits. However, Bidder to note that the quantities are only tentative and shall not relieve the LSTK contractor from any contractual obligations to meet the actual requirement.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
92	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 14, e)	As per referred line item, 186No.s of 33kV outdoor type termination kits are mentioned. Please clarify the requirement by bay wise and station wise for better understanding as these items are not mentioned in scope of works.	Please refer to the SLD for understanding of the termination kits. However, Bidder to note that the quantities are only tentative and shall not relieve the LSTK contractor from any contractual obligations to meet the actual requirement.
93	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 14, f)	As per referred line item, 139No.s of 33kV Jointing kits are mentioned. Please clarify the requirement by bay wise and station wise for better understanding as these items are not mentioned in scope of works.	These will be used in 33 cable connections between new 220/33 kV substation/CPP-1/CPP-2 and CPP-3. The quantity was envisaged considering a standard drum length of 500 m for 33 kV cables. However, the number shall be reduced considering the latest inormation of 1000 m drum length.
94	VOLUME-I of II	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	Communication equipments	Communication equipments (FOTE or PLCC) are missing in BOQ. Please confirm the requirements.	No communication equipment is needed.
95	General	Order of precedence	-	Please specify the order of precedence between Scope of works, Design basis, Specification, BOQ, and Drawings.	The order of precedence shall be Scope of Work, Drawings, Design Basis, Specification, Schedule of Equipment.
96	General	Ratings	-	We presume, bidder to follower the equipment ratings and sizes as per the drawings furnished. Please confirm.	Confirmed.
97	General	Key Plan	-	Kindly furnish the overall key plan by indicating 220/33kV substation and CPP stations for reference.	Attached to the Addendum.
98	General	Remote end communication	-	We are not envisaging any supply of communication (PLCC or FOTE) equipment and integration at remote end substation in bidder's scope. Please confirm	Confirmed.
99	General	Loose relays for Remote end & SCADA integration	-	We are not envisaging suuply of loose differential relays for opposite end and any SCADA equipment supply and integration at remote end substations. Please confirm.	Confirmed if specifically not specified in tender document.
100	General	Equipment specifications	-	a) Please furnish the detailed specification of equipments (CRP & SCADA, Transformer, GIS, Outdoor equipments etc.) b) We understand that, any equipment requirements/specifications in addition to tender documents for the completion of system shall be as per manufacturer's recommendations. Please confirm.	The bidder should offer based on available information/spefication in the tender document.
101	VOLUME-II of II, Electrical equipment and system installation philosophy, Cl. No. 4.9	Engineering Design Basis (Electrical)		As two different technical sections are furnished, it is difficult for bidder/vendor to finalise the requirements by comparing both the sections. We presume technical requirements mentioned at the start of Volume II (Table of contents in page 2 of 190) supersedes the other sections. Please confirm.	Bidder to note that the stricter or more stringent clause must be complied with by the Contractor. In this regard, Owner/PMC's decision shall be considered as final and binding to the Contractor.
102	VOLUME-II of II, Annexure-8, SYSTEM DESIGN PHILOSOPHY, Cl. No. 4.10.3, 5.11	Load Managers & Data Acquisition System		We are not envisaging any scope of load managers and data acquisition system in bidder's scope. Please confirm.	Confirmed. However, Disturbance Recorder at Grid Switchbaord at 33 kV GIS to be included in scope.
103	VOLUME-II of II, Annexure-8, SYSTEM DESIGN PHILOSOPHY, Cl. No. 4.13	UPS		As per referred clause two sets of batteries are mentioned for UPS system. However, as per Cl. No. 4.5.13, System design philosophy, only one common battery is mentioned. As both the clauses are contradicting with each other, please specify the actual requirements.	One set of battery shall be considered for UPS system.
104	VOLUME-II of II, Annexure-8, SYSTEM DESIGN PHILOSOPHY, Cl. No. 7.4.12, 7.4.24	Illumination wiring		We presume illumination wiring inside the building for light fixtures and lighting panels shall be laid in PVC or GI conduits. Please confirm.	Confirmed in GI conduits.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
105	General	Statutory Approvals		We understand, only CEIG approvals are in bidder's scope. Please confirm	Confirmed that CEIG/CEA approvals are required.
106	VOLUME-I of II , SCHEDULE OF QUANTITY: PART-1: ELECTRICAL ITEMS	BOQ, Sr. No. 14, e), f)		a) Please specify the quantity of indoor 33kV cable termination kits. b) As 33kV cable supply and 33kV Cable trench is not in bidder scope, we presume the quantity of outdoor termination kits and jointing kits as indicated in BOQ are final. Please confirm.	a) To be calculated based on the scope of cable terminations and given cable sizes. b) Good for proposal engineering only. Actual quantity is not expected to differ much.
107	Power Transformer	Power Transformer		We understand that, additional fittings & accessories like : Online DGA,Online dryer, Fiber optic Sensor, special tools & tackles, Thermosyphone filter, PD monitoring system, UHF PD monitoring system, UHF PD sensor, Oil storage bottle etc are not in our scope of supply.Kindly confirm.	Confirmed.
108	Power Transformer	Power Transformer		We will not do short circuit test for these ratings.Type test report for similar or higher rating shall be submitted as per the avialibiity .Kindly confirm.	Confirmed.
109	EHV cable	220 KV EHV Incoming Cable for line and transformer		We propose 1Cx630 Sqmm Copper cable with aluminium corrugated sheath (STR :40 KA for 1 Sec). Kindly Confirm.	Confirmed.
110		33 KV Cable		1Cx630 Sqmm AL conductor and Galvanised round wire armoured considered. Kindly confirm.	Confirmed. However, it is out of scope of supply in this package.
111		Battery and charger		We will consider VRLA type battery. We will consider dual FCBC type battery charger. Kindly confirm.	Ni-Cd type battery should be considered. Dual FCBC is accepted.
112		5 kVA, 230 V, 1 Phase UPS having 2 hrs of battery backup for control room		We will consider SMF-VLRA Battery for UPS. Kindly confirm.	Ni-Cd battery should be considered.
113		EOT		We will consider Single Girder EOT of 5 Ton Capacity. Kindly Confirm.	Subject to calculation/approval.
114		GIS Special tools and tackles.		Please inform wheather 1) SF6 gas filling and evacuation cart, 2) SF6 analizer, 3) Sf6 leak detector, 4) Portablble PD monitoring kit for GIS maintenance required to supply under this package or not.	Yes.
115		Rating of major Items as per SLD and BOQ		We understand that Rating mentioned for all major item in SLD and BOQ are binding. Kindly confirm.	Confirmed.
116	SLD	Protection & Metering Diagram 33kV SLD		1) CT for all feeders may be split into multiple CTs (not necessarily single CT with multiple cores) depending on CT vendor confirmation, as such core combos may not be possible in one CT. Pl confirm that the same is acceptable. 2) The ISO with ES dfor all feeders shall be positioned between CB & the main busbars. Hence Cable earthing is achieved with a combination of CB and earthing switch. This is as per type tested design of the OEM. Pl confirm that the same is acceptable. 3) Fuses for Line VT & Bus VT shall not be applicable as these are plugin type VTs. Pl confirm that the same is acceptable. 4) We assume that ISO with ES is required on both sides of the buscoupler CB in the same feeder. Pl confirm. 5) If the OEM design is single phase encapulsated, then chances of ph-ph fault are not possible and hence bus differential protection is not required. Pl confirm that bus differential protection is not required if offered design is single-phase encapsulated.	1) Confirmed. 2) Confirmed. 3) Confirmed for HV side of VT. 4) Confirmed. 5) Bus-Differential is a must.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
117	4.6.4 pg-35 of 190	Each unit of the switchboard shall have separate SF6 gas filled compartments for housing busbars and other power components		The compartmentalization and distribution of components shall be as per OEM type tested design. Pl confirm that compartmentalization can be as per OEM's type tested design. All HV parts including the main busbar joints shall be inside SF6 gas. This is the true definition of a GIS. Pl confirm the same	Confirmed as per OEM type tested design.
118	4.6.4 pg-36 of 190	The circuit breaker duty cycle shall be O-3 min-CO-3 min-CO.		The circuit breaker duty cycle shall be O-0.3s-CO-3 min-CO, suitable for auto reclosing. This is avialble with all OEMs	Confirmed as per OEM type tested design.
119	4.6.4 pg-36 of 190	The control supply of the switchboard shall be 110 V DC.		We recommend that the sprg charging motor shall be suitable for 230V AC from a stable source to prevent draining of battery especially when all motors charge simultaneously. Pl confirm the above	Confirmed as per OEM type tested design.
120	4.6.4 pg-37 of 190	Activation Arc Monitors		Since gas insulated switchgear, we assume that this requirement is not applicable. Pl confirm.	Confirmed.
121	General	33kV GIS Switchgear		The offered design must be such that it is modular so that modules can be site-replaceable, especially the circuit breaker module, thus giving the advantage of ease of maintenance and shortest downtime. Pl confirm the above and the same can be issued as corrigendum	Confirmed as per OEM type tested design.
122	General	33kV GIS Switchgear		All indications and operations shall not require opening of any door. In case any door is to be opened as per design, then successful internal arc type test with that door open must be furnished at bid stage to prove full protection to the operator even when that door is opened for any operation or to see any indication. Pl confirm the above and the same can be issued as corrigendum	Confirmed as per OEM type tested design.
123	General	33kV GIS Switchgear		All indications shall be provided with mechanical mimic, directly operated by the mechanism. Electrical/electronic indications shall not be acceptable to ensure 100% reliability. Pl confirm the above and the same can be issued as corrigendum	Confirmed as per OEM type tested design.
124	17.5	Degree of Protection - Routine test	**17.5 EHV/MV Switchgear : QAP**	This test is a type test, not a routine test. Pl confirm the same.	Confirmed.
125	17.5	Circuit breaker/circuit breaker panels, of each voltage class and current rating:	**17.5 EHV/MV Switchgear : QAP**	S/C test duty of CB is solely based on CB and hence CT is not part of this test, Pl confirm the same is acceptable.	Shall be as per Standard/Code.
126	17.5		**17.5 EHV/MV Switchgear : QAP**	STC test conducted without CT. STC capacity of CT is conducted separately with a corresponding report. Pl. confirm the same is acceptable.	Confirmed.
127	17.5		**17.5 EHV/MV Switchgear : QAP**	Temp rise report : This test has been conducted as per guidelines in governing standard IEC 62271. Such tests cannot be conducted for all combinations of panels. Hence temp rise test report submitted shall be acceptable. Pl. confirm.	Confirmed.
128	17.5	b. Surge arrestor/ lightning arrestor (as applicable) of each type:	**17.5 EHV/MV Switchgear : QAP**	We do not observe reqt of surge/lightning arrester in the scope of 33kV GIS. It is not seen in SLD also. Hence we are ignoring the same. Pl confirm. Any type test report shall be as per its respective governing IEC standard only.	To be confirmed by insulation corordination study by the bidder. Confirmed on type test.
129	17.5	f. Relays : • Relay settings	**17.5 EHV/MV Switchgear : QAP**	• Relay settings are excluded from our scope, as it requires system study. Pl confirm the above.	The substation shall be commissioned by the selected bidder (Contractor). Hence, relay setting is required which will be done by the contractor based on short circuit current at different voltage level to be made available to them by the Owner.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
130	Clause No 2.1.3	(Point No 1 & 2) Page No 13 of 190 - Civil scope of work	**Civil Works**	We request M/s.MRPL to furnish the preliminary soil investigation report for assessing the site condition and preparing the civil BOQ	Attached to the Addendum for assessing the site condition only.
131	Document No. EDB-002 ,	Clause 4.1.e - Green Belt	**Civil Works**	We presume that the green belt will be developed by M/s.MRPL and not part of this contract. Please confirm	Greenbelt development within battery limit is in the scope of Contractor.
132	Document No. EDB-002 ,	Clause 4.2 - Site Grading	**Civil Works**	We request you to furnish the plot plan with boundary coordinates and Contour survey report with proposed FGL	Plot plan is attached in the Addendum.
133	Document No. EDB-002 ,	Clause 3.2.7 - Seismic loads	**Civil Works**	We presume that static analysis with parameters confiorming to IS 1893 - Part I (Latest) shall be applicable for all structures. Please confirm	Design parameters of code IS: 1893 (P1 & P4) latest with amendments to be considered. Dynamic design wherever warrented by codal provisions depending on structural irregularities, height and plan dimensions of the structure, are to be performed. Where static analysis is permitted as per code the same will be acceptable.
134	Document No. EDB-002 ,	Clause 3.2.9 - Blast forces	**Civil Works**	We presume that the blast forces are not applicable for substation structures. Please confirm	Confirmed.
135	Document No. EDB-002 ,	Clause 6.1.c - Ductile detailing	**Civil Works**	We presume that the provision of IS 13920 is to be considered only in reinforcement detailing and not in the analysis of structures. Please confirm	Bidder's understanding is not correct. IS: 13920 also binds analysis and design requirements apart from detailing - the is to be followed as and where applicable.
136	Document No. EDB-002 ,	Clause 6.1. - Additional 2 floors for building design	**Civil Works**	Please confirm whether this requirement is applicable for substation building as this is an electrical installation with limited access	Will be applicable here also.
137	Document No. EDB-002 ,	Clause 6.2.ii - Corrossion inhibiting admixture	**Civil Works**	We presume that admixture is applicable only for substructures and not for superstructure. Also please specify the admixture to be used	For all concreting. Will be finalized at detail engineering stage.
138	Document No. EDB-002 ,	Clause 6.5 - Minimum thickness of Structural Members	**Civil Works**	Since switchyard equipments are lightly loaded, please confirm whether we can consider minimum thickness of 250mm for footing and 300mm for pile cap for these foundations if the design requirements are satisfied. Kindly confirm	Will be finalized at detail engineering stage.
139	Document No. EDB-002 ,	Clause 7.2 - Steel Grade	**Civil Works**	We propose to use E250 grade steel for lattice structures , Yst 210 Steel for pipe structures and 5.6 grade bolts for connections as per general practice . Please confirm	Shall be as per Tender Document.
140	Document No. EDB-002 ,	Clause 7.7 - Protective coating	**Civil Works**	We presume that the coating is not applicable for Galvanised structures and RCC superstructures. Also please specify the protective coating material to be used?	Will be finalized at detail engineering stage.
141	Document No. EDB-002 ,	Clause 8.1 - Type of brick	**Civil Works**	We request M/s.MRPL to check on the requirement of wire-cut bricks and permit us to use normal clay bricks of Ist class or equivalent concrete blocks in line with clause 2.4.3.a	Will be finalized at detail engineering stage.
142	Document No. EDB-002 ,	Clause 2.1.6 - Site planning	**Civil Works**	We presume that provisions of OISD-STD-163 is not applicable for substation buildings. Please confirm	Confirmed.
143	Document - Design basis for civil works,	Cl 5.1.2.9 (a) - Sand filling in Cable trenches	**Civil Works**	Request M/s.MRPL to check and confirm whether it is mandatory to do sandfilling in RCC cable trenches as this is not a general practice.	Sandfilling is confirmed.
144	Document - Design basis for civil works,	Cl 5.1.6.1 - Load on cable trench cover slab	**Civil Works**	Request M/s.MRPL to check the load of 2t/m for 300mm width to be considered for the cable trench cover slab which seems to be on a higher side as only occassional pedestrian movement is expected. Since this loads are to be transferred to cable trench side walls and base slab, request M/s.MRPL to reconfirm this load.	To be taken up at the execution stage.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
145	Clause No 10.16.0.0 Permits during excavations with internal departments/construction of superstructures/readymix operations	Page No 216 of 490 - Gate Pass/Vehicle Permits/Entry Procedures/Additional shift workings/Material management/Return materials/Safety	**Civil Works**	Request M/s.MRPL to share the construction/operational requirements for carrying out works related to Susbstation inside the plant	To be taken up at the execution stage.
146	General	Price Variation	**Civil Works**	Inflation on construction material – PV clause is mandatory in civil works with the recent steep increase on steel , cement and aggregates. Since it's an 17 months duration project, request M/s.MRPL to bring civil works under PV clause. Kindly confirm	Not envisaged presentlly.
147	General	Disposal point	**Civil Works**	Request M/s.MRPL to provide us the disposal of all the surplus materials within the proposed land. Kindly confirm	To be taken up at the execution stage.
148		Construction power and water	We assume that construction water and power will be provided in free of cost.		Please refer to tender specification.
149		Duct Banks/Cable Trenches/trestle/cable gallery/road crossing outside the SWYRD Battery limit	Duct Banks/Cable Trenches/trestle/cable gallery/road crossing outside the SWYRD Battery limit	We assume that no any Duct Banks/Cable Trenches/trestle/cable gallery/road crossing outside the SWYRD Battery limit is in our scope of work	Bidder's assumption is correct in general.
150		Tender Drawings - 220/33 kv substation layout in mrpl complex for refinery complex power system upgradation work, Foundation layout and detail of cpp-1 & cpp-3 ict-2 for refinery complex power system upgradation work	Tender Drawings - 220/33 kv substation layout in mrpl complex for refinery complex power system upgradation work, Foundation layout and detail of cpp-1 & cpp-3 ict-2 for refinery complex power system upgradation work	We assume that provided drawings along with tender documents are only for reference. Bidder can modify inline with manufacturer recommondation and soil data	Bidder's assumption is correct in general.
151		Clause No 6.12, 6.13, 6.14, 6.15, 6.16 - Page No 261 of 271	Clause No 6.12, 6.13, 6.14, 6.15, 6.16 - Page No 261 of 271	We assume that these cluases are not applicable for the proposed SWYRD work.	Bidder's query is not clear/traceable.
152		Civil Specification & requirements	Civil Specification & requirements	Based on the prebid meeting conference dated 09/11/2023 it was communicated that the Civil specifications provided are in General and for plant works and for switchyard /substations of GIS buidling general practice adopted with Industry practices / Utilities can be adopted for design and construction of the civil works.	Bidder's assumption is correct in general.
153		Accomodation for site staffs	Accomodation for site staffs	Request M/s.MRPL to consider accomodation for supervisors, engineers and site office staffs within the plant premises on chargeable basis.	Can not be provided.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
154	**Page 19/490**	Part I-Instructions to Bidders , **ITB 3.1. - Site Visit (Pg 19/490)**	**ITB 4.1. - Site Visit -** Bidder is advised to visit and examine the site and its surrounding and shall familiarize himself of the existing facilities and environment and shall collect all other information which he may require for preparing and submitting the Tender and entering into the contract. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the Bid and during the contract period / after contract period. All costs for and associated with site visits shall be borne by the bidder.	**1) The Bidder understands that the entire land for substation is already acquired / in possession of Customer/Employer and which is free from all encroachments please confirm.** **2) The Bidder requests that , as applicable, any clearances/activities w.r.t. a) Forest Clearance and Tree Cutting (as applicable) b) Right of Way c) Railway Clearance (if applicable) d) Unauthorized Construction e) any other site access restrictions f) Licenses , Statutory Approvals as applicable to be in Customer's/Employer's scope.** **Any cost incurred w.r.t. the same shall be to Customer's/Employer's Scope. Suitable time extension shall be given to the bidder for such access restrictions/other restrictions.**	1) Bidder's understanding is correct. 2) Statutory approval from CGIS/CEA shall be by bidder.
155	**Page 33/490**	Part I-Instructions to Bidders , **ITB 21.1 - Notification of Award (Pg 33/490)**	ITB 21.1 - The lowest evaluated bid shall be accepted by owner for award. The Bidder, whose bid is accepted by Owner, shall be issued Order/Letter/Fax of Acceptance (LOA/FOA) prior to expiry of bid validity. Bidder shall acknowledge the receipt.	**The Bidder requests for the modification of the clause as** The lowest evaluated bid shall be accepted by owner for award. The Bidder, whose bid is accepted by Owner, shall be issued Order/Letter/Fax of Acceptance (LOA/FOA) prior to expiry of bid validity. Bidder shall acknowledge the receipt **after the fulfillment of the following conditions :** **a) This contract agreement has been duly executed for and on behalf of the Employer and the Contractor.** **b) The Contractor has submitted to the employer the performance security (PBG).** **c) The employer has paid the contractor the advance amount provided the contractor has submitted the advance payment guarantee.** **d) Employer has handed over the encumbrance free land.**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
156	**Page 123 / 490**	General Conditions of Contract, - **GCC Clause 2.8.1.1-Suspension of Work and Supplies (Pg 123/490)** **General Conditions of Contract, - GCC Clause 2.8.2.0-Suspension of Work and Supplies (Pg 123/490)**	**GCC Clause 2.8.1.1 -** During the period of any suspension under Clause 2.8.1.0, the CONTRACTOR shall at his own cost within the scope of the relative work, properly protect and secure the work and materials so far as is necessary in the opinion of the Engineer-in-Charge. **GCC Clause 2.8.2.0 -** The CONTRACTOR shall not be entitled to claim compensation for any loss or damage sustained by the CONTRACTOR by virtue of any suspension as aforesaid, notwithstanding that consequent upon such suspension, the machinery, equipment and / or labour of the CONTRACTOR or any part thereof shall be or become or be rendered idle and notwithstanding that the CONTRACTOR shall be liable to pay salary, wages or hire charges and expenses thereof or therefor.	**The Bidder requests that in case of Suspension for reasons attributable to the Employer, any reasonable costs incurred by the Bidder for Upkeep/protection/sustenance of the site are to be reimbursed to the Contractor and the time extension shall be provided by the Employer.**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
157	**Page 148/490**	General Conditions of Contract, **GCC Clause 7.0.7.0 - Termination (Pg 188/490)**	If for any cause (including but not limited to resistance put up by the CONTRACTOR and/or his servants or agents or any court order consequent upon a suit or proceedings filed by the CONTRACTOR), the OWNER is unable to fully take over possession of the entire works within 7 (Seven) days from the date of completion of the measurements as contemplated above, the OWNER shall, in addition to all discounts, compensations and/or damages recoverable from the CONTRACTOR in terms hereof (including but not limited to OWNER's entitlements under Clause 4.4.0.0 and Clause 7.0.9.0 hereof) of otherwise, be entitled to recover from the CONTRACTOR liquidated damages in the amount equivalent to 1% (one percent) of the Lumpsum Price for each week or part thereof that the said taking over possession of any works is delayed beyond the period of 7 (seven) days specified above, subject to a maximum of 5% (five	**The Bidder requests for modification of the following clause :** If for any cause (including but not limited to resistance put up by the CONTRACTOR and/or his servants or agents or any court order consequent upon a suit or proceedings filed by the CONTRACTOR), the OWNER is unable to fully take over possession of the entire works within 7 (Seven) days from the date of completion of the measurements as contemplated above, the OWNER shall, in addition to all discounts, compensations and/or damages recoverable from the CONTRACTOR in terms hereof (including but not limited to OWNER's entitlements under Clause 4.4.0.0 and Clause 7.0.9.0 hereof) of otherwise, be entitled to recover from the CONTRACTOR liquidated damages in the amount equivalent to **~~1% (one percent)~~ 0.5% (half percent)** of the Lumpsum Price for each week or part thereof that the said taking over possession of any works is delayed beyond the period of 7 (seven) days specified above, subject to a maximum of 5% (five percent) **~~of the Lumpsum Price~~ of the undelivered portion**. **The payment of liquidated damages shall be the sole and exclusive remedy to the owner for delay. The Contractor shall not be liable for delays that are not caused by fault (negligence/intentional act) of the Contrator.**	Please refer to clause 71 in SCC of the tender specification.
158	**Page 162 / 490**	General Conditions of Contract, - **GCC Clause 5.2.1.2 - Tests, Commissioning and Possession of Works (Pg 162/490)**	Upon satisfactory completion of the Final Tests in respect of all plant, machinery, equipment, sub-systems and systems constituting the works/UNIT and Mechanical Completion of the UNIT to the satisfaction of the OWNER, the Engineer-in-Charge shall prepare a Final Test Certificate which shall certify the date on which Final Tests in respect of various plant, machines, equipment, sub-systems and systems have been successfully completed and the date of Mechanical Completion of the UNIT.	**The Bidder requests for the addition of the following clause :** **In case commissioning is delayed by more than 90 days from the scheduled date as notified by the Contractor to the Employer, or the facilities are put to commercial use by the Employer, due to reasons not attributable to Siemens then the Switchyard/Facilities will be considered as deemed commissioned.** **Consequently, the defect liability period shall start and the final payment due to Contractor (if any) shall become due to the Contractor. Any additional charges on account of delay in commissioning shall be reimbursed by the Employer.** **The Retention Payments will be released against submission of 10% Retention Bank Guarantee valid till end of the 12 months.**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
159	**Page 185 / 490**	General Conditions of Contract, - **GCC Clause 7.0.0.0 - Termination (Pg 185/490)**	New Clause for Termination of the Contract by the Contractor	**The Bidder requests for Termination / Suspension of Work on the project for the following :** **If the Employer Fails to fulfil the Employer Obligations / Deliverables including non payment within 90 days even after the cure period of 30 days the Contractor shall have the right to suspend / terminate the Contract**	Please follow the tender specification.
160	**Page 194 / 490**	General Conditions of Contract, Section 9 - **GCC Clause 8.5.0.0 - Indemnity and Insurance (Pg 194/490)**	The CONTRACTOR shall at all times indemnify and keep indemnified the OWNER and its officers, servants, agents from and against all third party claims whatsoever (including but not limited to property loss and damage, personal accident, injury or death of/or to property or person of any Sub-contractor(s) and/or the servants/ agents of the CONTRACTOR or any Sub-contractor(s) and or the OWNER) arising out of any act or omission of the CONTRACTOR and the CONTRACTOR shall at his own cost and initiative at all times upto the successful conclusion of the defect liability period specified in clause 5.4.1.0 hereof take out and maintain all insurable liabilities under this clause, including but not limited to third party insurance and liabilities under the Motor Vehicles Act, Worker's Compensation Act, Fatal Accidents Act, Personal Injuries Insurance Act, Emergency Risk Insurance Act and /or other Industrial Legislation from time to time in force in India with Insurance Company(ies) approved by the OWNER, and such policy(ies) shall	**The Bidder requests to modify the clause as :** The CONTRACTOR shall at all times indemnify and keep indemnified the OWNER and its officers, servants, agents from and against all third party claims whatsoever (including but not limited to property loss and damage, personal accident, injury or death of/or to property or person **~~of any Sub-contractor(s) and/or~~** the servants/ agents of the CONTRACTOR **~~or any Sub-contractor(s) and or the OWNER)~~** arising out of **~~any~~ negligent** act or omission of the CONTRACTOR and the CONTRACTOR shall at his own cost and initiative at all times upto the successful conclusion of the defect liability period specified in clause 5.4.1.0 hereof take out and maintain all insurable liabilities under this clause, including but not limited to third party insurance and liabilities under the Motor Vehicles Act, Worker's Compensation Act, Fatal Accidents Act, Personal Injuries Insurance Act, Emergency Risk Insurance Act and /or other Industrial Legislation from time to time in force in India with Insurance Company(ies) approved by the OWNER, and such policy(ies) shall be of not lesser limit then the limits hereunder specified with reference to the matters hereunder specified, namely.	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
161	**Page 195 / 490**	General Conditions of Contract, Section 9 - **GCC Clause 8.7.0.0 - Limitation of Liability (Pg 195/490)**	The aggregate liability of the CONTRACTOR to the OWNER (whether based on contract or tort, including negligence and strict or absolute liability) arising out of or under this Contract shall not exceed twenty percent (20%) of the Lump sum Price provided that no such limit shall apply in respect of: (i) any liability pursuant to CONTRACTOR's indemnity obligations under the contract; or (ii) any loss resulting from fraud, intentional or wilful misconduct or illegal or unlawful acts or omissions of CONTRACTOR, its affiliates or any sub-contractor or any supplier or any of its or their respective officers, directors, employees, servants or agents; or (iii) any liability to rectify, repair, restore or replace any materials and/or works or deficiencies therein in terms of the Contract; (iv) any liability under clause 7.0.7.0 or Clause 7.0.9.0; AND provided always that such limitation shall exclude any amounts recovered under any policy (ies) of insurance taken out and/or maintained by the	**The Bidder requests to modify the clause as :** a) The aggregate liability of the CONTRACTOR to the OWNER (whether based on contract or tort, including negligence and strict or absolute liability) arising out of or under this Contract shall not exceed twenty percent (20%) of the Lump sum Price provided that no such limit shall apply in respect of: (i) any liability pursuant to CONTRACTOR's indemnity obligations under the contract; or (ii) any loss resulting from fraud, intentional or wilful misconduct or illegal or unlawful acts or omissions of CONTRACTOR, its affiliates or any sub-contractor or any supplier or any of its or their respective officers, directors, employees, servants or agents; or (iii) any liability to rectify, repair, restore or replace any materials and/or works or deficiencies therein in terms of the Contract; (iv) any liability under **clause 7.0.7.0 (Termination-LD) ~~or Clause 7.0.9.0 (Termination-Risk Purchase); AND provided always that such limitation shall exclude any amounts recovered under any policy (ies) of insurance taken out and/or maintained by the CONTRACTOR pursuant to the provisions of the Contract.~~** **b) Neither Party shall be liable to the other Party, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, loss of any contract, loss of business, business interruption, loss of revenue, loss of goodwill or loss of anticipated**	Please follow the tender specification.
162	**Page 206 / 490**	General Conditions of Contract, Section 9 - **GCC Clause 1.0.39.0 - Part II - Arbitration (Pg 206/490)**	"Plans" and "Drawings" shall mean maps, plans, tracing and prints forming part of the bid documents and any detail or working drawings, amendments and / or modifications thereof approved in writing by the Engineer-in-Charge or any agency notified by the OWNER to the CONTRACTOR for the purpose and shall include any other drawings or plans in connection with the work or any supply as may from time to time be furnished by or approved in writing by the Engineer-in-Charge or any other agency nominated by the OWNER in this behalf.	**The Bidder understands that only the non-IPR related a) drawings/ as-built drawings, b) Maps c) plans d) tracing and e) prints need to be provided under this clause. Please confirm**	Confirmed.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
163	**Page 219 / 490**	Part II, General Conditions of Contract, **New Clause - Export Regulations (Pg 219/490)**	Additional Clause-Export Reservation Clause	**The Bidder requests to incorporate the following as a separate provision in the tender documents:** 1.If Recipient transfers goods (hardware and/ or software and/ or technology as well as corresponding documentation, regardless of the mode of provision) delivered by Siemens or works and services (including all kinds of technical support) performed by Siemens to a third party Recipient shall comply with all applicable national and international (re-) export control regulations. In any event of such transfer of goods, works and services Recipient shall comply with the (re-) export control regulations of the Federal Republic of Germany, of the European Union and of the United States of America. 2.Prior to any transfer of goods, works and services provided by Siemens to a third party Recipient shall in particular check and guarantee by appropriate measures that a.There will be no infringement of an embargo imposed by the European Union, by the United States of America and/ or by the United Nations by such transfer, by brokering of contracts concerning those goods, works and services or by provision of other economic resources in connection with those goods, works and services, also considering the limitations of domestic business and prohibitions of by-passing those embargos;	Not acceptable.
164	**Page 219 / 490**	Part II, General Conditions of Contract, **New Clause - Export Regulations (Pg 219/490)**	Additional Clause-Export Reservation Clause	b.Such goods, works and services are not intended for use in connection with armaments, nuclear technology or weapons, if and to the extent such use is subject to prohibition or authorization, unless required authorization is provided; c.The regulations of all applicable Sanctioned Party Lists of the European Union and the United States of America concerning the trading with entities, persons and organizations listed therein are considered. 3.If required to enable authorities or Siemens to conduct export control checks, Recipient, upon request by Siemens, shall promptly provide Siemens with all information pertaining to the particular end customer, the particular destination and the particular intended use of goods, works and services provided by Siemens, as well as any export control restrictions existing. 4.Recipient shall indemnify and hold harmless Siemens from and against any claim, proceeding, action, fine, loss, cost and damages arising out of or relating to any noncompliance with export control regulations by Recipient, and Recipient shall compensate Siemens for all losses and expenses resulting thereof.	Not acceptable.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
165	**Page 283 / 490** **Page 286 / 490**	**General Conditions of Contract, Appendix VII Proforma of Bank Guarantee For Security Deposit/Performance Bond (Pg 283/490)** **General Conditions of Contract, Appendix VI Guarantee against Advance Payment (Mobilization) (Pg 286/490)**	Bank Guarantee Towards Performance Security Bank Guarantee For Advance Payment	**Performance Security and Advance Bank Guarantee** The Bidder requests that Bank Guarantee formats should be close ended w.r.t. Validity and Value, with a jurisdiction clause and a Bank Guarantee return clause. **Advance Bank Guarantee** Bidder requests for addition of the Advance Bank Guarantee Reduction clause in the Bank Guarantee Format.	Please follow the tender specification.
166	**Page 318/490**	Part II, Special Conditions of Contract, **Clause 14.11 Firm Price : (Pg 28/123)**	The quoted price shall remain firm and fixed and valid until completion of the contract and shall not be subject to escalation for any reason whatsoever.	**The Bidder requests for the modification of the clause as** **Except for Equipments " Transformers, Control Protection & SAS System,LT Switchgear, isolators, CT, VT, structure, cables, cable treys, PLCC, Installation Testing & Commissioning works, Civil Works .,** The quoted price shall remain firm and fixed and valid until completion of the contract and shall not be subject to escalation for any reason whatsoever. Price Variation shall be calculated on basis of IEEMA Indices and the base date shall be 30 days prior to the Bid Submission date.	Please follow the tender specification.
167	**Page 358 / 490**	Special Conditions of Contract, **SCC Clause 38 - Building and Other Construction Workers Act (Pg 358/490)**	BOCW Cess at the prevailing rate, if applicable, shall be remitted to the "Secretary, Building and Other Construction Workers Welfare Board" of the concerned State by the Contractor. The same shall be reimbursed to the Contractor by OWNER, based on the submission of the proof of payment.	**The Bidder requests for the following clarification** The Bidder requests to clarify whether the **Building and Construction Workers Welfare Cess - BOCW cess shall be applicable** @1% **on the whole contract** or **on the Services portion for Civil Works and Installation.**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
168	**Page 372 / 490** **Page 188 / 490**	Special Conditions of Contract, **SCC Clause 71 - Price Adjustment for Slippage in completion (Pg 372/490)** General Conditions of Contract, GCC Clause **7.0.7.0 - Termination (Pg 188/490)**	SCC 71 - Time schedule as defined in Annexure I to SCC, the Owner shall be entitled to a discount in the total Lump sum price. The discount shall be applicable at the rate of 0.5% (half percent) of the total Lump sum price of LSTK Contract for every week of the delay or part thereof subject to a maximum of 5% of the total Lump sum price of LSTK Contract. The above discount shall be recovered by the Owner out of the amounts payable to the Contractor or from any Bank Guarantees or Deposits furnished by the Contractor or the Retention Money retained from the Bills of the Contractor, either under this contract or any other Contract with Owner. GCC 7.0.7.0 - If for any cause (including but not limited to resistance put up by the CONTRACTOR and/or his servants or agents or any court order consequent upon a suit or proceedings filed by the CONTRACTOR), the OWNER is unable to fully take over possession of the entire works within 7 (Seven) days from the date of completion of	**Bidder understands that GCC Clause 7.0 7.0 Termination) and SCC 71 Price Adjustment for Slippage in completion) are the same clause and cannot be operated independently hence the maximum LD exposure on delay shall not exceed 5%. Bidder Requests for the Confirmation of the same.**	Please follow SCC clauses in tender specification.
169	**Page 373 / 490**	**Special Conditions of Contract, - SCC Clause 71.0 - Price Adjustment for Slippage in Completion (Page 373 / 490)**	c) As an alternative the contractor shall have an option to provide a Bank Guarantee from a scheduled Bank and in a format acceptable to the OWNER for a sum equal to 5% (FIVE Percent) of the total contract value which shall be available for recovery of the Price Adjustment for Slippage in completion (if any) finally determined after MECHANICAL COMPLETION OF THE UNIT. This Bank Guarantee shall be in addition to any other Guarantee to be provided by the Contractor and shall be valid for a period of not less than 12 (TWELVE) months from the date of Mechanical completion or 18 months from date of Commissioning whichever is earlier.	**The Bidder requests that no Bank Guarantee to be provided in lieu for for Slippage in completion** **The Bidder requests for deletion of the clause.**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
170	**Page 382 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **2.0 Mobilization Advance (Page 382 / 490)**	CONTRACTOR, if requested, shall be paid recoverable interest bearing Mobilization Advance up to a maximum of 10% (Ten Percent) of awarded Contract Value. The mobilization advance will attract an interest @ SBI lending rate prevailing at the time of release of payment plus 2%.	**The Bidder requests for Interest Free Mobilization Advance Payment**	Please follow the tender specification.
171	**Page 383 - 388 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **(Page 383 - 388 / 490)**	**Design and Detail Engineering Services (Form SP 1)** a)60% (Sixty percent), on pro-rata basis…… approved by the Owner/PMC b)15% (Fifteen percent), on pro-rata basis…….. and their approval under Code I c)10% (Ten percent) on submission…….. issuance to site. a.3% (Three percent) against 30% 3-D Model Review. b.3% (Three percent) against 60% 3-D Model Review. c.3% (Three percent) against 90% 3-D Model Review d.1% (One percent) against submission of 3-D Model……. d)5% (Five percent) on submission of As Built drawings…… e)5% (Five percent) on issuance of Mechanical Completion Certificate.. f)3% (Three percent) on issuance of Commissioning Certificate.. g)2% (Two percent) on issuance of Completion Certificate.. **Supplies (Form SP-2)** a)10% (Ten percent) of total supply value (including mandatory spares), on pro-rata basis, on	"The Bidder requests for the inclusion of the following payment terms Supply: 10% of contract value as advance along with Letter of Award / LOI, within 15 days , against 10% ABG 80% pro-rata payment on dispatch of equipments from works **within 30 days** 10% Payment within 30 days from the date of Successful completion of installation and commissioning. Services - Civil and ETC: 10% of contract value as advance along with Letter of Award/LOI, within 15 days , against 10% ABG 80% pro-rata payment on completion of services **within 30 days** * 10% Payment within 30 days from the date of Successful completion of installation and commissioning. *** In case commissioning is <u>delayed by more than 90 days from the scheduled date as notified by</u> the Contractor to the Employer, or the <u>switchyard is put to commercial operations</u> , due to reasons not attributable to Siemens, then the switchyard will be considered as deemed commissioned. Consequently, the defect liability period shall start and the final payment due to Contractor (if any) shall become due to the Contractor. Any additional charges on account of delay in commissioning shall be reimbursed by the Employer.** **The Retention Payments will be released against**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
172	**Page 383 - 388 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **(Page 383 - 388 / 490)**	**Civil Works (Form SP-6)** a)10% (Ten percent), on pro-rata basis, on completion of piling work… b)80% (Eighty percent), on pro-rata basis, against the Certified Running Account Bill(s)…… c)5% (Five percent) on issuance of Mechanical Completion Certificate.. d)3% (Three percent) on issuance of Commissioning Certificate.. e)2% (Two percent) on issuance of Completion Certificate.. **Structural Works (Form SP-6)** a)5% (Five percent) on finalization of quantity…… b)55% (Fifty five percent), on pro-rata basis, against supply and fabrication… c)30% (Thirty percent), on pro-rata basis, on erection… d) 5% (Five percent) on issuance of Mechanical Completion Certificate.. e) 3% (Three percent) on issuance of Commissioning Certificate.. f) 2% (Two percent) on issuance of Completion Certificate..	**Refer the Clarification above**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
173	**Page 383 - 388 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **(Page 383 - 388 / 490)**	**Mechanical Equipment Other than Piping (Form SP-6)** a)45% (Forty five percent), on pro-rata basis, on completion of erection… b)45% (Forty five percent), on pro-rata basis, on completion of alignment… c)5% (Five percent) on issuance of Mechanical Completion Certificate.. d)3% (Three percent) on issuance of Commissioning Certificate.. e)2% (Two percent) on issuance of Completion Certificate.. **All Electrical Work (Form SP-6)** a)45% (Forty five percent), on pro-rata basis, on completion of erection/installation…… b)45% (Forty five percent), on pro-rata basis, on completion of pre-commissioning….. c)5% (Five percent) on issuance of Mechanical Completion Certificate.. d)3% (Three percent) on issuance of Commissioning Certificate.. e)2% (Two percent) on issuance of Completion Certificate..	**Refer the Clarification above**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
174	**Page 383 - 388 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **(Page 383 - 388 / 490)**	**All Instrumentation Work (Form SP-6)** a)45% (Forty five percent), on pro-rata basis, on completion of erection…… b)45% (Forty five percent), on pro-rata basis, on completion of pre-commissioning…… c)5% (Five percent) on issuance of Mechanical Completion Certificate.. d)3% (Three percent) on issuance of Commissioning Certificate.. e)2% (Two percent) on issuance of Completion Certificate.. **Installation Including Supply of Material (Form SP-6)** a)90% (Ninety percent), on pro-rata basis, on completion of insulation work… b)5% (Five percent) on issuance of Mechanical Completion Certificate.. c)3% (Three percent) on issuance of Commissioning Certificate.. d)2% (Two percent) on issuance of Completion Certificate..	**Refer the Clarification above**	Please follow the tender specification.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
175	**Page 383 - 388 / 490**	**Annexure III to Special Conditions of Contract - Payment Terms for Contracts on EPC LSTK Basis** **(Page 383 - 388 / 490)**	**Painting Including Supply of Material (Form SP-6)** 10% (Ten percent), on pro-rata basis, on surface preparation….. 80% (Eighty percent), on pro-rata basis, on final painting….. a)5% (Five percent) on issuance of Mechanical Completion Certificate.. b)3% (Three percent) on issuance of Commissioning Certificate.. c)2% (Two percent) on issuance of Completion Certificate.. **Mechanical Completion of Package Work (Form SP-6)** 100% (Hundred percent) on issuance of Mechanical Completion Certificate….. **Commissioning Including Pre-Commissioning and Start Up (Form SP-6)** 100% (Hundred percent) on issuance of Commissioning Certificate of the package work…. **Payment Terms for Assistance Services during Operation** Payment: 100% against submission of bills and time sheets certified by the Engineer-In-Charge on monthly	**Refer the Clarification above**	Please follow the tender specification.
176	Page 8 of 190	1.2	**Site conditions** Meteorological data S.No. 3,4,5	**Confirm the Design Temperature as follows**: Design temperature for Non-Elect. Eqpt. : 38 Deg.C Design temp. for Elect. Eqpt. Other than Battery : 50 Deg.C Design temperature for Battery : 50 Deg.C (Min. is 10 Deg.C)	Confirmed.
177	Page 10 of 190	2.1.1 (1)	**Electrical scope of work** (3D Modelling)	3D Modelling - Generally for Substations 3D modelling is not done. Request Purchaser to confirm if 3D modelling is really required. If required, Purchaser to confirm the scope of 3D modelling work (i.e.) If the entire SS building / Outdoor yard, trnech / tray , buildings, equipment and Lighting system need to be modelled. What about 33KV Cabling work. Do they also need to be modelled. Purchaser to confirm	3D modelling is needed for for everything except lighting fixtures and cables.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
178	Page 10 of 190	2.1.1 (2)	**Electrical Scope of Work :** Testing and commissioning of Interconnecting transformer	Purchaser to clarify / confirm the scope of work with respect to ICT-2. 1. Supply and erection of ICT-2 along with Marshalling Kiosk, Annunciator panel (if any), NIFPS, RTCC Panel, NIFPS panel are in Purchaser's scope. 2. Transformer, NIFPS, Other accessories - Foundation design and drawings are in Purchaser's scope. 3. Supply of Control and Power cables to and from ICT-2, Its marshalling box, Ann. panel, NIFPS system etc. are in the scope of purchaser. 4. Laying of control cables along with the erection accessories such as Cable glands, lugs, termination kits, Cable installation accessories are in Contractor's scope. 4. Only testing and commissioning of ICT-2, NIFPS, RTCC Panel, Ann. panel (if applicable) along with their cables are in Contractors' scope. Purchaser to confirm the same.	1) Supply and erection of ICT-2 along with field equipment like Marshalling Kiosk and NIFPS are in Purchaser's scope. Indoor panels shall be installed by the bidder. 2) Confirmed. 3) Supply of 33 kV power cables shall only be supplied by Purchaser. Rest all supply and service by bidder. 4) Confirmed. 5) Testing and commissioning along with the above mentioned scope will be under bidder's scope of work.
179	Page 10 of 190	2.1.1 (5)	**Electrical Scope of Work :** Interconnection between ICT-2 and existing 33KV Generatoion Switchboard (Panel 41) located in CPP-3	Purchaser to clarify / confirm the following: 1. Supply of 33KV cables by Purchaser 2. Cable raceway system along with control cabling for interconnection in Bidder's scope 3. Cable raceway means cable trays, their supports, Eps and Anchor fasteners. Provision of adequate space for erection of these newly supplied trays in existing cable cellar room to be confirmed by Purchaser. 4. Cable route length is indicated as 300mtr. approximately. Purchaser to confirm the route length.	1) All 33 kV power cable supply will be by Purchaser. 2) Yes. 3) Yes. 4) Bidder to quote based on tender specification requirement/information.
180	Page 11 of 190	2.1.1 (6)	**Electrical Scope of Work :** Interconnection between ICT-2 and existing 33KV Generatoion Switchboard (Panel 9) located in CPP-1	Purchaser to clarify / confirm the following: 1. Supply of 33KV cables by Purchaser 2. Cable raceway system along with control cabling for interconnection in Bidder's scope 3. Cable raceway means cable trays, their supports, Eps and Anchor fasteners. Provision of adequate space for erection of these newly supplied trays in existing cable cellar room to be confirmed by Purchaser. 4. Cable route length is indicated as 350mtr. approximately. Purchaser to confirm the route length. 5. It is written in the Spec. that ICT-2 will be connected to the 33KV Adaptor panel located in CPP-6. We understand that this is a type error and ICT-2 in CPP-1 will be connected to the 33KV Adaptor panel in CPP-1. Please confirm. 7. Only sand filling is required for the outdoor cable trench between CPP-1 and CPP-3 as per Spec. Purchaser to confirm that the cable sizing for 33KV Cable is done considering the soil thermal resistivity and no improvement of soil thermal resistivity is required by adding compounds	1) All 33 kV power cable supply will be by Purchaser. 2) Yes. 3) Yes. However, there will not be any cable trays inside purchaser's cable trench, which will be sandfilled only. 4) Bidder to quote based on tender specification requirement/information (4300 m). 5) ICT-2 will be located in CPP-3 and the 33 kV Local Adaptor Panel shall also be located in CPP-3. Please refer to the tender specification requirements. 6) Query missing. 7) Confirmed.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
181	Page 11 of 190	2.1.1 (7)	**Electrical Scope of Work :** Interconnection between ICT-3 and existing 33KV Generatoion Switchboard (Panel 23) located in CPP-2	Purchaser to clarify / confirm the following: 1. Supply of 33KV cables by Purchaser 2. Cable raceway system along with control cabling for interconnection in Bidder's scope 3. Cable raceway is in the Overhead Piperack. BOQ shall include cable trays and their supports only. Provision of adequate space for erection of these newly supplied trays in existing cable / pipe rack along with tray supports to be confirmed by Purchaser. 4. Cable route length is indicated as 700mtr. approximately. Purchaser to confirm the route length. 5. Upgradation of existing relaying to transformer feeder protection - We understand that the line differential protection relay is to be replaced with trafo diff. protection	1) All 33 kV power cable supply will be by Purchaser. 2) Yes. 3) Yes. 4) Bidder to quote based on tender specification requirement/information. 5) The existing feeder is a power feeder only.
182	Page 11 of 190	2.1.1 (8)	**Electrical Scope of Work :** Interconnection between ICT-3 and existing 33KV Generatoion Switchboard (Panel 20) located in CPP-1	Purchaser to clarify / confirm the following: 1. Supply of 33KV cables by Purchaser 2. Cable raceway system along with control cabling for interconnection in Bidder's scope 3. Cable raceway is in the Overhead Piperack. BOQ shall include cable trays and their supports only. Provision of adequate space for erection of these newly supplied trays in existing cable / pipe rack along with tray supports to be confirmed by Purchaser. 4. Cable route length is indicated as 750mtr. approximately. Purchaser to confirm the route length. 5. Upgradation of existing relaying to transformer feeder protection - We understand that the line differential protection relay is to be replaced with trafo diff. protection	1) All 33 kV power cable supply will be by Purchaser. 2) Yes. 3) Yes. 4) Bidder to quote based on tender specification requirement/information. 5) The existing feeder is a power feeder only.
183	Page 11 of 190	2.1.1 (11)	**Electrical Scope of Work :** Interconnection between new 33 kV GIS in the new 220/33 kV Substation and existing 33 kV Generation Switchboard (Panel-11) located in CPP-1	We understand that Line diferential protection relay is located on both ends of 33KV Feeder cable and FO cable is run between the relays for communication.	Bidder has to supply & install the differential protection relays at both end and the required FO cable supply, installation & termination.
184	Page 11 of 190	2.1.1 (12)	**Electrical Scope of Work :** Interconnection between new 33 kV GIS in the new 220/33 kV Substation and existing 33 kV Generation Switchboard (Panel-30) located in CPP-2	We understand that Line diferential protection relay is located on both ends of 33KV Feeder cable and FO cable is run between the relays for communication.	Bidder has to supply & install the differential protection relays at both end and the required FO cable supply, installation & termination.
185	Page 12 of 190	2.1.1 (13)	**Electrical Scope of Work :** Interconnection between new 33 kV GIS in the new 220/33 kV Substation and existing 33 kV Generation Switchboard (Panel-19) located in CPP-3	We understand that Line diferential protection relay is located on both ends of 33KV Feeder cable and FO cable is run between the relays for communication.	Bidder has to supply & install the differential protection relays at both end and the required FO cable supply, installation & termination.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
186	Page 12 of 190	2.1.1 (14)	**Electrical Scope of Work :** Modification of 33 kV cable connections of existing ICT-1.	Following scope of supply is considered in Bidder's scope. 1. 33KV, 1C X 630 sq.mm. cable/Phase from ICT-1 in CPP-3 to 33KV Gen. swgr. Panel 3 in CPP-3. Aroute length of 300 mtr. Is considered. 2. Associated cable raceway is in Bidder's scope 3. 12 nos. of Straight through joints (6 nos each at entry and exit points of MRPL Premises) and 12 nos. termination kits suitable for 1C X 630 Sq.mm. cable We presume that for rerouting of cables inside CPP-2 and CPP-3, adequate cable trays are available in the existing cellar room. Purchaser to confirm.	1) The order of length is correct. 2) Yes. 3) Approximate number of 33 kV straight through joints is made available in Schedule of Quantity in Volume-I of II, for estimation purpose only.
187	Page 12 of 190	2.1.1 (15)	**Electrical Scope of Work :** Supply and installation of cable trays on the overhead cable trestles and overhead steel cable rack in the cable route from 220/33 kV Substation to CPP-3.	It is written in Spec. that no cable trays to be used inside the trench. Does it mean that the RCC Cable trench is to be used for just burying the cables in sand ? Purchaser to confirm.	Confirmed.
188	Page 12 of 190	2.1.1 (16)	**Electrical Scope of Work :** Supply and Installation of Inter-tripping hardware	What are the items to be considered under this heading? Purchaser to clarify..	A small control panel facilitating intertripping between the new substation and the existing Bajpe MRSS.
189	Page 12 of 190	2.1.1 (18)	**Electrical Scope of Work :** Supply and Installation of trefoil clamps	Trefoil clamps will be used only for cables routed in cable trays. For buried cables no trefoil clamps will be used. Purchaser to confirm.	To be used in cable trench also.
190	Page 15 of 190	2.1.3 (31)	Civil Scope of Work	Spec. indicates Dismantling and making good existing Roads / concrete work (if any) in Civil scope of work. Purchaser to clarify and furnish the details of such work with quantities.	Not envisaged at present.
191	Page 15 of 190	2.1.4 (8)	C&I Scope of Work	More clarity is needed against this point in the Spec.	The Fire detection system shall beof the new substation needs to be hooked up to the existing fire detection system of the CPP-2.
192	Page 17 of 190	2.2.1	Electrical Terminal Points	Purchaser to confirm if the termination kits at panel ends are in the scope of Purchaser / bidder.	By bidder.
193	Page 18 of 190	2.2.2	Mechanical Terminal Points	Purchaser to confirm the interface point for the following facilities along with the invert level, flow rate,pressure as applicable: 1. Drinking / Domestic water supply 2. Fire water supply	1) To be taken up at execution stage. 2) No fire water system is envisaged.
194	Page 18 of 190	2.2.3	Civil Terminal Points	Purchaser to confirm the interface point for the following facilities along with the invert level, flow rate,pressure as applicable: 1. Road interface points 2. Sewage water line 3. Storm water line	1) As shown in tender drawing. 2) and 3) To be taken up at execution stage.
195	Page 26 of 190	4.5.2	Area classification and equipment selection	This being a Substation, it will be considered as a safe area and area classification will not be applicable. Kindly confirm.	Confirmed.
196				Degree of Protection is mentioned as IP-55 for Non hazardous area. Generally Indoor fixtures come in IP 20 category. Purchaser to clarify / confirm the requirement.	Tender requirement needs to be met.
197	Page 29 of 190	4.5.9	Insulation system	Insulation coordination study is not in our scope. Kindly confirm.	To be included in bidder's scope of work.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
198	Page 32 of 190	4.6	Basic design criteria of electrical equipment	Spec. calls for redoing the type tests if the type test certificate for an electrical equipment is older than 5 years from time of contract award. Five years is too short a period for Standard Equipment. Many OEMs don't accept for redoing the type tests and they give an undertaking indicating that there is no design change since the Type test. Purchaser to review and confirm if Re-testing is mandatory in case of not meeting 5 Years stipulation.	CEA guidelines to be followed.
199	Page 33 of 190	4.6.2	220 kV Gas Insulated Switchgear (GIS)	Spec. indicates that the Busbar shall be made of copper. Generally the Bus bars in GIS are made of Alumium alloy. Purchaser to review and confirm if Alumium alloy is acceptable.	Cu/ Aluminum busbar is acceptable for 220 kV GIS as per OEM standard.
200	Page 37 of 190	4.6.5	LV switchboard	Spec indicates that the earth fault protection shall be provided to motor feeders using CBCT and earth fault relay. Purchaser to clarify from which rating of motor feeders this earth fault protection is required.	55 kW and above.
201	Page 39 of 190	4.6.9	Cables	Spec. indicates that Fire survival power and control cables capable for withstanding 750 °C for three (3) hours shall be used for cable for critical application drive in classified hazardous area (if any) and for all fire safety cables. Scope of this package is restricted to Substation and hence this requirement is not applicable. Purchaser to clarify / confirm.	Confirmed.
202				Purchaser to furnish the Soil thermal resisticity for doing the Cable sizing calculation.	All 220 kV, 33 kV power cables are already sized in the tender document. There is hardly any LV power cables will will be buried/sandfilled.
203	Page 41 of 190	4.8.2	Cabling system	Spec. indicates that all exposed cable trays shall be covered regardless of its tier position in the group of trays. We understand that tray covers are required for the trays located in Pipe racks and cable racks only. Cable trays inside the cable cellar room do not require cover. Please confirm our understanding.	Confirmed.
204				Spec. indicates that the straight through joints shall be avoided to the maximum extent possible. However, in no case the same shall be installed in hazardous areas. Since we have interplant cabling laid in trenches which are existing / passing through the plant, we request MRPL to clearly inform us if any cable is passing through hazardous area.	This is not applicable for sandfilled cables.
205	Page 44 of 190	4.8.4	Illumination system	Critical lighting is limited to Substation. There are no remote locations considered in our scope. Purchaser to confirm.	Confirmed.
206	Page 74 of 190	7.4	Clean agent system	Only portable Fire extinguishers - clean agent based is considered in our scope for SCADA room. Clean agent based Fire protection system with Cylinders, Piping, valves, sprinklers etc. are not considered in our scope. Purchaser to clarify / confirm.	Shall be in accordance to the tender document/relevant code/NFPA.
207	Page 76 of 190	8.3	Fibre optic cable	If the distance is not much can we use Multimode FO cable instead of Single mode type? Purchaser to confirm.	To be taken up at execution stage.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
208	Page 76 of 190	9	Vendor list	For LV switchgears and other Distribution boards, whether channel partners of Siemens / Schneider /ABBare acceptable? Purchaser to confirm.	As per approved vendor list. However, the tender allows other manyfacturers also after approval from the purchaser.
209	Page 87 of 190	9	Vendor list	For Power transformers please accept TESLA, BTW ATLANTA, Technical Associates and other PGCIL approved vendors also for supply.	As per approved vendor list. However, the tender allows other manyfacturers also after approval from the purchaser.
210	Page 94 of 190	10	Existing facilities under and above ground	Spec. indicates that Relocation (if required) of existing above ground or underground facilities encountered before or during construction shall be carried out with the approval of the OWNER/PMC. Same may be quantified by Purchaser for estimation purpose.	To be taken up at execution stage, if any.
211	Page 120 of 190	15	Road Work	Purchaser is requested to confirm the no. of road crossings across the Existing roads for estimation purpose.	Within the battery limit as per the proposed layout.
212	Page 12 of 190	2.1.1 (15)	Supply and installation of cable trays on the overhead cable trestles and overhead steel cable rack in the cable route from 220/33 kV Substation to CPP-3.	Kindly provide the Length of the cable trays. In the Drawings it is not clear	Please follow chainage values in the tender drawing to get the length estimate.
213	Page 14 of 190	2.1.3 Point (1)	**Civil Scope of Work** The plot of 220/33 kV Substation is already graded land. Only micro-grading of the plot is envisaged. Contractor to decide up on the requirement of conducting Topographic Survey post his/her site visit for the purpose stated earlier.	Kindly provide the Existing Topo Survey, With in the short span arranging a survey team and conducting topo survey on prebid stage is not envisaged	Not envisaged as it is already graded land. However, the successful Bidder has to arrange for survey of land to fix the RL and site co-ordinates.
214	Page 14 of 190	2.1.3 Point (2)	Conducting Geotechnical Investigation Study of the area proposed for 220/33 kV Substation for designing the civil work for the 220/33 kV Substation	Kindly provide the existing Geo Technical investigation along with bore log data & SBC details for carrying out Civil Design works	Attached with the Addendum. However, the Bidder has to conduct Geotechnical survey upon award of work.
215		General	As per the 230KV GIS Building layout drawing issued we understand that Cable Cellar is not envisaged .Since all the cables are terminated out side the building	Kindly confirm whether our understanding is correct.	Bidder's understanding is correct as far as 220 kV power cables are concerned.
216	Page 14 of 190	2.1.3 Point (3)	Complete Plant civil work including but not limited to Storm Water Drainage System, Sewage System, and Internal fencing system	Our scope of work is limited to GIS Building and other associated civil works including fencing,roads and storm water drainage etc around the GIS building only .All other works are excluded from the scope of this tender. Kindly confirm whether our understanding is correct.	All the civil work inside the battery limit of proposed 220/33 kV Substation and ICT-2 foundation at CPP-3 Area.
217	Page 14 of 190	2.1.3 Point (5)	Tree cutting, if any	We will carry out the Tree Cutting if necessary, however necessary approval shall be issued by MRPL. Kindly confirm	Confirmed.
218	Page 14 of 190	2.1.3 Point (20)	Supply and fixing of GI sheet/galvalume for shed roofing.	Scope is not clear. Kindly clarify	Wherever necessary as per the tender specification.
219	Page 15 of 190	2.1.3 Point (24)	Underground/Surface Facilities (Water tanks, Septic tanks, Soak pits).	Pl provide the Size of the Water tank. We will consider Septic tank & soak pit suitable for 10 persons. Kindly confirm	As per the requirement of occupancy of the building.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
220	Page 16 of 190	2.1.5 Point (2)	Obtaining Statutory Permits and confirmation	Our scope of obtaining Stautory approval is limited to Approval from CEA/ CEIG for the scope of work. All other approvals are excluded from our scope. Kindly confirm whether our understanding is correct	Bidder's understanding is correct.
221	Page 16 of 190	2.1.5 Point (4)	Supply of start-up/commissioning spares, engineering spares, first fill and consumables (oil & grease, lubricants, servo-fluids/control fluids, gaskets as applicable) for 6 months, operation spare for defect liability period and mandatory spares for 10 years of operation and maintenance	Kindly provide the List of Mandatory spares for 10 years	List of mandatory spares are available in Volume-II of II, chapter 18.
222	Page 16 of 190	2.1.5 Point (6)	One set of Special tools & tackles.	Kindly provide the List of Special tools & tackles required	EPC bidder to decide.
223	Page 16 of 190	2.1.5 Point (8)	Relocation (if required) of existing above ground or underground facilities encountered before or during construction shall be carried out with the approval of the Owner/PMC	Identification of such activity at this stage is not possible and the same shall be carried out at extra cost as and when the need arises. Kindly confirm	Not envisaged at present.
224	Page 16 of 190	2.1.5 Point (11)	Contractor shall arrange for third party inspection by any of the agencies specified in the Bidding Document. The prices shall be inclusive of charges towards third party inspection. Coordination and liaisoning etc. with third party inspection agency shall also be the responsibility of the Contractor	We have in house QMS , hence we don't anticipate hiring of TPI for this project. Kindly confirm.	TPI is a must.
225	Page 17 of 190	2.2	Terminal Points	We have noted the Terminal points listed and our offer will be based on the terminal points . Kindly confirm	Confirmed.
226	Page 18 of 190	2.3	Exclusions	Our scope of work is limited to 230KV switchyard and other associated works in the switchyard considering the exclusions . Kindly confirm	Confirmed.
227		General		We have considered all the equipments covered under this package are suitable for Non Hazardous Area. Kindly confirm our under standing is correct	Confirmed.
228	Page 192 of 362		Protection & metering diagram for refinery complex power system upgradation work	Under Notes, it is mentioned that Tariff metering CT parameters and Differential Protection CT parameters need to be matched with upstream 220KV CT located BAJPE MRSS substation. we request you to kindly furnish the CT parameters for Tariff metering at BAJPE MRSS substation	Tariff metering for MRPL purpose is independent of Bajpe MRSS. The differential CT details shall be informed to the successful bidder at the execution stage.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
229	Page 191 of 362		220/33KV Substation layout in MRPL complex for Refinery complex power system upgradation work	In the layout LCC panels are located outside the GIS hall. Generally these Local control cubicles of GIS are located opposite to GIS within the same hall for the following reasons: 1. Cabling between GIS and LCC is by GIS vendor and hence the LCC will be located as close as possible 2. For Local operation (i.e.) during testing and maintenance, viewing GIS operation during local operation is essentially required. we request you to kindly advice if the layout can be modified suitably.	Layout can be modified as suggested by OEM.
230	Page 191 of 362		220/33KV Substation layout in MRPL complex for Refinery complex power system upgradation work	Height of the Lifting hook in the GIS hall will be decided based on the Equipment height which will vary from vendor to vendor. Purchaser to confirm if height and width of the building can be modified to accommodate the equipment	Layout can be modified as suggested by OEM.
231	Page 32 of 190	4.6.1	**220 kV Air insulated switchyar**d Power supply to this 220 kV AIS shall be through 220 kV cables from the 220 kV Bajpe MRSS located approximately 5 km from the proposed location of the 220/33 kV substation.	We understand that Supply & Laying of Cable from 220KV Baipe MRSS to 220KV AIS inside MRPL campus are not part of this work. Kindly confirm	Confirmed.
232	Page 33 of 190	4.6.1	Provision for a second air insulated 220 kV bay with equipment as specified for the first incomer bay shall be kept in order to provide redundancy to the 220 kV incoming supply to the 220/33 kV substation	Whether we have to carryout the activities for the second AIS bay also along with the equipments. Kindly Confirm	Bidder does not have to supply the second 220 kV AIS bay equipment. However, the second incomer bay in 220 kV GIS shall be supplied by the bidder.
233	Page 33 of 190	4.6.1	The Revenue/Tariff Metering system shall be implemented at the 220 kV power supply source end, that is in 220 kV Bajpe MRSS.	Providing Revenue/Tariff Metering system is part of this scope, if so Kindly provide the CT & VT details of the other end. Kindly Confirm	The Revenue/Tariff Metering system with the KPTCK shall be located in 220 kV Bajpe MRSS and is excluded from bidder's scope of work. However, there will be a "MRPL Metering Panel" which will be located inside the new 220/33 kV substation. This "MRPL Metering Panel" along with 220 kV CT & PT shall be under bidder's scope of work.
234	Page 34 of 190	4.6.2	**220 kV Gas Insulated Switchgear (GIS)** 220KV Gas insulated Switchgear - The busbar shall be made of copper conductors.	As per the manufacturer standard GIS busbard will be made out of Aluminum Alloy. Copper busbars are not available. Hence we will be supplying the GIS with Aluminum alloy Bus Bars only. Kindly confirm your acceptance of the same	Cu/ Aluminum busbar is acceptable for 220 kV GIS as per OEM standard.
235			An EOT crane shall be provided inside the GIS hall for handling the GIS/its components.	We have considered 5 Ton EOT crane for 220KV GIS Building. Kindly confirm the capacity is OK.	EPC bidder to decide based on OEM requirements..
236		General	As per GIS Building layout drawing attached ,it was noticed that LCC are mounted on the MV/LV Switchboard room	As per the General installation practice followed the LCC will mounted in the GIS Hall only. Kindly confirm	May be decided as recommended by the OEM.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
237	Page 37 of 190	4.6.5	**LV switchboard** The main LV switchboard in the new 220/33 kV substation, which will distribute 415/230 V LV auxiliary power to all LV consumers, shall be fed directly from MRPL's existing emergency distribution board/panel.The bus rating of this LV switchboard has been estimated at 1000 A continuous current and 50 kA for 1 s as short circuit current	Kindly confirm the following. 1.We understand that Supply & Laying cables from MRPLs Existing Emergency switchgear to LV switchgear is excluded from the scope of this package. 2. We have not considered any feeders for LV Consumers. 3. LV Board will be supplied as per the SLD issued along with the tender.	1) The power supply shall be from MRPL existing panel. The scope of supply of the cable shall be mutually decided at execution stage. 2) No feeder at 33 kV system for deriving of LV supply is not needed. 3) Power supply by Purchaser. LV Switchboard detailing by Bidder.
238	Page 39 of 190	4.6.9	33KV Power Cables	We understand that Supply of 33KV Cable not part of this Contract Kindly confirm	Confirmed.
239	Page 40 of 190	4.6.11	**Receptacles :** Adequate number of welding receptacles----------. These shall be rated for 63 A suitable for 415V, 3 phase system with a scraping earth. Outdoor receptacles --------	Kindly provide the Number of welding receptacles required. We don't envisage any requirement of welding receptacles	One for each transformer at least.
240	Page 40 of 190	4.6.12	**Motor operated valves (MOV)**	We don't envisage any MOV in the present scope of work. Kindly confirm	Not envisaged at present.
241	Page 41 & 42 of 190	4.8.2	**Cabling system :** Support span: 1500 mm for LV & Control Trays. However, in case of 220 kV and 33 kV cables, the support span shall be restricted to 1000 mm for the entire cabling system in that area	As we understand that for 33KV Cable laying required number of Cable tray supports and cable trays will be provided by MRPL. Kindly confirm	Cable trays in the new 220/33 kV substation, when envisaged by the bidder, shall be supplied and installed by Bidder. Cable trays in Purchaser's external cable trench is not required. Cable trays and its supporting members in Purchaser's external pipe rack shall be by the bidder. Cable trays in purchaser's external cable rack and cable trestle shall be by bidder (Purchaser will provide the cable tray supporting system in this case).
242			All exposed cable trays shall be covered regardless of its tier position in the group of trays.	Only Top trays have been provided with covers, but as indicated whether we have to provide covers to all the trays. Kindly Confirm.	In outdoor area, all cable trays shall be covered.
243		Tender Layout		We understand that there is no provision required for future bays in GIS and space provision required in GIS building. Only space space for maintence of bay in one side of GIS need to be considered by bidder.hence busbar extension module as shown in layout not required.	Provision for extension for at least two bays shall be kept as per tender documents.
244		Tender Layout		We understand that standalone LCC for GIS is mandatory and LCC can be placed in side the 220KV GIS Hall.	Confirmed.
245		Tender Layout		We understand that GIS building orientation /dimension can be optimized as per OEM requirement after considering clearance as per standard.	Confirmed.
246		AC and Ventilation system		We understand that as GIS hall shall be provided with Air conditioning system hence no requirement of positive pressure inside the GIS hall.We will consider magnetic type air curtain inside GIS hall in front of rolling shutter to optimize the losses of airconditioning. Kindly Confirm.	Confirmed. Type of air curtain can be discussed at execution stage.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
247		AC and Ventilation system		In Section A of building only HVAC supply duct shown however in project specification requirement of return duct mentioned. There is a ambiguity between layout and specification. Kindly clarify the requirement.	Both supply and return duct shall be considered.
248		AC and Ventilation system		Supply and return duct will be placed approximately at a height of 4.5 meter below corwell of EOT. Kindly confirm	To be taken up at execution stage.
249		Tender Layout		Height merntion for GIS and control room building in section drawing are indicative for GIS building bidder to consider building height suitable with OEM standard hook height and EOT travel. Similarly for auxliary and 33KV GIS hall shall be designed considering the requirement of 33KV GIS standard	Confirmed.
250		Tender Layout		Please clarify the cable trench provision inside substation for 33KV spare bays in side substation area.	Cable trenches inside substation area shall be designed considering cables for at least one spare outgoing feeder (cable size shall be considered similar to present O/G feeders).
251		Tender Layout		We understand that for cable interconnection of CPP 1,2,3 and new substation , Existing Pipe rack /Cable rack main vertical/horizontal supports shall be used for supporting arrangement of 33KV cable. No vertical/horizontal supports shall be in bidders scope.	In existing pipe rack to CPP-1 & 2, cable trays along with vertical and horizontal supports shall be considered by Bidder. In new cable rack/trestle by Purchaser, supports for trays shall be made available to the Bidder by the Purchaser.
252		Tender SLD		From SLD we understand	Query is not complete.
253		Clarification on PG Test		We request you to kindly clarify the requirement of performance test requirement.We understand performance test means precomissioning test only.	Please refer to clause no. 5.2.0.0 in Page 162 of 490 of Volume-I of II.
254		Transformer Loss		We understand that there is no loss capitalization. We are also requesting you to provide us the maximum allowable loss for transformer.	The Grid Power Transformers shall have the following losses: a) No Load Loss = 30 kW Max. b) Load Loss = 300 kW Max. c) Auxiliary Loss = 3 kW Max. D) Total Losses = 333 kW Max.
255		Gas zone II		We understand that proposed area is not under any Gas zone area we understand the following are not in present scope. 1. CCTV 2. Intercommunication/telephone system. 3. Public address system	The new 220/33 kV substation shall be in safe area. 1) CCTV will be in Bidder's scope of work. 2) & 3) PA/Telephone system shall not be in Bidder's scope of work.
256				We understand that BOCW is not applicable for this project as this project is inside there existing plant only.	The project work shall be inside the existing Refinery Complex premises.
257				We request you to consider the Price variation /adjustment at least for main item like Power Transformer, Cables, Structures and and Civil work	Not envisaged presently.
258	487 of 490	7.0	DC & UPS System	Mentioned battery & UPS sizes are enough to cater, the complete present and future scope of DC load. Hence, we are not considered any battery and UPS sizing calculations. Please confirm.	The sizes given are only for quotation purpose. However, the Bidder must consider daliverables for arriving in to the final equipment sizing for these items.
259	487 of 490	8.0	Aux. Power Supply	Please provide single line diagram of Auxiliary AC & DC for LT switchgear feeder consideration, which incomers are in the scope of MRPL.	Detail designing of LT AC & DC system is under Bidder's scope of work.
260	487 of 490	9.0	Earthing & Lightning Protection	Mentioned conductor sizes are enough to cater, short circuit current and short time rating. Hence, we are not considered any conductor sizing calculations. Please confirm.	The sizes given are only for quotation purpose. However, the Bidder must consider daliverables for arriving in to the final equipment sizing for these items.
261	487 of 490	14.0	Cable & Accessories	**220kV Cabling System:** Kindly provide bonding system, sheath bonding cable and accessories details	To be finalized at execution stage.

Pre Bid Queries for MRPL E-PUBLIC Tender No.: 3200000752 for
Main EPC Package for Refinery Complex Power System Upgradation Project

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
262	194 of 362	-	Tender Layout	GIS building size can be optimized based on GIS vendor recommendations. Please confirm.	Confirmed if OEM recommendations and tender spefication requirements are met.
263	194 of 362	-	Tender Layout	220kV EHV cable trench size can be optimized. Please confirm.	Confirmed if OEM recommendations and tender spefication requirements are met.
264	194 of 362	-	Tender Layout	33kV MV cable trench size can be optimized. Please confirm.	Confirmed if OEM recommendations and tender spefication requirements are met.
265	194 of 362	-	Tender Layout	220kV AIS CRP panel will be placed in new 220/33kV GIS cum Control Room Building. Please Confirm.	Confirmed.
266	194 of 362	-	Tender Layout	We are considering GIS Extension on One Side only as per Layout. Please confirm.	Confirmed.
267	39 of 362	4.6.9	Cables	As per 220kV system short time current and time is 40kA for 3 secs. Kindly confirm short time current and rating to be considered for metallic sheath of 220kV EHV cable.	40 kA for 1 second.
268			General	Please provide the Geotechnical Investigation Report (SBC) and ERT Report	Attached with the Addendum.
269	94 of 362	10	EXISTING FACILITIES UNDER AND ABOVE GROUND	Please provide the details of Underground utilities in the proposed SS Plot area.	To be discussed at the execution stage.
270			General	Contour drawing and proposed FGL is required for estimation of earth work for Land development. Please provide the level(s) - HFL, FGL & FFL?	No major earth work is envisaged at present.
271			General	We propose equipment support structure shall be Lattice type. Please clarify.	To be discussed at the execution stage.
272			General	Kindly confirm the distance of outfall for drainage system, if any.	To be discussed at the execution stage.
273			General	As per layout we understand that road is alredy existing for the new scope or we have to make new road for new scope of work. Please clarify.	New roads to be constructed with the new 220/33 kV Substation. Outside roads are already existing.
274			General	Kinldy Confirm Scope of Construction of boundary wall and Main Gate is considered in present scope of work.	No boundary Wall and main gate need to be considered.
275	Tender_3200000752_Spec_VOL-I_of_II	BPS Line Item No. 6.0, Clause No.6.A	5 T EOT Crane	It is not clearly mentioned in the Technical Specifcation that, Crane shall be Single Girder Type or Double Girder Type So, We are considering Single Girder EOT Crane for 220KV GIS Hall. Please confirm.	Subject to calculation/approval.
276	Tender_3200000752_Spec_VOL-II_of_II	Tender Layout Page No. 194	220 KV GIS AIR CONDITIONING	As per Tender Layout Section HVAC Supply air duct has been shown above EOT crane. We are planning HVAC Supply air Duct routing below the EOT crane to facilitate the GIS HALL air conditioning . Please confirm	To be discussed at the execution stage.
277	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.1 Air conditioning system	General	Air- Conditioning heat load calculation shall be done on the basis of max site temperature and unit will satisfactory work up to ambient temperature i.e. 50 deg C. Please confirm	Shall be as per clause no. 6.2.1 in Tender Specification Volume-II of II ((page 700f 190).
278	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.2 Ventilation system	Air cooled precision air conditioning (PAC) unit will serve GIS hall, switchboard room, SCADA room,operator room, tool room and corridor area. At least one unit of similar capacity shall be provided as a stand-by unit. PAC unit will be located inside PAC room whereas outdoor unit will be located on the roof of the building	We understand that Air conditioning system to be considerd with 1 Air changes/hr for following area. Please confirm. 1. GIS hall, 2. switchboard room, 3. SCADA room, 4. operator room, 5. tool room and corridor	Shall be as per clause no. 6.2.1 in Tender Specification Volume-II of II ((page 700f 190).

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
279	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.2 Ventilation system	Battery room shall have exhaust fans (1W + 1S, 2 x 100%). Flame proof type drive motor shall beprovided. All parts of this system coming in contact with acid fumes shall be epoxy painted.	as per Technical specification of air conditioning system and price schedule we understand that there is no air conditioning requirement in Battery Room. We are considering Tube axial flow type exhaust fan pls confirm.	Noted and confirmed.
280	Tender_3200000752_Spec_VOL-II_of_II	BPS Line Item No. 1.01	The wall mounted air cooled non duct-able split air conditioner complete with hermetically sealed rotary compressors (suitable for R-407C / R-32 refrigerant) of inverter driven (5 star) and air cooled condensers in the Outdoor unit with powder coated GI casing, built-in electrical items & supports and Indoor unit housing dry panel type HDPE filters (efficiency 90% down to 10 micron), cooling coils, evaporator fans with two speed drive motors, control console, all encased in powder coated GI casings with swivelling type supply air grilles and decorative RA grilles and interconnecting refrigerant piping (duly insulated) between outdoor and indoor units and insulated drain piping, microprocessor based cordless remote control panel and plug top with connecting cable for each split unit.	we are considering Hi-wall split unit inverter type with 5 star rating . As per specifications Split AC with dry panel type HDPE filters (efficiency 90% down to 10 micron) has been asked. Please note that that Hi-Wall spliy AC is OEM standard item same shall be provided.	Tender specification requirement should be met.
281	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.1 Air conditioning system	General	HVAC Equipment Make List is not available please provide the same.	To be mutually agreed at execution stage.
282	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.1 Air conditioning system	General	As per TS Inside temeprature condition is 24 Deg C is mentioned. Please provide the Winter season inside condition and RH% criteria if any .	Same to be maintained.
283	Tender_3200000752_Spec_VOL-I_of_II	11. PAINTING	Suitable painting methods shall be adopted as specified elsewhere	We understand that there is no specific anti corrosive paint protection criteria requirement for mechanical system . Please confirm	Bidder's understanding is correct.
284	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.1 Air conditioning system	General	As per TS Inside temeprature condition is 24 Deg C is mentioned. Please provide the Winter season inside condition and RH% criteria if any .	Same to be maintained.
285	Tender_3200000752_Spec_VOL-II_of_II	6.2 HVAC Technical Specification, Clause No. 6.2.2.1 Air conditioning system & Tender Layout Page No. 194	SCADA Room Air conditioning	There is discrepency in Technical specification of air conditioning system- Precision air conditioning system to be provided in SCADA Room but as per Tender Layout specific notes No. 2 - Split AC to be considered in SCADA Room. Pls Confirm	Precision air conditioning system to be provided in SCADA Room. Split AC to be considered in meeting room.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
286	Tender_3200000752_Spec_VOL-II_of_II	Clause no. 7 BASIS OF DESIGN FOR FIRE DETECTION AND FIRE FIGHTING WORK	Fire Fighting System for 220/33 KV Substation	As per referred clause, we understand that, following Fire Detection & Protection System shall be envisaged for this project. Please confirm 1. Fire Detection & Alarm System 2. Portable Fire Extinguisher 3. Clean Agent for SCADA Room 4. SITC of NIFPS System for 3 nos. 60/75 MVA Grid Transformers & 1 no. 25/31.5 MVA Transformer. 5. Installation, Testing & Commissioning of NIFPS System for ICT-2 25/31.5 MVA Transformer. Supply by others. Any Water Based Fire Protection System like (Hydrant System, HVWS System Sprinkler System etc.) or any other type of Fire protection System will not be provided for 220/33KV Susbstation in present Scope. Please confirm.	1) Correct. 2) Correct. 3) Correct. 4) Correct. 5) Installation and supply by others. No waater based fire protection system is envisaged.
287	Tender_3200000752_Spec_VOL-II_of_II	FORM-SP-05	Clause no- 2 Piping 2.1- All Piping material along with all Pipes, Fittings, Flanges, Gaskets, Valves, Strainers, Fasteners etc. excluding Fire Fighting Equipments. 2.2- Fire Fighting System	As per referred clause of Price Schedule, FORM-SP05, Piping Work, We understand that Piping Work for Fire Fighting System shall be related to NIFPS System for Grid Transformer & ICT-2 only & same shall not be related to any Water Based Fire Protection System. Please confirm.	Confirmed.
288	Tender_3200000752_Spec_VOL-II_of_II	7.2 Fire detection and alarm system & 2.3.2 Mechanical Exclusions & DOCUMENT NO EDB-0003, DESIGN BASIS FOR ELECTRICAL	On the alarming, two red flashlights shall be located in the SCADA Room and in the CPP-2 control room. Similarly, two horns shall also be provided in those two places. & b. Fire fighting work outside new 220/33 kV Substation. & The system shall be designed to provide audio-visual indication at the main panel to be located in fire station and zonal panels, in control rooms. Repeater panels shall be provided as specified in project design data sheet.	There is discrepency in referred clauses. As per Clause no. 2.3.2-b, Fire Fighting work outside new 220/33 KV Susbstation is excluded from scope, however as per Clause no. 7.2, Fire Alarm related scope is mentioned in Existing CPP-2 as well. Please clarify. We understand that, Fire Alarm System for New 220/33KV Susbstation shall be Standalone & the same shall not be integerated from any existing Fire Alarm System in CPP/Fire Station of refinery area. Please confirm.	Water based fire fighting/protection system is not required. However, fire detection and alarm system is required. The fire detection and alarm system of the new substation shall be hooked up with the existing Honeywell ESSER system in existing CPP-2 control room.
289	Tender_3200000752_Spec_VOL-II_of_II	7.2 Fire detection and alarm system	UV/IR type flame detectors shall be provided in process/field area for monitoring flame. This will be connected to fire panel. UV/IR detectors shall constantly monitor fire or flame by detecting the ultraviolet (UV) and/or infrared (IR) radiation from a hydrocarbon fuelled fire. The UV/IR flame detector shall be a unitized device that contains all sensing, signal processing and visual	Please clarify where UV/IR Detector provided in 220/33KV Susbstation area.	Tender specification requirement should be met.

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Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
290	Tender_3200000752_Spec_VOL-II_of_II	7.4 Clean agent system for SCADA Room	Clean Agent Cylinder bank location	Please clarify whether the Clean Agent Cylinder shall be placed in SCADA Room or Separate Cylinder Room shall be considered. Presently there is no Cylinder Room is shown in Layout, so, we understand that, cylinders shall be placed inside SCADA Room itself. Please confirm.	Confirmed to be located in the SCADA room itself.
291	Tender_3200000752_Spec_VOL-II_of_II	DOCUMENT NO EDB-0003, DESIGN BASIS FOR ELECTRICAL	The system shall be designed to provide audio-visual indication at the main panel to be located in fire station and zonal panels, in control rooms. Repeater panels shall be provided as specified in project design data sheet.	Please clarify Where the Repeater Panel shall be provided in 220/33KV Susbstation area.	Not envisaged at present.
292	Tender_3200000752_Spec_VOL-II_of_II	DOCUMENT NO EDB-0003, DESIGN BASIS FOR ELECTRICAL	4.16.6 The fire detection system shall be interfaced with fire suppression system, HVAC system and plant communication system, Clean agent system, Gas detection system, wherever specified. 4.16.9 System shall be designed to provide necessary audio visual signals at control room with mimic panel and repeater control panel. The system shall be hooked with main F & G panel located at the main control room. The repeated panel shall be located near Main Control Room.	Please clarify the scope of Gas Detection System/F&G System & location where the same shall be provided for 220/33KV Susbstation. We understand that same is not envisaged for 220/33KV Susbstation.	Not envisaged in substation.
293	Tender_3200000752_Spec_VOL-II_of_II	DOCUMENT NO EDB-0003, DESIGN BASIS FOR ELECTRICAL	4.16.14 A fire siren network with a common control panel at Fire control station shall be provided as per the standard sounds and with timer control to communicate abnormal situations / fire incidents in units/ OSBL areas.	Please clarify the scope of Fire Detection & Protection System in OSBL Area.	Not envisaged.
294	Tender_3200000752_Spec_VOL-II_of_II	General	Scope Clarification Fire Protecion System	We understand that, there is no scope of Fire Fighting System for CPP-1, CPP-2, CPP-3 or any other area outside battery limit of new 220/33Kv Susbstation. Please confirm	Confirmed.

Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
295	Tender_3200000752_Spec_VOL-II_of_II	2.1.1 Electrical Scope of Work	2. Testing and commissioning of Interconnecting Transformer ICT-2, rated 25/31.5 MVA, 33/33 kV as shown in the tender SLD & P&M Diagram. This ICT-2 shall be a free issued item along with its Nitrogen Injection Fire Protection System (NIFPS) to the Contractor by Owner. The Owner will supply and install this transformer. The Owner will also supply, install, test and commission the NIFPS of this ICT-2. However, the Contractor needs to do testing and commissioning of the ICT-2 after supplying and installation/laying of all relevant panels such as RTCC panel and associated control cabling for the RTCC panel/NIFPS control panel.	Please clarify the scope cabling for NIFPS System for Free Issued Transformer (ICT-2)	To be included in Bidder's scope of work.
296	382 of 490	Terms of Payment		We understand that all the payments under this contract shall be paid within 30 days from the date of invoice of respective items. Please confirm	As per tender document only.
297	487 of 490	Schedule of Quantity	Mandatory Spares Parts for 10yrs of Operation & Maintenance	Please provide the list of Spares that needs to be Quoted	List of mandatory spares are available in Volume-II of II, chapter 18.
298	487 of 490	Schedule of Quantity	Mandatory Spares Parts for 10yrs of Operation & Maintenance	Please provide the list of Spares that needs to be Quoted	List of mandatory spares are available in Volume-II of II, chapter 18.
299	488 of 490	Schedule of Quantity	33kV Cabling System	We understand that 33kV Cable will be Free issued by Owner. Please confirm how the Quantity variation will be covered due to change in Quantity. Since this is a LSTK Tender.	No quantity variation is envisaged.
300	384 of 490	3.2	Payment Terms	Please cofirm the list of Major Tagged Items.	Bidder to fill in in relevant SP.
301	200 of 490	8.21.0	STATUTORY APPROVALS	Please confirm: 1.Contractor shall not be responsible for statutory approvals,tree cutting, forest clearance, site clearances, access to site and right of way. The same shall be in scope of Employer/Owner. 2.Right of Way shall be in the Owner's/Consultant's scope	1) Only CEIG/CEA approval is required by the Bidder. 2) Confirmed. 3)

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Sr. No.	Clause No.	Document Clause	Subject	Queries by Bidder	Replies by Purchaser
302				Please add the following as a separate clause in the SCC; If Contractor notifies the Owner/Customer/Purchaser that the Works or a part of the Works are ready for acceptance, the Customer shall declare the acceptance of the Works or relevant part in writing within two weeks of the notified date. Upon expiry of the two week period the Works or relevant part of the Works shall be deemed accepted, unless the Customer has stated and substantiated in writing legitimate grounds on which it refuses acceptance. The acceptance shall be effective as of the date of Contractor's notification. In any event, the works shall deemed to be accepted if put in the commercial operation by the Purchaser. In case commissioning is delayed by more than 90 days from the scheduled date as notified by the Contractor to the Owner, due to reasons not attributable to Contractor/Supplier, then it will be considered as deemed commissioned. Consequently, the defect liability period shall start and the final payment due to Contractor (if any) shall become due to the Contractor.	Please follow the tender specification.
303	376 of 490	79	PROJECT SPECIFIC ACCOUNT	Please delete this provision. Since Working capital of this project and the cash flows would be either self-funded or funded via internal cash of the company, this account is not required.	Please follow the tender specification.
304	35 of 362	4.6.3	Grid Power Transformer	Please confirm the requirement of Type Test Report for Grid Power Transformer.	Required.
305	87 of 362	9	Vendor List	Please confirm whether Bidder can Propose/Consider Vendors approved in PGCIL/KPTCL.	Confirmed.
306			General	We Understand that System Study is not in Bidder Scope.	Confirmed except insulation cor=ordination study.

Attachment-8:

Engineering Design Basis Electrical

(Revised)

ENGINEERING DESIGN BASIS ELECTRICAL

JOB NO : **B038**

PROJECT : **EPCM Services for BS-VI Projects**

CLIENT : **MRPL**

EIL SIGNATURE : 24.05.2017

CLIENT SIGNATURE: M. MITRA.

Rev. No.	Date	Purpose	Prepared by	Reviewed by	Approved by
0	24/May/2017	Issued For Implementation	BANSAL VARUN	RATHAUR RASHMI SINGH (MS)	BHOGAL B R
A	20/Apr/2017	Issued For Client comments	BANSAL VARUN	RATHAUR RASHMI	BHOGAL B R

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

Table of Contents

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.6.
In case of any conflict between statutory requirements, this design basis and standard design philosophy, the most stringent requirement shall govern. AS BUILT SLD/drawing/design data to be furnished to MRPL in editable soft copy formats also along with regular hard copies.

2.0 ABBREVIATIONS, CODES & STANDARDS / PUBLICATIONS

2.1 ABBREVIATIONS

Code	Description
LED	Light Emitting Diode
ELR	Earth Leakage Relay
DCDB	DC Distribution Board
ACDB	AC Distribution board
AC	Alternating Current
ACB	Air Circuit Breaker
ASB	Auxiliary Service Board
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
EPC	Emergency Power Control Center
EPMCC	Emergency Power cum Motor Control Center
FRLS	Flame Retardent Low Smoke
GI	Galvanised Iron
GTG	Gas Turbine Generator
HMI	Human Machine Interface
HSR	High Availability Seamless Redundancy
HV	High Voltage
IEC	International Electro-Technical Commission
LDB	Lighting Distribution Board
LV	Low Voltage
MCC	Motor Control Centre
MCCB	Moulded Case Circuit Breaker
MOV	Motor Operated Valve
MV	Medium Voltage
NGR	Neutral Grounding Resistor
OLTC	On Load Tap Changer
PCC	Power Control Centre
PESO	Petroleum & Explosive Safety Organisation
PLC	Programmable Logic Control
PMCC	Power Cum Motor Control Centre
PRP	Parallel Redundancy Protocol

Code	Description
PT	Potential Transformer
PTB	Physikalisch-Technische Bundesanstalt
PVC	Polyvinyl Chloride
RCC	Reinforce Cement Concrete
RSTP	Rapid Spanning Tree Protocol
SFU	Switch Fuse Unit
SPN	Single Phase & Neutral
STG	Steam Turbine Generator
TP	Three Phase
TPN	Three Phase & Neutral
UPS	Uninterrupted Power Supply
VFD	Variable Frequency Drive
XLPE	Cross Link Poly Ethylene

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	Code of practice for the fire safety of buildings - Electrical Installations.	IS-1646	Latest
2	Code of practice for selection: installation and maintenance of automatic fire detection and alarm system.	IS-2189	Latest
3	Code of practice for the protection of buildings and allied structures against lightning.	IS-2309	Latest
4	Code of practice for fire safety of industrial buildings - Electrical generating and distributing stations.	IS-3034	Latest
5	Code of practice for Earthing.	IS-3043	Latest
6	Code of practice for Interior Illumination.	IS-3646	Latest
7	Application guide for Insulation Coordination.	IS-3716	Latest
8	Code of practice for installation and maintenance of electrical equipment in mines	IS-4051	Latest
9	Guide for safety procedures and practices in electrical work	IS-5216	Latest
10	Guide for selection of electrical equipment for hazardous areas.	IS-5571	Latest
11	Classification of hazardous areas(other than mines) having flammable gases and vapours for electrical installations.	IS-5572	Latest
12	Code of practice for Industrial Lighting.	IS-6665	Latest
13	Guide for Control of undesirable static electricity.	IS-7689	Latest

S.No.	Description	Standards / Codes	Edition
14	Guide for improvement of power factor - consumer's installations.	IS-7752	Latest
15	Application guide for on load tap changers.	IS-8478	Latest
16	Reference ambient temperature for electrical equipment	IS-9676	Latest
17	Code of practice for selection, installation and maintenance of transformer.	IS-10028	Latest
18	Code of practice for selection, installation and maintenance for switchgear and control gear.	IS-10118	Latest
19	Application guide for Power Transformer.	IS-10561	Latest
20	Voltage bands for electrical installations including preferred voltages and frequencies.	IS-12360	Latest
21	Guide for short circuit calculations in three phase AC systems.	IS-13234	Latest
22	Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres.	IS-13408(Part-1)	Latest
23	Guide to the use of electrical apparatus for potentially explosive atmospheres in the presence of combustible dusts	IS- 15142	Latest
24	National Electrical Code (NEC) - BIS Publication.	SP-30	Latest
25	Recommended practices on static electricity	OISD-STD-110	Latest
26	Classification of Area for electrical installation at Hydrocarbon Processing and handling facilities	OISD STD-113	Latest
27	Inspection and safe practices during electrical installation	OISD-STD-147	Latest
28	Design aspects for safety in electrical systems	OISD STD-149	Latest
29	Fire Protection System for Electrical Installations	OISD STD 173	Latest
30	Lightning Protection	OISD STD-180	Latest
31	Electrical apparatus for explosive gas atmospheres - General requirements.	IS/IEC 60079-0	Latest
32	Equipment protection flameproof enclosures "d"	IS/IEC 60079-1	Latest
33	Electrical apparatus for explosive gas atmospheres - Intrinsic safety 'I'	IS 5780/IEC 60079-11	Latest
34	Electrical apparatus for explosive gas atmospheres Increased safety type "e"	IS-6381/IEC 60079-7	Latest

S.No.	Description	Standards / Codes	Edition
35	Electrical apparatus for explosive gas atmospheres - Oil immersion "o"	IS 7693/IEC 60079-6	Latest
36	Electrical Apparatus for explosive gas atmospheres - Powder filling 'q'	IS 7724/IEC 60079-5	Latest
37	Classification of flammable gases or vapours with air with air according to their maximum experimental safe gaps and minimum igniting currents	IS 9570/IEC 60079-12	Latest
38	Electrical apparatus for explosive gas atmosphere -Part-15 Construction, test and marking of type of protection "n" electrical apparatus	IS/IEC 60079-15	Latest
39	Grid connected photovoltaic systems-	IEC 62446	Latest

3.0 GENERAL / DESIGN CONSIDERATIONS

S.No.	Project Philosophy
1	LV - Low Voltage. The voltage which does not normally exceeds 250 V.
2	MV - Medium Voltage. The voltage which normally exceeds 250 V and does not exceeds 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.

4.0 SPECIFIC DESIGN REQUIREMENTS

S.No.	Project Philosophy
1	Cables for lighting shall be sized to allow the following voltage drops - Street lighting : 10 % - DC Critical lighting : 5 %
2	CABLING
2.1	Cable route philosophy Street lighting, fire alarm and telephone cables shall be directly buried in road berm. Street lighting cables shall not be laid along with fire alarm and telephone cables. These cables shall be laid in separate road berm.
2..2	Cable laying philosophy The single core cables shall be laid in trefoil formation except for short run of cables within substations. Single core cables pertaining to 3-phase circuits shall be laid together and separated from multi-core cables. Single core power cables shall be colour coded in Red, Yellow, Blue (the outer sheath shall not be black in colour).

S.No.	Project Philosophy
2.3	Road crossings a) ERC shall be on overhead piperack for all cable crossings in process area. For areas where cables are laid underground, 150mm PVC pipes shall be provided. The ERC shall have min. 30% spare space. b) All new roads must be provided with ERCs (Electrical Road Crossings) - with minimum of two PVC pipes of 150 mm diameter - at each ERC and pull chambers (with brickwork & cover slab) on either sides. For straight long stretches of road, a maximum spacing of 75 Meters is to be maintained between adjacent ERCs. c) Electrical Road Crossings with PVC Pipes shall not have more than 3 rows at one location. ERCs for HV & MV cables at a same location shall be separate. Minimum 30% spare pipes shall be maintained at all ERCs. Pipes used for ERC shall be Heavy Duty PVC with 150 mm diameter (2x2).
3	Fire prevention & protection system shall be provided as per OISD-173. Fire resistant paint shall be provided as per OISD recommendation for all terminations (up to 1 m) from cable gland at switchgear end. Fire resistant paint shall also be provided at the load end terminations (up to 1 meter) for motors / DBs / JBs / Receptacles.
4	Single core power cables shall be colour coded Red, Yellow and Blue (outer sheath shall not be black in colour).
5	All connections in HV/MV/LV switchborads shall be screw less type with cage clamp connections. All CT connections shall be with isolation facility wherein CT connections get shorted on sliding of lever.
6	For HV and MV motors, LED indications for space heater supply ON shall be provided on respective feeders in the switchboard. Additionally, analog ammeter shall be provided on each bus section for recording the current drawn by space heaters fed from auxiliary 240V AC supply.
7	Space heater shall be provided for motors >= 30kW. However, for fin fan cooler motors, the space heater shall be provided for motors >=15kW.
8	Spare feeders shall be considered as per the following philosophy: a) 6.6 kV HV Switchboards: One (1) motor feeder for each CT rating; one (1) transformer feeder of each rating; one (1) plant feeder of each rating. b) PCC Switchboards: One (1) ACB motor feeder of each rating (on each bus); one (1) ACB Plant Feeder of each rating (on each bus); at least one (1) MCCB feeder of each rating (on each bus). c) MCC Switchboards: One (1) or 20% (whichever is maximum) motor feeders of each rating on each bus. d) LDBs / ELDBs / ASBs: Two (2) or 25% (whichever is maximum) feeders of each type (indoor / outdoor) & rating on each bus. e) DCDBs / UPS ACDBs: Two (2) or 25% (whichever is maximum) feeders of each rating. f) Lighting / Power Panels: One (1) or 20% (whichever is maximum) outgoing circuits in each phase.
9	All connections for DCS/PLC signals from SRRs to Substations (such as feeder on/ off commands, etc.) as required as per P&ID shall be hard wired through overall screened multicore & twisted pair 2.5sq.mm. cables.
10	Monitoring signals from sub-station 110 V DC System, sub-station UPS for Critical Lighting and control room UPS for DCS - such as ON / OFF / TRIP, Alarms (grouped), Battery Charging Mode (Float / Boost) shall be hardwired to the respective sub-station Data Concentrator. Additionally 4-20 mA signal for output current & voltage for these auxiliary systems shall also be hardwired to the respective sub-station Data Concentrator and further communicated to DCS.
11	For motor feeders, additional lock out relay shall be provided for process trips.
12	Breaker lifting trolley, breaker rack-in and rack-out handle, fuse puller shall be provided along with the switchboard.

S.No.	Project Philosophy
13	Existing telephone exchange is IP based. However, existing exchange has capacity to cater to new telephone requirements for new units and revamped units. Telephone handsets for the new buildings and FLP hansets is not to be procured.
14	Load shedding shall be considered only for all HV and MV incoming and outgoing breaker feeders. For these, hardwired breaker trip contacts from respesctive switchboards shall be extended to the dedicated marshalling panel to be placed in the respective substation.
15	Provision/ port for ECS connectivity with data concentrator to be provided. The connectivity shall be over multimode OFC with communicaton protocol of MODBUS over TCP/IP.
16	All motors tagged "A" shall be fed from left "A" bus and all motors tagged "B" shall be fed from right "B" bus. Motors tagged "C" shall be fed from A bus and so on.
17	Light Fixtures in Plant / Unit area shall be distributed in the following proportion: (Normal Lighting - 75% - Gray Coloured); (Emergency Lighting - 25% - Yellow Coloured). Adequate no. of critical lighting fixtures (Red coloured) shall also be provided.
18	Suitably sized Junction Boxes (JBs) are to be installed near motors for terminating multiple power cables / larger conductor cross-section power cables - than those recommended for direct termination by the OEM.
19	For emergency diesel generator (DG) sets, separate Auto Mains Failure (AMF) panels shall be provided outside the DG enclosure. The AMF Panel shall have an outgoing breaker / MCCB with contactor and 25 relay feeding the EPMCC / Emergency Switchboard.
20	All MOVs shall be fed from Emergency Power Switchboards only.
21	SS/MCC room to SRR cable entry shall be through MCT for new and existing units.
22	Following philosophy shall be followed: a) For START : NO contact shall be provided from DCS/ PLC. B) For STOP/ TRIP/ ESD : One common NC contact shall be provided from DCS/ PLC.
23	For electrical start operation of drives from DCS/PLC following signals must be available in DCS/PLC · a) Drive local / remote (From Substation) · b) Drive Ready to start (From Substation)
24	For electrical operation of drives that require Start Permissive from DCS/PLC,Latching shall be done at Substation/MCC end.
25	Dual redundant port (RS-485) connection at MODBUS-RTU from Data concentrator panel to DCS shall be provided. This connection shall be done through 2P, copper, overall shielded, armoured cable. Following status shall be taken through this connection for all the breaker feeders (motors rated above 55kW and incomer breakers of HV/PMCC/EPMCC). • Current • Trip circuit healthy • Breaker ON • Breaker OFF
26	For overall isolation of all level gauges in new unit , a contact will go from DCS to respective substation.
27	New UPS in new SRR for decongestion of SRR-6 is not required and 2 no. feeders in existing ACDB of required rating shall be provided for feeding of new PDB as envisaged for new building.
28	For Current Line Differential Protection, the Pilot Wire / communication channels shall be directly through fiber optic cable. Copper cables for pilot wires with multiplexers shall not be used.
29	Separate Dry-Type Lighting Transformers with manual offline tap changers to be provided for LDB / ELDB incomers.

S.No.	Project Philosophy
30	All MCCBs shall be microprocessor based with overload, short circuit and shunt trip feature.
31	Power Supply for Critical Lighting shall be through a separate dual redundant 240 V-AC or 415 V-AC UPS unit with two hour battery back-up.
32	All sub-station buildings coming under the BS-VI project shall have solar panels mounted on roof-tops and inverters for solar power generation. These shall be Grid Interactive Photo-Voltaic Solar Electric Plants feeding power to the PMCC Switchboard at Sub-Stations - which shall have provision for connecting to Solar Power Inverters with Reverse Power Protection.
33	All lighting panels, power panels and welding receptacles shall be provided with 4 pole incoming.
34	Consider 2 plant feeders + 1 spare plant feeder in 6.6kV switchboard in SS53 (SRU). These feeders are required for existing N2 plant. Load for each of these feeders shall be 2.5MW. Feeder differential relay shall not be considered for these feeders. Only feeder is to be provided, further cabling as required shall be done by MRPL.

5.0 OWNER / CLIENT SPECIFIC REQUIREMENTS

5.1 SITE CONDITIONS

S.No.	Description	Selected Option	Available Options
1	Equipment design temperature (IS-9676)	40 DEG C	a)40 DEG C b)45 DEG C c)50 DEG C d)Any other
2	Relative humidity	91%	
3	Soil Resistivity	As per soil investigation report	
4	Minimum temperature. for battery sizing	15 DEG C	a)10 DEG C b)20 DEG C c)Any other
5	Altitude above mean sea level	Less than 1000m above MSL	a)Less than 1000m above MSL b)Any Other
6	Maximum temp	37.8 DEG C	
7	Minimum temp	16.7 DEG C	
8	Siesmic Zone	As per IS 1893	

1. Min. temperature for electric heat tracing shall be 16.7 Deg C.
2. Average annual rainfall as 3500mm/ annum with mainly affected months from June to September.

5.2 POWER SOURCE DETAILS

S.No.	Description	Selected Option	Available Options
1	Power System	From Existing system	a)Independent system b)Existing system
2	Grid Supply	NA	a)Yes b)No (Below Clause is not applicable)
2.1	Name of sub station		
2.2	Number of feeders		

S.No.	Description	Selected Option	Available Options
2.3	Length of feeder		
2.4	Type /size of conductor/ cable size	__ sqmm	
2.5	Voltage	kV ± %	
2.6	Frequency	Hz ± %	
2.7	Maximum fault level		
2.7.1	3 Phase fault	kA, sec.	
2.7.2	1 Phase fault	kA, sec.	
2.7.3	X/R Ratio		
2.8	Minimum fault level	kA, sec.	
2.9	Design fault level	kA	
2.10	Basic Insulation Level	kV	
2.11	System neutral Earthing		
2.12	Minimum power factor	NA	a)0.9 b)0.95 c)Any other
2.13	Parallel operation of incomers	NA	a)YES b)NO
2.14	PLCC requirement	NA	a)YES b)NO
3	CPP and its configuration		
3.1	Type of Generator	Existing	a)STG b)GTG
3.1.1	Number of Generator	Existing	
3.1.2	Rating of Generator/Voltage/P.f	Existing	
3.1.3	Requirement of Generator Circuit Breaker	Existing	a)YES b)NO
3.2	Parallel operation with grid	Existing	a)YES b)NO
3.3	Type of Neutral Earthing for Generators	Existing	
3.4	Black Start DG Envisaged	Existing	a)YES b)NO
4	Emergency generator	Existing / New	a)Centralised b)Distributed
4.1	Generator Voltage	6.6kV (Existing for SS52) 415V (new for SS53 and 54)	a)6.6KV b)415V c)Any Other
4.2	Parallel operation with other sources	Momentary Paralleling and Maintenance test run.	a)Momentary Paralleling b)Continuously Paralleling
4.3	Auto Starting	YES	a)YES b)NO
4.4	Type of Emergency Generator	Diesel	a)Diesel b)Gas
5	Solar Power System	NOT APPLICABLE	
5.1	Solar PV System	Roof top Solar Power system (off grid)	a)Provided b)Not provided
5.2	Buildings on which solar power system to be mounted	Substations	

S.No.	Description	Selected Option	Available Options
5.3	Technology	Grid Interactive Photo Voltaic Solar Electric plants (without batteries)	
5.4	Battery	NA	
5.5	Connectivity	With substation data concentractor over IEC 61850	
5.6	Monitoring System	NA	a)Provided b)Not provided
5.7	Location of Inverter	Indoor (inside substation)	a)Outdoor b)Indoor

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	33kV / 6.6kV/415V ± 6%	a)11kV/6.6kV/415V ± 6% b)33kV/6.6kV/415V ± 6%
1.2	Frequency	50 Hz ± 3%	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%
2.2	DC critical Lighting system	Through 240V ±10% UPS	a)220V ± 10% b)110V ± 10%
2.3	Instrumentation Power Supplies	110V ± 1%	

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

5.3.2 UTILISATION VOLTAGE

S.No.	Description	Selected Option	Available Options
1	Primary EHV/HV distribution voltage	a)33kV	a)33kV b)66kV c)Any other
2	Secondary HV distribution voltage	a)6.6kV	a)11kV b)6.6kV c)3.3kV d)Any Other
3	Primary EHV/HV distribution system neutral Earthing	a)Solidly Earthed	a)Solidly Earthed b)NGR c)Unearthed
4	Secondary HV distribution system Neutral Earthing	Resistance Earthed	

S.No.	Description	Selected Option	Available Options
5	HV motor voltage for DOL	6.6kV (For motors rating >= 150kW)Except VFD driven motors	
6	MV motor voltage	415 V AC (except VFD motor) (For motors rating 0.18<=kW<=132)	
7	AC Motors	240V AC (except MOVs which shall be 3 phase) (For motors rating < 0.18kW)	
8	DC Motor	110V DC / As per equipment supplier standard	
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	
13	Auxiliary Boards incoming power supply	415V AC,TPN	
14	Welding Receptacles	415V AC,TPN	
15	Bulk loads like Process Heaters etc	415V AC,TPN	
16	Normal Lighting/Emergency Lighting	240V AC,SPN	
17	LAN UPS	UPS not considered. 240V AC, SPN (normal supply)considered for computer points. LAN sockets (passive components) considered only. All LAN cables to be terminated at one common point in respective building.	

5.3.3 UTILISATION VOLTAGE FOR CRITICAL SUPPLIES

S.No.	Description	Selected Option	Available Options
1	Switchgear protection control power supply	110V DC	a)220V DC b)110V DC
2	Critical lighting power supply	240V AC UPS supply	a)220V DC b)110V DC
3	Input power supply for Plant communication system	110V AC UPS supply	a)240V AC SPN (With Dedicated battery back up) b)110V AC UPS
4	Input power supply Fire alarm system power supply	240V AC SPN (With Dedicated battery backup)	
5	Power supply for electrical annunciation panel	NA	a)220V DC b)110V DC
6	Normal Instrumentation power supply	Refer Instrumentation design basis	
7	Critical instrumentation power supply	Refer Instrumentation design basis	

S.No.	Description	Selected Option	Available Options
8	Instrumentation Shut-down system power supply	Refer Instrumentation design basis	

5.3.4 OPERATING PHILOSOPHY

S.No.	Description	Selected Option	Available Options
1	Auto/Manual transfer at primary distribution voltage bus with momentary paralleling	a)NO (33kV)	a)YES b)NO
2	Auto/Manual transfer at secondary distribution voltage bus with momentary paralleling	a)YES (6.6kV)	a)YES b)NO
3	Auto /Manual transfer at MV with momentary paralleling		
3.1	At PCC/EPC/EPMCC Level	a)YES	a)YES b)NO
3.2	At MCC/ASB/LDB Level	YES with AUTO/ MANUAL transfer with ACBs or MCCB with contactor	a)YES b)NO
4	Continuous Parallel operation of Incomers		
4.1	Primary EHV/HV voltage	a)No(33kV. Only momentary paralleling	a)YES b)NO
4.2	Secondary HV voltage	b) No (6.6KV).Only momentary paralleling	a)YES b)NO
4.3	PCC/PMCC	a) No. Only momentary paralleling	a)YES b)NO
5	Power Factor Correction		
5.1	Power factor improvement capacitors- location	NA	a)6.6kV bus b)415V c)Both 6.6kV & 415V d)Any other
5.2	Minimum P.F. to be maintained at Transformer Primary	NA	
5.3	Monitoring at Transformer Primary	NA	a)YES b)NO
6	Load shedding	Yes	a)YES b)NO
6.1	Voltage level for Load Shedding	For all HV and MV incoming and outgoing breaker feeders	a)33kV b)11kv c)6.6kV d)0.415kV e)Any Other

5.4 CONTROL-PROTECTION - METERING

5.4.1 CONTROL PHILOSOPHY

S.No.	Description	Selected Option	Available Options

S.No.	Description	Selected Option	Available Options
1	Location of Relays for Generator	Generator control panel (Existing)	
2	Location of Relays for Outdoor Switchyard	Not Applicable	
3	Location of Protection relays for EHV/HV switchgear		NA
3.1	Primary voltage EHV/HV switch gear	a)On switchgear	a)On switchgear b)Separate relay and control panel
3.2	Secondary Voltage HV switchgear	a)On switchgear	a)On switchgear b)Separate relay and control panel
4	EHV/HV Switchgear control		
4.1	Generator	NA	
4.2	Outdoor Switchyard	NA	
4.3	Primary voltage EHV/HV switch gear	a)On switchgear	a)On switchgear b)Separate relay and control panel
4.4	Secondary Voltage HV switchgear	a)On switchgear	a)On switchgear b)Separate relay and control panel c)ECS
5	Numerical Protection/Monitoring system for		
5.1	EHV system	NA	a)YES b)NO
5.2	HV Switchboard	a) Yes	a)YES b)NO
5.3	PMCC/PCC	a)Yes	a)YES b)NO
5.4	MCC	No (However, numerical relays to be provided for MCC/ASB incomer and buscoupler rated greater than 400A)	a)YES b)NO
6	Control and logic through numerical relays	Yes	a)YES b)NO
7	Hardwired synchronization control panel-SCAP	No	a)YES b)NO
7.1	Synchronizing trolley required	NA	a)YES b)NO
7.2	Type of Panel	NA	a)Mosaic b)Simplex
7.3	Extent of Coverage on SCAP	NA	
8	Type of annunciation panel	No	a)HMI b)Part of SCAP
9	Load shedding panel	No (only provision of trip contacts with separate marshalling box for each switchboard (common for both buses))	a)Part of ECS b)Separate PLC c)Hardwired
10	Method of motor starting		

S.No.	Description	Selected Option	Available Options
10.1	HV Motors	Direct on line (Refer note-1)	
10.2	HV Motors	Note 1	a)Auto transformer b)Soft starter c)VFD d)Dedicated transformer 2 MW and above
10.3	MV Motors	DOL up to motor 132 kW rating	
11	Starting MVA limitation conditions for Motors		
11.1	HV Motors	To be decided during detailed engg.	
11.2	MV Motors	To be decided during detailed engg.	

Notes:
1. Soft starters/Auto transformer/Dedicated transformer/ V/F controlled soft starter shall be considered for starting large HV motors if essential/unavoidable as per system design requirement/equipment design limitation.

5.4.2 POWER ISOLATION FOR TRANSFORMERS LOCATED REMOTELY AWAY FROM HV SUBSTATION

S.No.	Description	Selected Option	Available Options
1	Push button in transformer bay for tripping remote breaker	Yes	a)YES b)NO
2	Local power isolating device	Yes (33kV and 6.6kV isolation breaker panels (as applicable)with feeder, line and transformer protection)	a)YES b)NO
3	Type	Breaker in panel	
4	Protection relay required	Yes	

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(2,4)	YES	-	YES	YES	YES (1)	YES
3	51G backup earth-fault relay (Earthed neutral)	51G(11)	YES	YES	-	-	-	-	-
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	-	-	-	-	NO	YES
6	Instantaneous over-current relay	50	YES	YES	-	-	-	-	-
7	Instantaneous earth-fault relay	50N	YES(2)	YES	-	-	-	-	-
8	Differential protection relay	87	YES(5)	-	YES(6)	YES(7)	-	YES	-

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) (NOT APPLICABLE)

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
1	Distance protection	21			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
9	Earth fault relay	50N				YES	YES

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
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/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	
30	Dead bus charging relay	98	YES(27)	YES	YES		

S.No.	Relay Description	NEMA Code	Generator	Generator Transformer	EHV Incomer	EHV Transformer	Syn. Motor
31	Over fluxing	99	YES	YES(28)			
32	Out of step	78	YES				YES

5.4.3.3 RELAY PROTECTION PHILOSOPHY

S.No.	Project Philosophy
30	For Current Line Differential Protection, the Pilot Wire / communication channels shall be directly through fiber optic cable. Copper cables for pilot wires with multiplexers shall not be used.
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 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. The transformer protection relay shall always be on the primary (HV) side of the breaker feeder.
6	For motors rated 1500 kW and above, excluding VFD fed motors. For VFD fed motors, motor protection numerical relays shall be provided on VFD panels only. For breakers feeding to VFDs, only feeder protection numerical relays shall be provided with the breaker feeder.
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 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 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.
18	Under voltage and over voltage function along with associated timer shall be part of the numerical relays.
19	Auto changeover logic between Incomers and bus coupler shall be built in the numerical relay.
20	Tripping relays (86) & Trip Circuit supervision relay (95) shall be part of numerical relay.
21	2 Nos. of 86 relays shall be considered for HV and MV breaker fed motors for ease of differentiating between process & electric trip. Process trip relay shall be electromechanical, self reset type.
22	Breaker control switch shall be hardwired type.
23	
24	Restricted earth fault relay 64R shall be provided for transformer rating >= 2.5 MVA in the incomer of switchboard fed from transformers having secondary voltage greater than 3.3KV and secondary winding is star connected.
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 seperate numerical relay. Hence shall not be part of main comprehensive numerical relay.CT for 87 and 64R can be clubbed, as two core of single CT.

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 : Digital (as part of multi function meter). Metering shall additionally be 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	HV Incomer	YES(3)	YES(3)	YES	YES	YES	YES	-	YES	YES	YES
2	HV Bus Tie	YES	-	-	-	-	-	-	-	-	-
3	HV Transformer	YES	-	-	-	YES	YES	-	-	-	-
4	HV Bus P.T.	-	YES	-	-	-	-	-	-	-	-
5	HV Plant Feeder	YES	-	-	-	-	YES	-	-	-	-
6	HV Motor	YES	-	-	-	-	YES(kWh)	YES	-	-	-
7	HV Capacitor	YES	YES	-	-	-	-	-	YES	-	-
8	PCC/PMCC Incomer	YES(3)	YES(3)	-	YES	-	YES(kWH)	-	-	-	-
9	PCC/PMCC Bus Tie	YES	-	-	-	-	-	-	-	-	-
10	PCC Bus P.T.	-	YES	-	-	-	-	-	-	-	-
11	ACB Outgoing (Non motor)	YES	-	-	-	-	YES(kWh)	-	-	-	-
12	MV Motor (>55kW)	YES (3)	YES (3)	-	-	-	YES (kWh)	-	-	-	-
13	MCC/ASB Incomer	YES(3)	YES(3)	-	-	-	-	-	-	-	-
14	MCCB O/G(250A)	YES	-	-	-	-	YES(kWh)	-	-	-	-
15	LDB Incomer	YES(3)	YES(3)	-	-	-	YES(kWh)	-	-	-	-
16	DG Set-MV	YES	YES	YES	YES	YES(kW)	YES(kWh)	YES	-	-	-

1.Field Ammeters are to be provided for all motors rated above 5.5kW.
2.All metering shall be part of numerical relay in case of electrical system having numerical relays.
3. Digital Multi function meter with RS-485 port for communication for all feeders rated above (& including 160Amp.) shall be provided.
4. Analogue ammeters with selector switches shall be provided on all DOL motor feeders rated above and including 15kW.
5. All MV & HV breaker feeders shall have separate Digital Multi Function Meters with RS-485 port for communication - apart from Numerical Relays.

6. Additionally, for incomer feeders, analogue voltmeters with Selector Switches shall be provided on the line side as well as bus side for all HV and MV switchboard incomers.

5.4.4.2 METERING FOR GENERATOR AND GENERATOR TRANSFORMER

5.5 SUBSTATION DESIGN

5.5.1 SUBSTATION AUTOMATION SYSTEM

S.No.	Description	Selected Option	Available Options
1	Substation Automation System (SAS)	Data Concentrator	
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)IEC 61850 HSR d)Redundant architecture for other open protocols
4	Data concentrator for SAS	common for HV & MV	a)not required b)common for HV & MV c)seperate for HV & MV
5	Communication with other devices		Existing
5.1	Communication with ECS	Ports provided	
5.1.1	Protocol for communication with ECS	MODBUS over TCP/IP (Refer Note-1)	a)IEC 61850 b)Modbus
5.2	Communication with DCS	Hardwired. ports are also available on data concentrator	a)part of data concentrator b)part of ECS RTU
5.2.1	Protocol for communication with DCS	Hard wired for control/status. However Dual Redundant RS485 ports available on MODBUS-RTU protocol.	
5.3	Communication with VFD & UPS	part of data concentrator	a)part of data concentrator b)part of ECS RTU
5.3.1	Protocol for communication with VFD & UPS	IEC 61850	
6	HMI for SAS	1 operator & 1 engineering workstation with 1 no. A3 printer	a)not required b)operator cum engineering workstation c)1 operator & 1 engineering workstation
7	Laptop	Separate for HV & MV for each substation	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 data concentrator	a)not required (part of ECS) b)part of HMI c)part of data concentrator

S.No.	Description	Selected Option	Available Options
9	Relay parameterization	through Laptop (locally)	a)SAS HMI b)ECS HMI

1. Time synchronization feature shall be provided with respective sub-station data-concentrators for communication with ECS / SCADA system. Communication with ECS / SCADA system - through dual redundant multimode Optical Fiber Network.
2. Power for DCP shall be fed from Substation 110V DC system.

5.5.2 EHV SWITCHYARD

S.No.	Description	Selected Option	Available Options
1	Type	NA	
2	Type of bus	NA	a)String bus b)Tubular bus
3	Structure for outdoor	NA	a)Galvanised b)Painted c)Not applicable
4	Bus material	NA	a)Aluminium b)Copper

5.5.3 SUBSTATION FEATURES

S.No.	Description	EHV	HV	MV	MCC/Elec. Room
1	Elevated with trays in cable cellar	NA	YES	Yes	NO
2	Raised with internal trenches	No	NO	NO	YES (refer Note-2)
3	All top cable entry with trays below ceiling	NA	NA	NA	YES (refer Note-3)
4	Pressurisation against ingress of dust	NA	NA	NA	NA
5	Air-conditioned room for operator	NA	YES	YES	NA
6	Roof slab for				
6.1	Power transformer	NA	YES	NA	NA
6.2	Distribution transformer	NA	YES	YES	
7	Air conditioning of switchgear hall	NA	YES	YES	YES
8	EOT crane in sub-station	NA	NA	NA	NA
9	Capacitor Bank	NA	NA	NA	NA

1. Substation shall be provided with gents toilet, ladies toilet and an electrical store room.
2. Raised with internal trenches and cable trays in two or three layers - adequate space shall be provided for man movement inside trench after tray installation.
3. Each HV/MV sub-station shall have separate toilets / washrooms for Gents & Ladies.
4. Each HV/MV sub-station shall have a Maintenance Personnel Room.
5. All Rolling Shutters for Sub-Station Buildings shall be motorised.
3. Electrical panels for Air-Conditioning System shall have top cable entries.

5.5.4 SPECIFIC EQUIPMENT LOCATIONS

S.No.	Description	Selected Option	Available Options
1	Batteries in substation and control Rooms	Separate room in substation/ control room for electrical and instrumentation system respectively, with own ventilation	
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	a)Air-conditioned room in substation b)SRR
5	Thyristor controlled panels	Air conditioned room	a)Air-conditioned room in substation b)SRR
6	UPS System	Air conditioned room in control room	
7	Lead-Acid and Nickel-Cadmium	Separate room	a)Separate room b)Common room
8	Location of VRLA battery	NA	
9	Annunciation panel	NA	
10	Energy saver panel with Lighting transformers	NA	
11	GIS Hall	NA	a)Air Conditioned b)Pressurised

1. Battery room shall be preferably located in corner side of control room building.
2. Electrical equipment installed in battery room such as exhaust fan, lighting, battery circuit breakers, receptacles shall be of frameproof and corrosion proof construction and certified for gas group II-C classified locations. Heat detectors installed in battery room shall be of intrinsically safe type.

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	NA	a)Single b)Double
2	Circuit breaker type	NA	
3	Isolator type	NA	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	Execution	NA	
2	Type of Switchgear	NA	
3	Busbar	NA	a)Double b)Single
4	Circuit Breaker Type	NA	

5.6.2 HV SWITCHBOARD

S.No.	Description	Selected Option	Available Options
1	Execution	Fixed	a)Drawout b)Fixed
2	Type of switchgear	GIS (SF6)	a)Air insulated b)Gas insulated
3	Bus bar	Single bus	a)Single bus b)Double bus
4	Circuit breaker type	VCB	a)SF6 b)VCB
5	Motor Control	VCB	a)Breaker b)Vacuum contactor

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	
2	PT Secondary	110V AC	

5.6.4 TRANSFORMERS (POWER/DISTRIBUTION)

S.No.	Transformer	Voltage Ratio	Vector Group	Tap Changer	Cooling
3	Main power transformer	33/6.9kV	Dyn1	Off load Tap Changer	ONAN/ONAF
2	Dedicated (e.g. for VFD)		As Reqd.	Off-circuit	ONAN
4	Intermediate power transformer	11/6.6kV	Dyn11	Off Load Tap Changer	ONAN / ONAF
5	Distribution transformer (<= 2500 KVA)	6.6/0.433 KV	Dyn 11	Off-load tap changer	ONAN

Note:
1) Oil Soak Pits & Common Collection Pits shall be provided for all transformers within a sub-station when the total oil quantity exceeds 2000 Liter.

2) Nitrogen Suppression type Fire Fighting system for all oil-filled transformers rated for 5

MVA and above or oil greater than 2000 Liters.

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	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	Above 55 kW Up to and including 132 kW	
5.2	MCC	Up to and including 55 kW	
6	Type of switchboard for small package (AC system, Pressurisation system ,Bagging plant etc)	Compartmentalised Fixed type	a)Compartmentalised Fixed type b)Non Compartmentalised Fixed type

5.6.6 MEDIUM VOLTAGE MOTOR STARTER TYPE

S.No.	Description	Selected Option	Available Options
1	Contactor and switch fuse with overload relay	NA	
2	Contactor, switch fuse and overload relay with CBCT for earth fault protection	NA	
3	Contactor and switch fuse with motor protection relay	NA	
4	Air circuit breaker with motor protection relay	Above 55kW up to 132KW (Separate CBCT for earth fault protection is required)	
5	Contactor and MCCB with overload relay	Less than 30kW. Electronic type motor protection relay with display shall be provided.	
6	Contactor, MCCB and overload relay with CBCT for earth fault protection	30kW and above up to 55kW. Electronic type motor protection relay with display shall be provided.	

1. MCCB (3 Pole with microprocessor release) & Contactors with Electronic Motor Protection

Relays (with display) -1 Ampere to 63 Amperes.
2. Moulded Case Circuit Breakers (MCCBs - 3 Pole with microprocessor release) & Contactors with with Electronic Motor Protection Relays (with display), CBCT and ELR. - 80 Amperes to 125 Amperes.
3. Air Circuit Breakers (ACBs - 3 pole) with Numerical Motor Protection Relays & CBCT for Earth Fault Protection for motors rated above 55 kW and up to / including 132 kW.

5.6.7 MEDIUM VOLTAGE OUTGOING FEEDER TYPE

S.No.	Description	Selected Option	Available Options
1	Switch fuse	NA	
2	Switch fuse with Contactor and CBCT for earth fault protection	NA	
3	MCCB with Contactor and CBCT for earth fault protection	Moulded Case Circuit Breakers (MCCBs - 4 Pole with microprocessor release) with contactor - 160 Amperes to 400 Amperes.	a)___A and up to ___A b)Not Applicable
4	MCCB	Moulded Case Circuit Breakers (MCCBs - 4 Pole with microprocessor release) - 16 Amperes to 125 Amperes.	a)___A and up to ___A b)Not Applicable

Note
1. Earth leakage relay shall be hand reset type.
2. For MV Switchboards rated for 400 A (including) or below, MCCBs (4-pole) shall be used for Incomers (with CBCT for Earth Fault Protection) & Bus-Couplers (with Auto- Transfer Mechanism).
3. For MV Switchboards rated for 630 A (including) and above, ACBs (4-pole) shall be used for Incomers (with CBCT for Earth Fault Protection) & Bus-Couplers (with Auto- Transfer Mechanism).

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

S.No.	Description	Selected Option	Available Options
1	Auto/OFF/Manual switch	On switchgear	a)Near motor b)Switchgear c)Control room
2	Local/OFF/Remote switch	ON lCS/ Push button station near motor	a)Near motor b)Switchgear c)Control room
3	Process interlock	PLC	a)PLC b)Switchgear
4	Reacceleration equipment	Switchgear	a)PLC b)Switchgear

5.6.9 CONTROL SUPPLY VOLTAGE

S.No.	Description	Selected Option	Available Options
1	Breaker control	110V DC	a)220V DC b)110V DC

S.No.	Description	Selected Option	Available Options
2	Breaker spring charging	110V DC	a)240V AC b)220V DC c)110V DC
3	Contactor feeder	240V AC	
4	Control supply for earth fault relay in contactor feeder(Note 1)	110V DC	a)24V DC b)220V DC c)110V DC d)240V AC
5	Control supply for contactor motor starter	Through control transformer	a)Control Transformer b)Tapping P-N of Respective Feeder c)Control Transformer in individual DOL Starter
6	Control transformer for each feeder	No. Common control transformer for each bus	a)YES b)NO c)Not Applicable

1. 240 V AC - Control Supply for all MV Switchboards - PMCC / MCC / LDBs / ASBs shall be through control transformers on individual buses.
2. 110 V DC Control Supply for HV & MV Switchboards shall be through two separate sources with a provision for source selection. 110 V DC Control Supply Buses shall have isolation feature through MCBs and shall be separate for each Bus on HV / MV Switchboard.
3. 240 V AC Control Supply for HV Switchboards shall be through two separate sources with a provision for source selection. 240 V AC Control Supply Buses shall have isolation feature through MCBs and shall be separate for each Bus on HV the Switchboard.

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)	B / F (Temp. Rise limited to B)
3	Anti-condensation heater	Yes	30 kW and Above
4	Additional canopy (outdoor motors)	Yes (FRP type) including for MOVs and indoor motors	Yes
5	Design voltage variation	±6%	±10%
6	Design frequency variation	±3%	±3%
7	Combined voltage / frequency variation (Design)	±10 % Any combination of above	±10 % Any combination of above

1. Motors for MOV actuator shall have F class of insulation with temperature rise limited to class-B.
2. All MV motor shall be minimum IE2 Type.
3. Terminal box for HV motors shall be phase segregated type.

5.6.11 UPS SYSTEM

S.No.	Description	Selected Option	Available Options

S.No.	Description	Selected Option	Available Options
1	Redundancy	100%	a)50% b)100%
2	Type of redundancy	Parallel redundant	a)Parallel redundant b)Hot standby
3	Back-up time	60 minutes	a)30 minutes b)60 minutes c)120 minutes
4	Bypass transfer control	Auto	a)Auto b)Manual
5	Separate fault diagnostic unit (Note 1)	Yes	a)YES b)NO
6	Battery type	Ni-Cd (2X100% dual modular redundant configuration in all options) Refer note-3	a)Lead acid b)Ni-Cd c)VRLA(in 2x50% configuration)
7	Type of UPS	IGBT	a)IGBT b)Transistorised
8	UPS Output Supply	Single Phase	a)Single Phase b)Triple Phase
9	UPS Output Voltage	110V AC	

1. Seperate Fault Diagnostic Unit(FDU) is required.
2. UPS for data communication system and sub-station HMI shall be non redundant with bypass type with VRLA battery.
3. Battery charger shall be rated for full load and boost charging 1x100% battery set.
4. All new UPS systems shall be interfaced (hardwired) with the respective sub-station Data Concentrator system for Fault Diagnosis / condition monitoring on HMI.
5. All battery banks for UPS System shall have a separate isolation switch with over-current protection. Isolation switches if mounted inside the battery room, shall have a explosion proof enclosure suitable for II C area.

5.6.12 COMMUNICATION SYSTEM

S.No.	Description	Selected Option	Available Options
1	Plant Communication System	Yes (IP based) (Existing to be extended wherever possible)	a)YES b)NO
2	Telephone System	Yes (IP based) (Existing to be extended) (Interconnection with existing system through OFC)Telephone lines requirement for new facilities shall be tapped from the closest available telephone JBs of the existing system.	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	NO	a)YES b)NO

S.No.	Description	Selected Option	Available Options
4.2	With telephone system	NO	a)YES b)NO

1. All telephone outlets shall be wired with 2-pair, 0.5mm dia cables. Similarly all Plant Communication Call Stations shall be ired with a minimum of 6-pair cables.

5.6.13 FIRE DETECTION AND ALARM SYSTEM

S.No.	Description	Selected Option	Available Options
1	Type	Analogue addressable IP based DGFAP (Hook with existing system wherever possible)	a)Conventional b)Analogue addressable
2	Name of buildings to be provided with Detectors	Control room,Substations, SRRs, DG room, MCC room, non plant buildings, canteen, workshop, etc.	
3	Detection System	Break Glass, Multi sensor detection	
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	Not required (Existing)	
6	Power supply for Siren	415V AC	a)415V AC b)110V AC UPS c)48V DC
7	Siren range	Not Required (Existing)	
8	Response indicator for rooms and concealed area for Addressable Fire alarm system	Yes	a)YES b)NO c)Not Applicable

1. Repeater panel is required for SS-53.
2. Manual Call Points (MCPs) /Break Glass Units (BGUs) for plant / outdoor areas shall all be suitable for II B / II C areas. BGUs for Office Buildings shall be modular flush mounted type.
3. If additional Fire Alarm devices are envisaged for upcoming revamp facilities, then the types / makes shall be exactly similar to the existing Honeywell XLS -1000 devices. Existing FA loops are to be extended to include newly installed devices.

5.6.14 DC SYSTEM

S.No.	Description	Selected Option	Available Options
1	Battery type		EXISTING
1.1	Switchgear Protection Control and critical lighting	Ni-Cd	a)Lead acid b)Ni-Cd c)VRLA
1.2	Instrumentation System	Ni-Cd	a)Lead acid b)Ni-Cd c)VRLA
1.3	Diesel Engine Starting	Lead Acid	

S.No.	Description	Selected Option	Available Options
1.4	DC Motors	As per manufacturer recommendation	a)Lead acid b)Ni-Cd c)VRLA
1.5	Fire alarm system	Ni-Cd/ VRLA (with 48hrs (normal)+ 30 minutes (alarm))	
1.6	Telephone system	NA	
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 (As per instrument design basis)	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% dual modular redundant(refer note-1)	a)2X50% b)1X100%

1. Battery charger shall be rated for full laod + float charging or boost charging 1x100% battery set, whichever is more.
2. All battery banks for DC System shall have a separate MCCB / isolation switch with over-current protection. MCCBs / Isolation switches if mounted inside the battery room, shall have a explosion proof enclosure suitable for II C area.
3. 110 V DC Systems shall have Dual Redundant Chargers (2 X 100% capacity) - with a single outgoing. Auto-Transfer mechanism shall be provided on the chargers" output side - with a single output to the DCDB Incomer.
4. Each 110 V DCDB shall have a single MCCB incomer with Digital Multifunction Meter and MCB Outgoing Feeders with ON indication (LED).

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		
2.1	MV Inverter	i) Motor kW rating upto 300KW at 415V , ii) More than 300kW & up to 700kW at voltage upto 690V	
2.2	HV Inverter	Motor rating more than 700kW	

Notes:
1. Bypass for VFD shall be provided as a standard practice unless not recommended from Process or driven equipment operation point of view.

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
1	Medium voltage power cable	Refer Note 4	a)Above 16 sqmm (Aluminium) b)2.5 sqmm to 16 sqmm (Copper)
2	Control cables	2.5 sqmm (Copper) (Note-5)	
3	Lighting	Cabling for plant / area lighting shall be with 2.5 / 4 sq. mm. multi-stranded copper conductor cables only.	
4	Communication system	0.9 mm dia. (Copper)	
5	Telephone System	0.9 mm dia.(Copper)	
6	Fire alarm system	1.5 sqmm (Copper) Refer note-8	

Notes:
1. Building wiring for lights / sockets / etc. shall be with FRLS PVC insulated 3 Core or 4 core flexible cables only - for circuit & point wiring. Individual wires shall not be used. For such building wiring 1.5 / 2.5 / 4 sq. mm. cross-section copper conductor cables shall only be used.
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. Cables having 25 sq. mm. cross-section or less shall have copper conductors. All MV power cables above 25 sq. mm. cross-section shall be with Aluminum conductors only - for all applications.
5. Control cable shall be twisted pair overall shielded type.
6. All armoured Control / MV & HV Power Cables shall have FRLS PVC outer sheath & XLPE insulation (Peroxide or Dry Cured with Nitrogen). Cables shall have low smoke properties i.e. FRLS type with 60% (Max) smoke density.
7. All outdoor safe-area /outdoor non-plant / indoor safe-area junction boxes, power distribution boxes, receptacles, sockets & plugs shall have polycarbonate enclosures with Ingress Protection class of IP-65 with adequately sized screwed / screw-less terminals inside.
8. Looping cable between DGFAP with repater panel/ CFAP shall be with 2.5 sq mm conductor.
9. All HV cables (single core or three core) shall be with Aluminum conductors only - for all applications.

5.7 CABLING SYSTEM

5.7.1 CABLE DETAILS

S.No.	Design Criteria	EHV	HV	415 volts

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

1. All armoured cables shall be of FRLS type with XLPE insulation (Peroxide or Dry Cured with Nitrogen). All flexible cables shall be of FRLS type with PVC insulation.
2. Cables from UPS / DC System Battery Banks shall be 3 Core flexible cables.
3. Only solid (single strand) Conductors to be used for Telephone / Fire Alarm / Plant Communication Systems. Multi-strand conductors to be used for all other applications - wiring for Lighting / MV Control / MV & HV Power Cables.
4. In case number of cable runs to motor loads increases due to voltage drop consideration, then adequately sized JBs with relevant area classification enclosures shall be supplied by the motor supplier.

5.7.2 CABLE LAYING PHILOSOPHY

S.No.	Description	Selected Option	Available Options
1	Process area	Overhead cable tray (main)/RCC trench (localized, based on site condition)	a)Overhead cable tray b)RCC trench

S.No.	Description	Selected Option	Available Options
2	Offsite paved area	Overhead cable tray / RCC trench	a)Above Ground cable tray on sleeper b)Overhead rack c)RCC trench
3	Offsite unpaved area	Above Ground cable tray/RCC trench	a)Above Ground cable tray b)Directly buried
4	Type of cable trays	hot-dip galvanised MS Cable Trays with painting / powder coating over the galvanized layer (Duplex System).	a)Galvanized prefabricated. b)Site fabricated and painted c)FRP type
5	Road Crossings for underground cables	PVC pipes (refer note below)	a)PVC Pipes b)Cable culvert
6	Road Crossings for Above ground cables	Overhead cable bridge/ ERCs	a)Overhead cable bridge b)Culvert

1. Separate cable tray for OFC / Plant Communication / Fire Alarm / Telephone Cables at all places (offsite area / plant area / buildings).
2. Electrical Road Crossings with PVC Pipes shall not have more than 3 rows at one location. ERCs for HV & MV cables at a same location shall be separate. Minimum 30% spare pipes shall be maintained at all ERCs. Pipes used for ERC shall be Heavy Duty PVC with 150 mm diameter.
3. OFC shall be armoured. When laid underground, OFCs shall be pulled inside HDPE pipes with pull wire. When laid on trays - no separate HDPE pipes envisaged for OFC laying.
4. ERCs must mandatorily have cable pull chambers on either ends constructed with brickwork / plaster & covered with RCC Slab.
5. At places where cables are directly buried in earth, before back-filling with loose earth, the cables shall be covered with a layer of sand and RCC Tiles of minimum 50 mm thickness.

5.8 EARTHING SYSTEM

S.No.	Description	Selected Option	Available Options
1	Earth electrode	Earth Electrode - 50% proportional mix of Galvanized MS Pipe (3 metre long)with Charcoal & Salt Earth-Pits and Galvanised MS Pipe with Bentonite / Marconite chemically treated Earth-Pits.	
2	Main earth loop material	GI strip (Refer attached Annexure-1)	
3	Substation earth loop	GI strip (Refer attached Annexure-1)	
4	EHV switchyard earth grid	NA	

1. For motors, refer attached Annexure-1 for earthing conductor size and specification.
2. For sub-station treated earth-pits with salt-charcoal, a permanent water line with service water shall be extended to all Pipe Electrodes for water treatment. A common tap / valve shall be provided on the water line.

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 (both LDB and ELDB)	a)YES b)NO
3	Lighting transformer required	Yes (both for LDB and ELDB incomers)	a)YES b)NO
4	100% Standby transformer for normal lighting system	Yes for all substations and MCC rooms having LDB/ ELDB	a)YES b)NO
5	100% Standby transformer for emergency lighting system	YES (NO for MCC rooms)	a)YES b)NO
6	Lighting transformer voltage ratio	415V/415V	a)415V/415V

1. ELCB shall be provided at the incomer of the LP/PP.
2. Lighting Transformers shall not have any energy saving feature - however provision for off-line tap cahnging shall be provided on this isolation transformer.
3. Additional control facility (ON & OFF) shall also be provided for control of all outdoor and process area lighting from DCS. The control facility shall be grouped for respective unit/ offsite/ tankage area. The selector switch for DCS/ LDB control shall be provided in DCS. Apart from process area lighting, no other outdoor lighting shall have remote controlling feature from DCS. Emergency lighting at all locations shall not have any remote controlling feature from DCS.
3. For remote buildings, critical lighting shall be through portable LED lanterns with rechargeable batteries. In buildings, all exit points / pathways / staircases must be illuminated by critical lighting.

5.9.2 CONTROL PHILOSOPHY

S.No.	Description	Selected Option	Available Options
1	Outdoor yard	Auto/Manual	a)Auto b)Manual c)Centralised d)Local
2	Street lighting	Auto/Manual	a)Auto b)Manual c)Centralised d)Local
3	Outdoor process area	Auto/Manual	a)Auto b)Manual c)Centralised d)Local
4	Process building	Auto/Manual	a)Auto b)Manual c)Centralised d)Local
5	Auto control	Photocell	a)Synchronous timer b)Photocell c)ECS
6	Lamp type for outdoor general lighting	1.Process/Off site Area: LED, High mast 2.Street Lighting: LED, Self powered Solar lamp	

S.No.	Description	Selected Option	Available Options
7	Lamp wattage for outdoor lighting (Normal)	During Detailed Engg	
8	Lamp type for emergency AC lighting	LED	a)CFL b)LED
9	ELCB at Incomer of Lighting / Power Panels	Yes	a)YES b)NO
10	Switch ON/OFF push button at substation entry	Not required	a)YES b)NO

NOTES:
1. 10% street lighting shall be with Self powered Solar lamp.
2. LED lamp shall be provided for high mast lighting.
3. In control rooms and sub-stations (switch-gear hall / cable-cellars) all light fixtures are to be provided with light switches with ON indication - after the MCB distribution board.
4. 20% of street lighting shall be with self-powered Solar Panelled LED Lights (with battery back-up & timer / photocell).
5. Only LED flood-lights shall be provided for high mast lighting. Each High Mast shall have a timer / photocell -contactor arrangement in its respective feeder pillar. High Mast feeder pillars shall be weatherproof with IP-55 protection. High mast shall be installed in safe area to the extent possible.
6. Light-fixtures in transformer bays shall be put on timer / photocell circuit from sub-station outdoor lighting distribution board.

5.9.3 AC EMERGENCY LIGHTING

S.No.	Description	Selected Option	Available Options
1	Name of process plants	All process areas (offsites and utilities)	
2	Name of buildings	Control rooms, substations, SRRs, DG room, etc.	
3	Power supply source	Under normal conditions - through normal 415 V supply; Under Black-Out conditions - through Emergency DG Set	

1. AC Emergency Lighting shall be provided in all buildings - all building lighting boards shall be fed from ELDBs located at nearest sub-station.
2. In process units, 25% of total lighting (normal + emergency) shall be fed from ELDB.

5.9.4 DC CRITICAL LIGHTING FOR ESCAPE

S.No.	Description	Selected Option	Available Options
1	Name of process units	All	
2	Name of building	Substation, Control room, SRR, DG room, etc.	
3	Power supply	240V AC LED type	a)220V DC b)110V DC
4	DC lighting for remote buildings	Through portable LED lanterns with rechargeable batteries. In buildings, all exit points / pathways / staircases must be illuminated by critical lighting.	

5.9.5 WIRING TYPE

S.No.	Description	Selected Option	Available Options
1	Process plant / Building / Shed	Armoured cable	
2	Large service building	PVC Concealed conduit	
3	Buildings with false ceiling	Black enamelled Surface conduit above false ceiling and PVC concealed conduit in walls	a)Surface conduit above false ceiling b)Cables
4	Substation (Switchgear Room)	METSEC channel in switchgear room/ concealed conduits	a)METSEC channel b)Concealed conduit
5	Substation (Cable Cellar)	Surface conduit	a)Surface Conduit b)Armoured cable
6	Other buildings in safe area	Black enamelled Surface conduit /PVC concealed conduit	

1. In Process Plant / Sheds: Armoured cables laid on Galvanized MS Trays. In Buildings: Flexible PVC insulated cables laid on GI Trays / Metsec Channels / Heavy-Duty PVC Conduits / (Duplex) Galvanized MS Conduits / Trunking system (concealed or surface).
2. In buildings with false ceiling - flexible PVC conduits shall also be used for cabling of recessed mounted light fixtures (vertical drop portions).
3. In buildings without false ceiling, concealed PVC conduiting is to be done in roof / floor slabs for lighting & fire alarm cabling.
4. Genarally all conduiting in buildings shall be concealed (except in cable cellar), mandatorily in office buildings.

5.9.6 SPECIFIC LIGHTING REQUIREMENTS

S.No.	Description	Selected Option	Available Options
1	Aviation lighting	Yes (LED)	a)YES b)NO
2	Security lighting for peripheral road boundary wall	Yes (LED flood lights)	
3	Type of control gear for HPMV/HPSV lamps	NA	a)Separate b)Integral
4	Control gear box location	LED Fixtures shall be preferably Integral Type (with in-built controller / converter PCBs)	
5	Type of high mast flood light	30 meters Telescopic tubular	a)30 meters Telescopic tubular b)Lattice structural mast

Notes:

1. All Lighting Poles / High Masts shall have Duplex System coating - i,e. Painting or Powder Coating over Hot Dip Galvanized Mild Steel.
2. For corrosive areas, die-cast Aluminum enclosed light fixtures shall be installed with die-cast aluminum JBs / DBs (in hazardous areas) and polycarbonate enclosed Industrical Light

Fixtures shall be installed with polycarbonate JBs / DBs (in safe areas).
3. Light Fixtures installed in transformer bays shall be polycarbonate enclosed with polycarbonate JBs / Sockets.
4. All Light Fixtures / Receptacles / Sockets / JBs / DBs in hazardous storage areas shall be flameproof type (Ex-de). All Light Fixtures in safe storage areas shall be Industrical type Water-Jet / Dust proof type with polycarbonate enclosed IP-65 Receptacles / Sockets / JBs / DBs.

5.10 ELECTRIC HEAT TRACING SYSTEM

S.No.	Description	Selected Option	Available Options
1	System Design Basis approach	Product Classification	a)Product Classification b)System approach

5.11 ELECTRICAL EQUIPMENT FOR HAZARDOUS AREAS

The electrical equipment for hazardous areas shall be selected as per IS-5571 and petroleum rules & Gas group shall be selected based on the hazardous area classification. The minimum requirement is summarised below:

S.No.	Equipment	Zone-1	Zone-2
1	MV Motors	Ex-de	Ex-n/Ex de/Ex p (Note-2.9, 2.10 & 2.11)
2	HV Motors	Ex-de / Ex-p (Refer note-2.8)	Ex-n/Ex-de/Ex-p (Note-2.9, 2.10 & 2.11)
3	Push Button Station	Ex-de	Ex-de
4	Motor Starters	Ex-de	Ex-de
5	Plug & Socket	Ex-de	Ex-de
6	Welding Receptacle	Ex-de	Ex-de
7	Lighting fitting	Ex-de	Ex-nR
8	Control Gear Box	Ex-de	Ex-nR/Ex-de
9	Junction Boxes	Ex-de	Ex-de
10	Transformer Unit	Ex-de	Ex-de
11	Plug & Socket	Ex-de	Ex-de
12	Break Glass Unit (Fire Alarm System)	Ex-de	Ex-de
13	Lighting Panel/Power Panel	Ex-de	Ex-de
14	Transformers	Hermetically sealed with surface temperature not exceeding 200 DEG C	Hermetically sealed with surface temperature not exceeding 200 DEG C

For additional Hazardous Area requirements, refer notes below -

5.11.1 NOTES

S.No.	Notes
4	All Battery Rooms to be provided with flame-proof fixtures (lights / exhaust fans / sockets) suitable for Hydrogen Gas (II C) area. Light / Fan Switches shall be mounted on the outside wall of battery rooms near the entrance.
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.

S.No.	Notes
2	As additional safety features, the following requirements for electrical equipment shall be followed.
2.1	All electric motors for agitators/mixers and metering 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-de)
2.3	All Light Fixtures / Receptacles / Sockets / JBs / DBs in hazardous storage areas shall be flameproof type (Ex-de). All Light Fixtures in safe storage areas shall be Industrical type Water-Jet / Dust proof type with polycarbonate enclosed IP-65 Receptacles / Sockets / JBs / DBs.
2.4	Irrespective of the area classification (whether zone 1 or zone 2), all motors and lighting fittings within the pump house/pump station/compressed house associated with offsite tank farm and within the loading/unloading gantries shall be of flameproof type. (Ex-de)
2.5	All emergency/critical lighting fixtures and associated junction boxes in hazardous areas (whether zone-1 and zone-2) shall be flameproof type. (Ex-de)
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.
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	All motors for hazardous area Zone-1 shall preferably be Ex-de type. Pressurised motors may be provided in exceptional cases, when Ex-de motors are not available.
2.9	Ex-n motors shall be used unless any other type is specified by process licensor, except for following cases: (i) HV motors in Zone-2 area for centrifugal compressors shall be Ex-de type. (ii)Ex-de motors shall be used in zone-2 areas having frequent start-stop requirements such as EOT cranes, elevators, MOV actuators, etc.
2.10	For zone-2 areas, motors with rating above 100kW having average starting frequency of more than 1 per week, Ex-de or Ex-p motors shall be used.
2.11	Ex-p motors shall be used for higher rated motors where Ex-n motors are not available.
3	Statutory Approval 1. Statutory Authority for Electrical Installation: CEA 2. Statutory authority for hazardous area: PESO:For area other than mines 3. Karnataka State Pollution Board

5.12 ELECTRICAL CONTROL SYSTEM-ECS

S.No.	Description	Selected Option	Available Options
1	Extent of coverage	Integration of new DCPs with existing ECS/ SCADA system at CPP-III	
1.1	No of substations	3	
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

S.No.	Description	Selected Option	Available Options
1.2.3	Emergency DG set	Yes	a)YES b)NO
1.3	Control		
1.3.1	EHV/HV switchboard	NA	a)YES b)NO
1.3.2	415V switchboard (I/C, B/C & outgoing breaker feeders)	NA	a)YES b)NO
1.3.3	Emergency DG set	NA	a)YES b)NO
2	Base ECS functionalities		
2.1	Breaker control in CPP & Switchyard	NA	
2.2	Breaker control in other substations	NA	
2.3	Area lighting	NA	
2.4	Electrical plant data acquisition and display	Yes	a)YES b)NO
2.5	Routine log report generation and energy balance report	NA	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
3	Advanced ECS functionalities		
3.1	Load shedding including maximum demand limit control	NA	a)YES b)NO
3.2	Synchronization	NA	a)YES b)NO
3.3	Capacitor feeder control for power factor improvement	NA	a)YES b)NO
3.4	Active & Reactive power control	NA	a)YES b)NO
3.5	Frequency & load control of all generators except DG	NA	a)YES b)NO
3.6	Excitation control of synchronous motors	NA	a)YES b)NO
3.7	Grid transformer OLTC control	NA	a)YES b)NO
4	Communication with other systems	MODBUS TCP/IP	

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)	

S.No.	Part Description	Description
2	Power Transformer (one set of spare for each power transformer)	Quantity is per transformer
2.1	Complete set of Gasket	one set
2.2	Sealing/Gauge glass of conservator	2 Nos of each rating & type.
2.3	Control fuses/MCB for MB cubicles	20% for each rating OR 1 No. (min.) of each rating, whichever is more
3	66kV and 33 KV Gas Insulated Switchgear	
3.1	Portable gas filling equipment/SF6 gas cart	1 No
3.2	Handle for disconnector switch drive	4 Nos.
3.3	Handle for earthing switch drive	4 Nos.
3.4	Pre selection key for three position switch	1 No.
3.5	Power cable termination kit	2 Sets
3.6	Tripping coil	1 Nos.
3.7	Closing coil	1 Nos.
3.8	Capacitive type voltage detectors	1 set
3.10	Density Monitoring Device	2 Nos of each type
3.9	Control fuses /MCB	10 Nos. each rating and type
3.11	Pressure gauge	2 Nos of each type
3.12	Indicating lamps covers	5 nos. of each colour
3.13	Indicating lamps	20% or 3 nos. (min.), whichever is more
4	33 kV ,11 kV,6.6 kV Air Insulated Switchgear (one set of spare for each switchgear)	Quantity is per switchboard
4.1	Closing coil	1 No. of each Rating/Type
4.2	Shunt trip coil	1 No. of each Rating/Type
4.5.	Indicating Lamps	20% or 3 nos. (min.), whichever is more
4.4	Indicating lamps covers	5 nos. of each colour
4.3	control fuses/MCB	10 Nos. each rating & type
5	415 V PCC/PMCC/EPCC or MV Switchboard (one set of spare for each Switchboard)	Quantity is per switchboard
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	10 Nos. each rating & type
6.1	Gasket	one set
6.2	Sealing/Gauge glass of conservator	2 Nos of each rating & type.
6	Distribution Transformer (one set of spare for each transformer)	Quantity is per transformer
5.5	Indicating lamps	20% or 3 nos. (min.), whichever is more
5.4	Indicating lamps covers	5 nos. of each colour
6.3	Control fuses/MCB for MB cubicles	20% for each rating OR 1 No. (min.) of each rating, whichever is more
7	Variable Frequency Drive (one set of spare for each VFD)	Quantity is per VFD
7.1	Transistors/IGBT/IGCT	One No of each rating & type
7.2	Control cards	One No of each type
7.3	Power supply cards	One No of each rating & type
7.4	Power fuses	20 % or one no (min) of each rating & type, whichever is more

S.No.	Part Description	Description
7.6	Contactors	10% of each type OR 1 no.(min) of each type, whichever is more
7.5	control fuses/MCB	10 Nos. each rating & type
7.9	Blocker Diode	2 nos. of each rating and type
7.8	Indicating lamps	20% or 1 nos. (min.), whichever is more
7.7	Indicating lamps covers	2 nos. of each colour
8	Data concentrator panel/HMI (one set of spare for each)	
8.2	Ethernet Switches	1 no. of each type
8.1	All cards such as input & output cards, power supply cards, processor cards etc.	One No of each type
8.3	control fuse/MCB	10 Nos of each rating & type
9	UPS (one set of spare for each UPS system)	
9.1	Power transistors/IGBT	One No of each rating & type
9.2	Power supply cards	One No of each type
9.3	Control cards	One No of each type
9.8	Blocker Diode	2 nos. of each rating and type
9.6	Indicating lamps covers	2 nos. of each colour
9.5	control fuse/MCB	10 Nos of each rating & type
9.4	Power fuses	20% for each rating OR 1 no. (min.)of each rating, whichever is more
9.7	Indicating lamps	10% or 3 nos. (min.), whichever is more
10	DC System(one set of spare for each DC System)	
10.1	Power fuses	20% for each rating OR 1 no. (min.) of each rating, whichever is more
10.2	control cards	1 no. of each rating & type
10.3	Power Thyristors/Transistors/IGBT/IGCT	1 no. of each rating & type
10.4	Control fuse/MCB	10 Nos. of each rating & type
10.5	Blocker Diode	Two nos. of each rating and 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	Power supply cards	1 no. of each rating & type
11	Synchronous motors (one set of spare for each rating & type)	
11.1	PowerFuses	20% for each rating OR 1 no. (min.)of each rating, whichever is more
11.2	Bearing (DE & NDE) (as applicable)	one set
11.4	Control Card	1 no. of each type
11.3	Control fuse/MCB	10 Nos. of each rating & type
12	HV induction motors (one set of spare for each rating & type)	
12.1	Bearing (DE & NDE)	one set
12.2	Terminal studs/bushing assembly	one no.
13	MV induction motors 37 kW & above (one set of spare for each rating & type)	
13.1	Bearing set (DE & NDE)	one no of each type

S.No.	Part Description	Description
13.2	Terminal/ bushing	one set each
14	Relays for switchboard/Relay control panel	one set of spare for each switchboard(refer note-8)*Relay Control Pael
14.1	Protection Relays	1 no of each type
14.2	Auxiliary Relays	1 no of each type
15	Fire alarm system	
15.1	All cards	one no. of each type
15.2	Power Fuses	20% for each rating OR 1 no. (min.)of each rating, whichever is more
15.3	Terminal blocks	20 nos
15.4	Fire detectors	1% of total installed capacity of each type OR 1 no.(min.) of each type, whichever is more
15.5	Glass for Break Glass Boxes/ Manual call point	5 % of each type OR 1 No. (min.) of each type, whichever is more
15.6	Control fuse/MCB	10 Nos. of each rating & type
16	Paging system / Plant Communication System	
16.1	All cards	one no of each type
16.2	Control fuse/MCB	10 Nos. of each rating & type
16.3	Power fuses	20% for each rating OR 1 no. (min.)of each rating, whichever is more
17	Thyristor control panel for heaters	
17.1	Rectifier control module(Control card fully assembled)	one no. of each type
17.5	Indicating Lamps	20% or 1 nos. (min.), whichever is more
17.2	Power supply card	one no. of each type
17.7	Contactors	10% of each type OR 1 no.(min) of each type, whichever is more
17.3	Control card	one no. of each type
17.9	Power fuses	2 nos. (min.)of each rating and type
17.8	Control fuse/MCB	10 Nos. of each rating & type
17.4	Blocker Diode	2 nos. of each rating and type
17.6	Indicating lamps covers	2 nos. of each colour
18	ECS	
18.1	Interposing relays (As applicable)	5 Nos. of each type
18.2	Power supply & control cards	1 nos. 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	4-20 mA signal injection set	1 No.
18.6	Isolation Transformer	1 No.

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. Complete technical details of the spare parts to be furnished by vendor after order.
10. Two sets of full electric arc protection suits suitable for 33kV level shall be considered as part of safety kit for the project.
11. For Power Transformers - One set of OTI & WTI gauges for each sub-station. One no. Cooling Fan, one set of LED Indication Lamps / MCBs /Auxiliary Contactors / Selector Switches for each Marshalling Cabinet.
12. One set of applicable Rotary Selector Switches for each GIS Switchgear.
13. For MV Switchboards - Two (2) nos. of Rotary Selector Switches of each type per MV Switchboard, One No. MCCB / MCB / Power Contactor / Auxiliary Contactor / EMPR / Ammeters / MFMs of each rating per switchboard.
14. For Distribution Transformers - One set of OTI & WTI gauges for each sub-station. One no. Cooling Fan, one set of LED Indication Lamps / MCBs /Auxiliary Contactors / Selector Switches for each Marshalling Cabinet.
15. For UPS System - Five (5) Cells for each battery bank of similar type with Five (5) nos. inetrconnecting links.
16. For HV & MV Switchboard Relays / Relay Control Panels - One (1) no. Auxiliary Relay of each type per switchboard.
17. For Fire Alarm System - Glass for BGUs / MCPs - 100 % spare. Each MCP to be supplied with two (2) nos. glasses.

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. Complete technical details of the spare parts to be furnished by vendor after order.

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. Complete technical details of the spare parts to be furnished by vendor after order.

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. Complete technical details of the spare parts to be furnished by vendor after order.

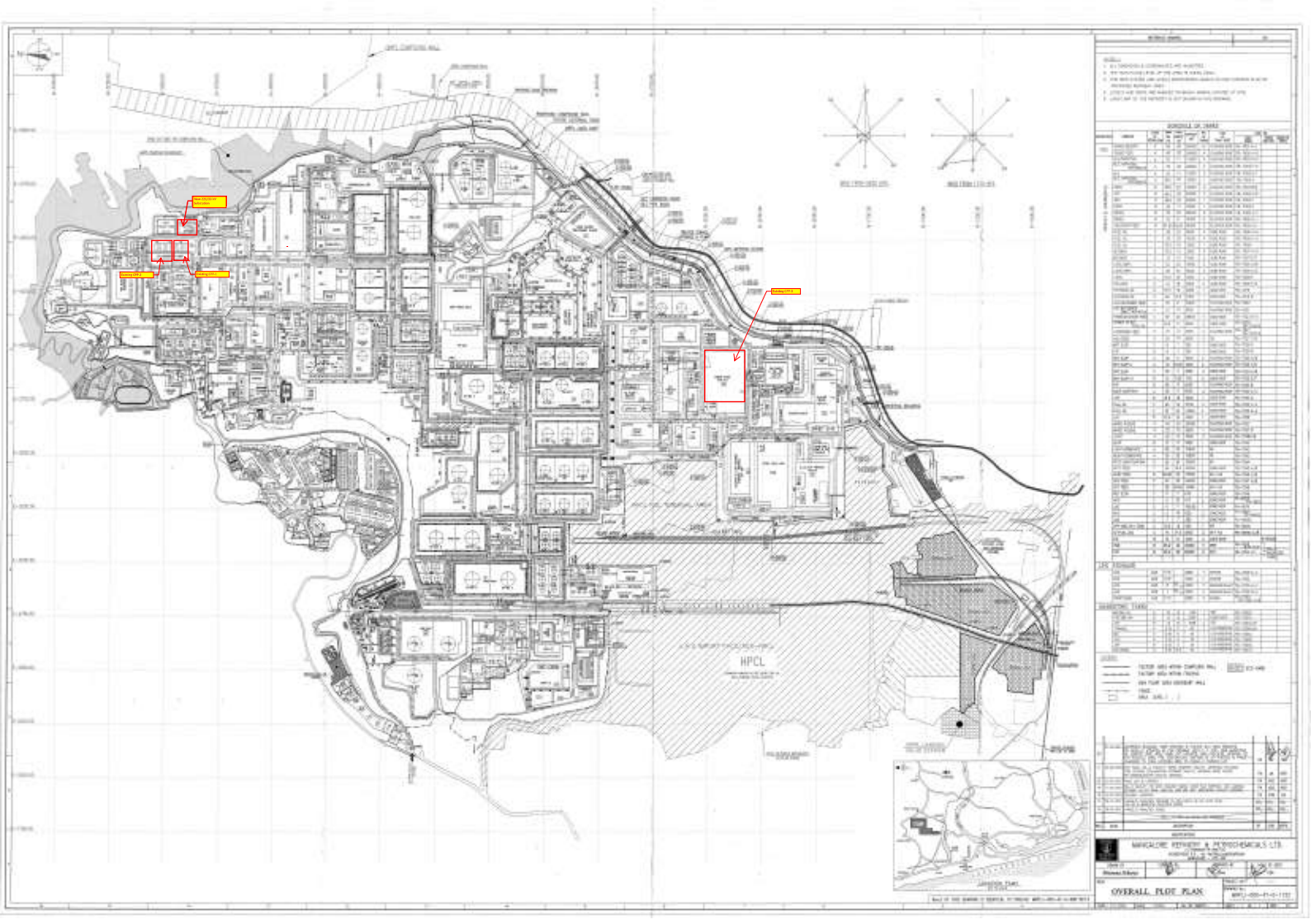
7.0 VENDOR DATA REQUIREMENT

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

Attachment-10:

Overall Plot Plan

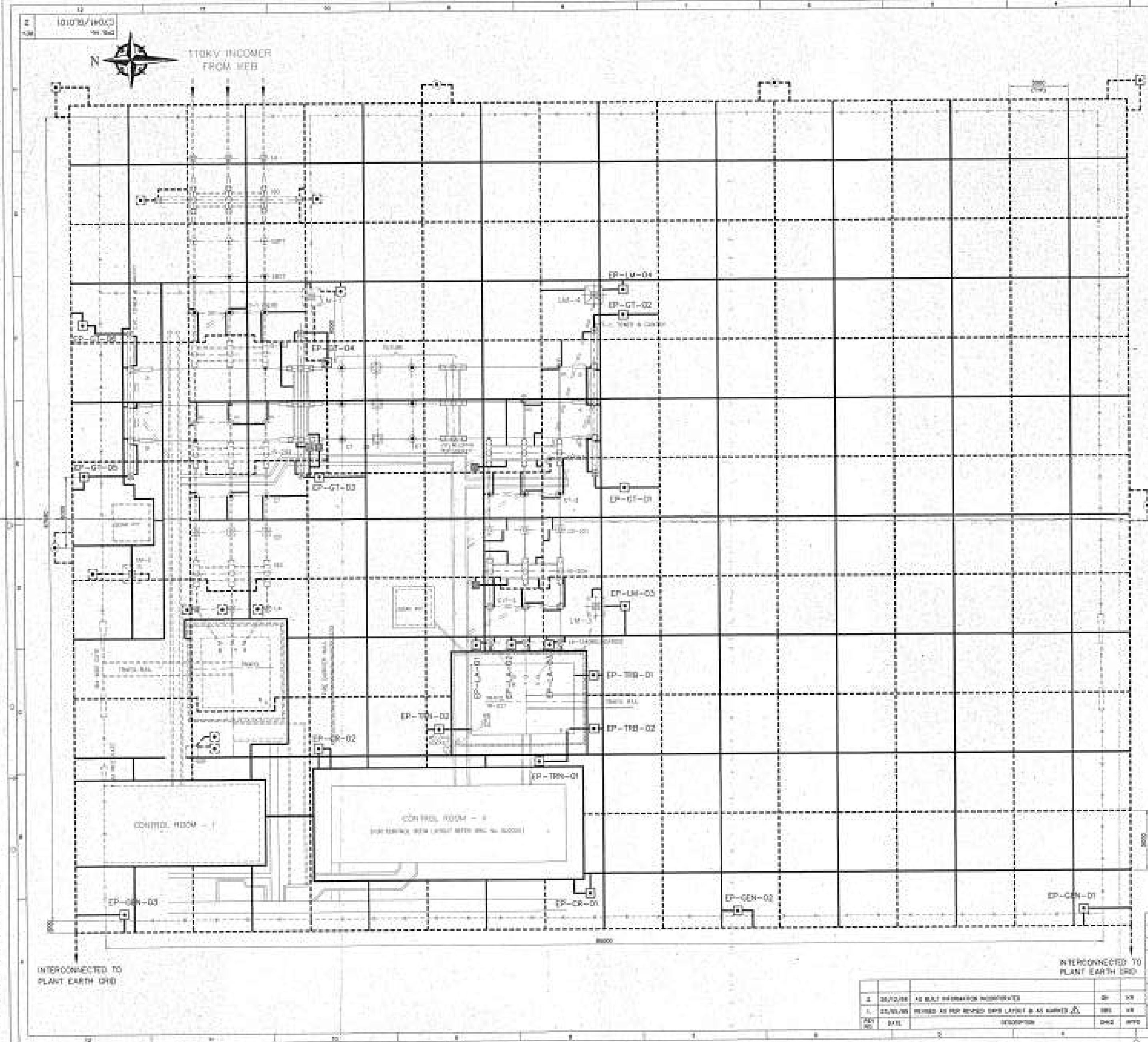
(For Reference Only)


HPCL
OVERALL PLOT PLAN

Attachment-11:

Earthing Layout of 110/33 kV Switchyard

(For Information Only)



ADD. EARTHMAT BELOW ISOLATOR OPERATING HANDLE

NOTES :-

1. ALL DIMENSIONS ARE IN mm.
2. 75x8mm GI FLAT SHALL BE USED FOR MAIN GRID AND FOR EQUIPMENT EARTHING CONNECTIONS. ALL JOINTS BELOW GROUND SHALL BE WELDED AND COVERED WITH BITUMEN COMPOUND.
3. SWITCHYARD EARTHING GRID SHALL BE CONNECTED TO MAIN PLANT EARTHING GRID AT TWO POINTS SUITABLY AT SITE.
4. WHEREVER EARTHING CONDUCTOR IS CROSSING CABLE TRENCH THE EARTHING CONDUCTOR SHALL BE LAID 300mm BELOW THE TRENCH.
5. MAIN GRID CONDUCTOR SHALL BE LAID AT MINIMUM 600mm BELOW FGL.
6. AUXILIARY EARTH MAT OF FINER MESH (1500x1500) SHALL BE PROVIDED FOR ISOLATOR OPERATING MECHANISMS.
7. WHEREVER EARTHING GRID IS FOULING WITH FOUNDATION, GRID CONDUCTOR SHALL BE DIVERTED SUITABLY AT SITE.
8. [illegible]
9. INSTALLATION OF EARTHING SYSTEM SHALL BE AS PER EIL STANDARD SPECIFICATION No. [illegible]
10. [illegible]
11. EVERY EQUIPMENT/STRUCTURE SHALL BE CONNECTED TO GRID BY TWO DISTINCT EARTH CONNECTIONS.
12. FENCE SHALL BE CONNECTED TO THE MAIN GRID AT [illegible] INTERVAL USING [illegible] GI FLAT.
13. FOR EQUIPMENT EARTHING AND OTHER EARTHING DETAILS IN EXISTING SWITCHYARD, REFER TO [illegible]
14. ITEMS SHOWN IN DOTTED LINE INDICATES FUTURE / EXISTING.
15. [illegible]

REFERENCE DRAWINGS / DOCUMENTS

IEEE-80 - 1986 : IEEE GUIDE FOR SAFETY IN AC SUBSTATION GROUNDING
IS 3043 - 1987 : CODE OF PRACTICE FOR EARTHING

L&T - DRAWING Nos.

C7041/ELC101	110/33kV SWITCHYARD EQUIPMENT LAYOUT
[illegible]	EARTHING CALCULATIONS
C7041/GLD103	EQUIPMENT EARTHING DRAWINGS
C7041/GLD102	EARTHING LAYOUT OF CONTROL ROOM BUILDING

EIL STANDARD DRAWING Nos.

7-51-101-REV-0	ELECTRODE FOR EARTHING SYSTEM
[illegible]	EARTH ELECTRODE IN TEST PIT
[illegible]	TYPICAL ARRANGEMENT FOR TRANSFORMER EARTHING
[illegible]	FENCE & GATE EARTHING

LEGEND :-

(dashed line)	EXISTING EARTH GRID (75x8mm GI FLAT)
(solid line)	EARTH GRID (75x8mm GI FLAT) TO BE ADDED NEW
(pit symbol)	EARTH PIT WITH [illegible] DIA, 3M LONG ELECTRODE (TO BE ADDED NEW)
EP-GT-01	GANTRY TOWER PIT
EP-LM-01	LIGHTNING MAST PIT
EP-GEN-01	GENERAL PIT
EP-TRB-01	TRANSFORMER BODY PIT
EP-TRN-01	TRANSFORMER NEUTRAL PIT
EP-CR-01	CONTROL ROOM PIT

BILL OF QUANTITIES :-

DESCRIPTION	QTY.
75x8mm GI FLAT	[illegible] MTR
50x6mm GI FLAT	300 MTR
EARTH PIT WITH [illegible] DIA, 3M LONG GI PIPE ELECTRODE	30 Nos.

AS BUILT

REV NO	DATE	DESCRIPTION	CHKD	APPD
2	[illegible]	AS BUILT INFORMATION INCORPORATED	[illegible]	[illegible]
1	[illegible]	REVISED AS PER REVISED GIPS LAYOUT & AS MARKED	[illegible]	[illegible]

CLIENT : MANGALORE REFINERY & PETROCHEMICALS LTD. (PHASE - II)
CONSULTANT : ENGINEERS INDIA LIMITED
PROJECT : 110KV SWITCHYARD EXTENSION

LARSEN & TOUBRO LIMITED
ECC - CONSTRUCTION GROUP

TITLE : EARTHING LAYOUT OF 110/33kV SWITCHYARD

SCALE : 1:700

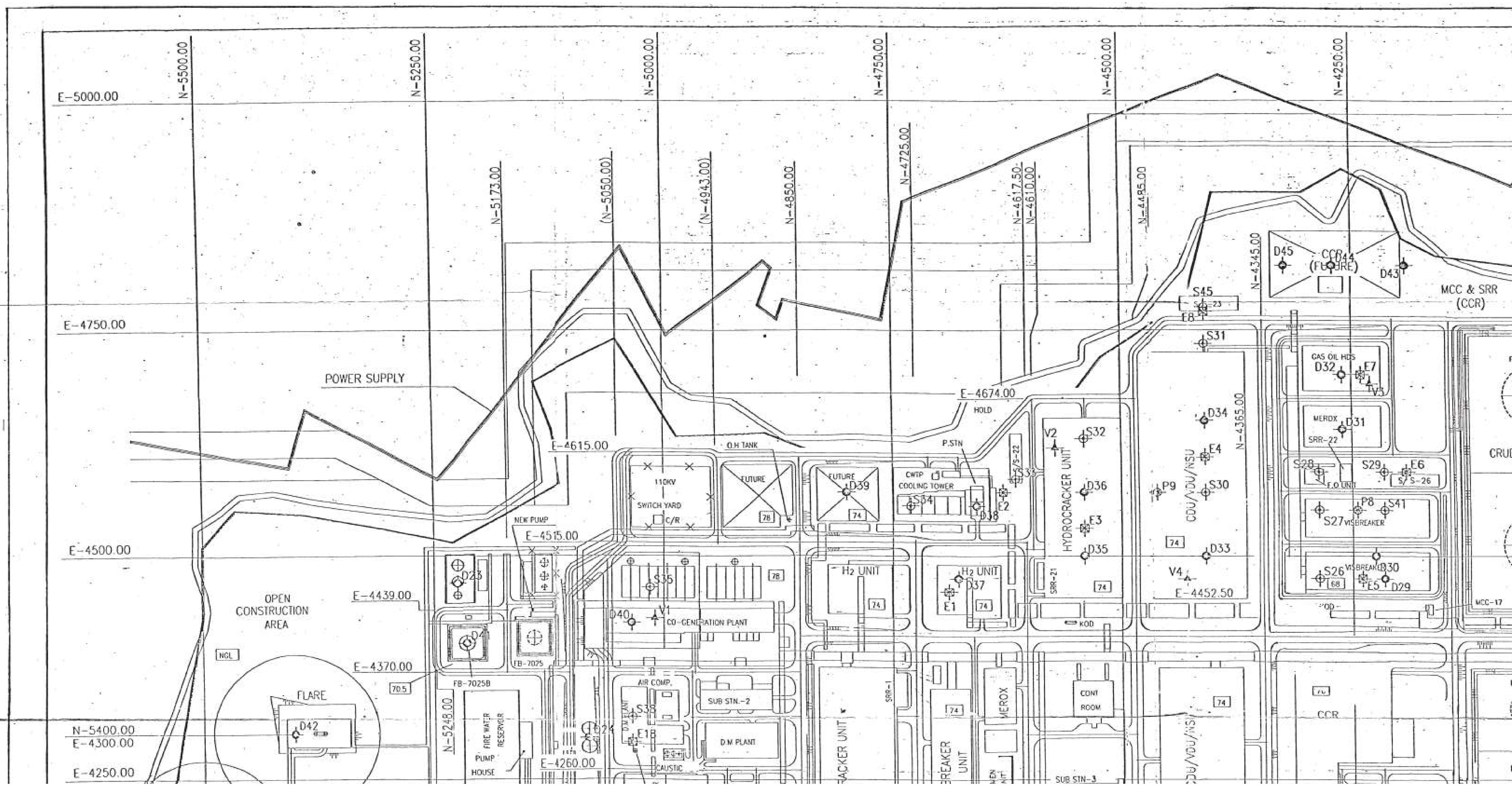
	SIGN	DATE
DSND	TJL	[illegible]/01/98
DRWN	[illegible]	[illegible]/01/98
CHKD	[illegible]	[illegible]/01/98
APPD	KK	[illegible]/01/98

DRG. No. C7041/GLD101 REV. 2

Attachment-12:

Existing Geotech Report CPP-1&2

(For Reference Only)



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E-4750.00
E-4500.00
E-4439.00
E-4370.00
E-4300.00
E-4250.00
E-4615.00
E-4515.00
E-4260.00
E-4674.00
E-4452.50
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N-5250.00
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N-4365.00
N-5248.00
N-5400.00
POWER SUPPLY
OPEN CONSTRUCTION AREA
NGL
FLARE
D42
FB-7025B
FB-7025
FIRE WATER RESERVOIR
PUMP HOUSE
NEW PUMP
110KV SWITCH YARD
C/R
FUTURE
O.H TANK
CO-GENERATION PLANT
AIR COMP.
SUB STN.-2
D M PLANT
CAUSTIC
H2 UNIT
CWTP COOLING TOWER
P.STN
HOLD
HYDROCRACKER UNIT
SRR-21
KOD
CONT ROOM
SUB STN-3
CDU/VDU/NSU
MERDX
GAS OIL HDS
SRR-22
F.O UNIT
VISBREAKER
S/S-26
MCC-17
CCR
CCR (FUTURE)
MCC & SRR (CCR)
MEROX
SRR-1
D23
D24
D31
D32
D33
D34
D35
D36
D37
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S26
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E1
E2
E3
E4
E5
E6
E7
E8
E18
P8
P9
V1
V2
V3
V4
D29
D30
S/S-22
S/S-23
74
78
68
70.5

SITE: MRPL - MANGALORE.

METHOD: PERCUSSION/ROTARY

CASING DEPTH: 150 mm ø upto 1.50 m.

BORE HOLE NO.: S-35 49
LOCATION: N 5015.00 m, E 4465.00 m
DATES OF EXECUTION: 4-11-95/5-11-95
GROUND LEVEL: 78.045 m
WATER TABLE DEPTH: 9.12 m BGL

DIA. OF BORE HOLE	DEPTH IN METRE	SAMPLES TYPE	SAMPLES NO	FIELD TESTS TYPE	FIELD TESTS RESULT	RECOVERY CR	RECOVERY RQD	STRATA LEGEND	STRATA DEPTH IN METRE	STRATA THICKNESS	DESCRIPTION OF STRATA
									0.00		
	0.50/0.63		1	SPT	N>100						
	2.00/2.20		2	SPT	N>100						
	3.50/3.68		3	SPT	N>100					6.50	Reddish brown very dense coarse grained SAND with fragments of gravel, & cobbles etc.
	5.00/5.10		4	SPT	N>100						
150 mm	6.50/6.95		5	SPT	N=27				6.50		
	8.00/8.45		6	SPT	N=30					3.00	Yellowish brown very stiff to hard sandy CLAY.
								GWT	9.12		
	9.50/9.95		7	SPT	N=31				9.50		
	11.00/11.45		8	SPT	N=30					3.00	Yellowish brown very stiff to hard sandy CLAY with fragments of gravel.
	12.50/12.95		9	SPT	N=33				12.50		
	14.00/14.45		10	SPT	N=45					2.50	Yellowish brown hard sandy CLAY with lenses of fine to medium grained sand.
	15.00/15.45		11	SPT	N=61				15.00		
											B.H. COMPLETED.

ABBREVIATIONS:

U	: UNDISTURBED	K	: PERMEABILITY
D	: DISTURBED	W	: WATER SAMPLE
R	: REMOULDED	CR	: CORE RECOVERY %
WS	: WASH SAMPLE	RQD	: ROCK QUALITY DESIGNATION %
SPT	: STANDARD PENETRATION TEST	DT	: DOUBLE TUBE CORE BARREL
VS	: VANE SHEAR		

SCALE: 1:100

ASIA FOUNDATIONS AND CONSTRUCTIONS LTD.
AFCONS HOUSE, VEERA DESAI ROAD, ANDHERI (W), BOMBAY-400058.

DRG. NO. 3008/

SITE: MRPL- MANGALORE.

METHOD: PERCUSSION/ROTARY

CASING DEPTH: 150 mm ø upto 2·00 m.

BORE HOLE NO.: D-39

LOCATION: N 4900·00 m, E 4565·00 m

DATES OF EXECUTION: 4-11-95/5-11-95

GROUND LEVEL: 78·249 m

WATER TABLE DEPTH: 9·16 m BGL

DIA OF BORE HOLE	DEPTH IN METRE	SAMPLES TYPE	SAMPLES NO	FIELD TESTS TYPE	FIELD TESTS RESULT	RECOVERY CR	RECOVERY RQD	STRATA LEGEND	STRATA DEPTH IN METRE	STRATA THICKNESS	DESCRIPTION OF STRATA
									0.00		
	0.50/0.80		1	SPT	N>100					2.00	Reddish brown, very dense, SAND with fragmensts of gravel.
	2.00/2.18		2	SPT	N>100				2.00		
										1.50	Reddish brown, hard, sandy CLAY with fragments of gravel.
	3.50/3.75		3	SPT	N>100				3.50		
	5.00/5.13		4	SPT	N>100					3.00	Reddish brown, very dense, coarse SAND with fragments of gravel.
	6.50/6.95		5	SPT	N=68				6.50		
	8.00/8.45		6	SPT	N=58					3.00	Yellowish brown, hard, sandy CLAY.
	9.50/9.95		7	SPT	N=50				9.50		
	11.00/11.45		8	SPT	N=39					3.00	Yellowish brown, hard, sandy CLAY.
	12.50/12.95		9	SPT	N=33				12.50		
										1.50	Yellowish brown, hard, sandy CLAY.
	14.00/14.45		10	SPT	N=31				14.00		
	15.50/15.95		11	SPT	N=36					6.00	Reddish brown, very stiff to hard, sandy CLAY.
	17.00/17.45		12	SPT	N=32						
	18.50/18.95		13	SPT	N=31						
	20.00/20.45		14	SPT	N=18				20.00		B.H. COMPLETED.

ABBREVIATIONS:

U : UNDISTURBED
D : DISTURBED
R : REMOULDED
WS : WASH SAMPLE
SPT : STANDARD PENETRATION TEST
VS : VANE SHEAR
K : PERMEABILITY
W : WATER SAMPLE
CR : CORE RECOVERY %
RQD : ROCK QUALITY DESIGNATION %
DT : DOUBLE TUBE CORE BARREL

SCALE: 1 : 100

ASIA FOUNDATIONS AND CONSTRUCTIONS LTD.

AFCONS HOUSE, VEERA DESAI ROAD, ANDHERI (W), BOMBAY-400058.

DRG. NO. 3008/

SITE: MRPL - MANGALORE.

METHOD: PERCUSSION/ROTARY

CASING DEPTH: 150 mm ø upto 2.00 m.

BORE HOLE NO.: D-40 (1)
LOCATION: N 5015.00 m, E 4425.00 m
DATES OF EXECUTION: 5-11-95 / 6-11-95
GROUND LEVEL: 78.429 m
WATER TABLE DEPTH: 9.20 m BGL

DIA OF BORE HOLE	DEPTH IN METRE	SAMPLES TYPE	SAMPLES NO	FIELD TESTS TYPE	FIELD TESTS RESULT	RECOVERY CR	RECOVERY RQD	STRATA LEGEND	STRATA DEPTH IN METRE	STRATA THICKNESS	DESCRIPTION OF STRATA
									0.00		
	0.50/0.73		1	SPT	N>100						
	2.00/2.13		2	SPT	N>100					5.00	Reddish brown very dense coarse grained SAND with fragments of gravel.
	3.50/3.68		3	SPT	N>100						
									5.00		
	5.00/5.20		4	SPT	N>100					1.72	Yellowish brown very dense coarse grained SAND with gravel.
	6.50/6.72		5	SPT	N>100				6.72		
	8.00/8.45		6	SPT	N>100					4.28	Yellowish brown dense clayey SAND with gravel.
								GWT	9.20		
150 mm	9.50/9.95		7	SPT	N=44						
	11.00/11.45		8	SPT	N=22				11.00	1.50	Brownish grey very stiff sandy CLAY.
	12.50/12.95		9	SPT	N=22				12.50		
	14.00/14.45		10	SPT	N=26					3.00	Yellowish brown medium dense clayey SAND.
	15.50/15.95		11	SPT	N=30				15.50	1.50	Brownish grey medium dense to dense clayey SAND.
	17.00/17.45		12	SPT	N=40				17.00		
	18.50/18.95		13	SPT	N=49					3.00	Brownish hard sandy CLAY.
	20.00/20.45		14	SPT	N=53				20.00		B.H. COMPLETED.

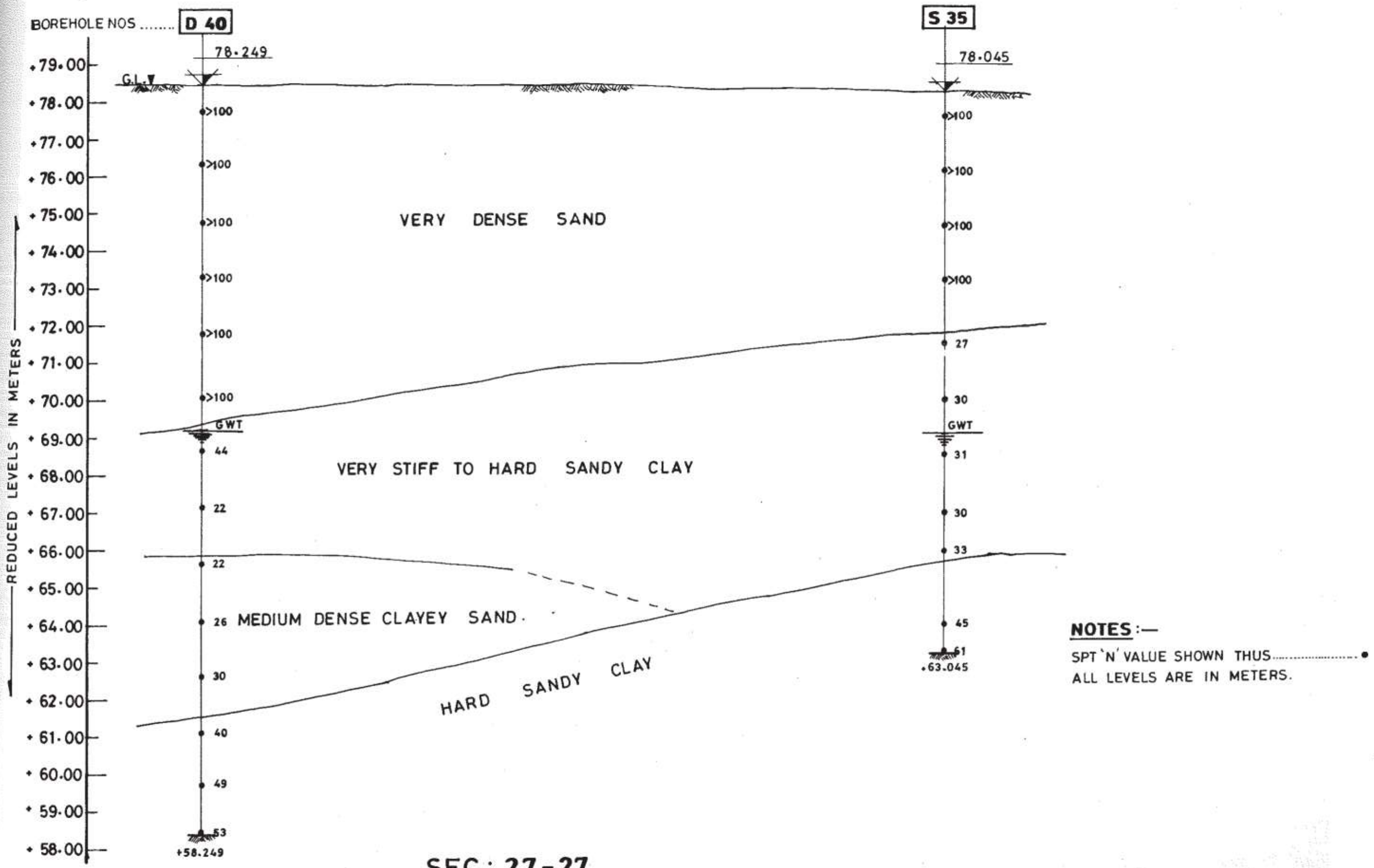
ABBREVIATIONS:
U : UNDISTURBED
D : DISTURBED
R : REMOULDED
WS : WASH SAMPLE
SPT : STANDARD PENETRATION TEST
VS : VANE SHEAR
K : PERMEABILITY
W : WATER SAMPLE
CR : CORE RECOVERY %
RQD : ROCK QUALITY DESIGNATION %
DT : DOUBLE TUBE CORE BARREL

SCALE: 1 : 100

ASIA FOUNDATIONS AND CONSTRUCTIONS LTD.
AFCONS HOUSE, VEERA DESAI ROAD, ANDHERI (W), BOMBAY-400058.

DRG. NO. 3008/

S.NO.	DATE	REVISION	SIGN.



NOTES:—

SPT 'N' VALUE SHOWN THUS.....●

ALL LEVELS ARE IN METERS.

SEC : 27-27

AFCONS
ASIA FOUNDATIONS & CONSTRUCTIONS LTD.
ENGINEERS AND CONTRACTORS
AFCONS HOUSE, 16, SHAH INDUSTRIAL ESTATE, VEERA DESAI RD., ANDHERI (W), BOMBAY-400053

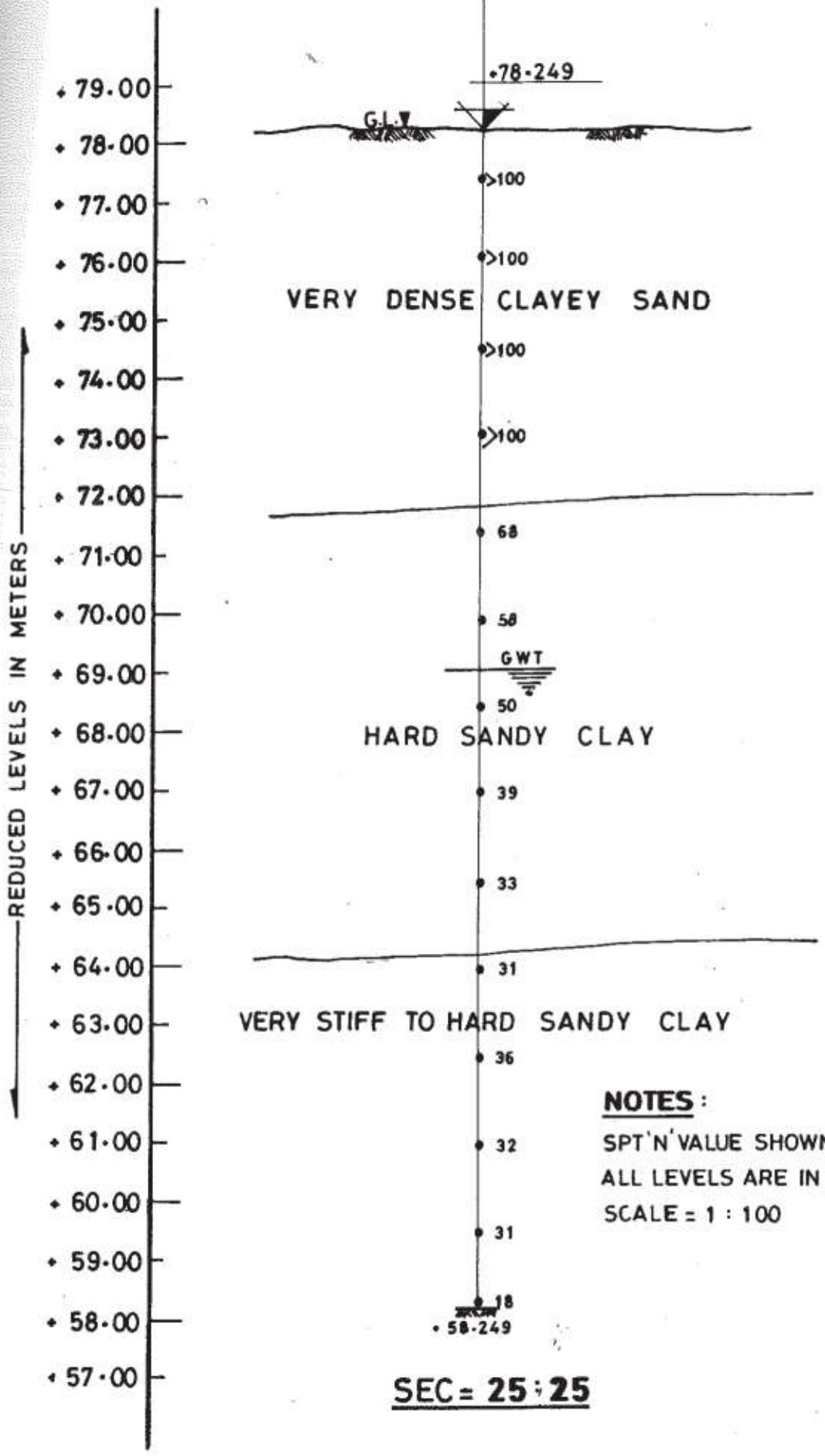
CLIENT- MANGALORE REFINERY & PETROCHEMICALS LTD.

JOB- GEOTECHNICAL INVESTIGATION FOR MANGALORE REFINERY EXPANSION - BOILER & CO-GEN. PLANT

TITLE- GENERALISED SUBSOIL SECTION ALONG THE BOREHOLES.

SCALE	PRD. BY	CKD. BY		DATE	DRG. NO.	REV
H= 1:200 V= 1:100	P.M.K.	P.S.B.	FOR AFCONS	18-1-96	3008/22	

BOREHOLE NO **D39**



NOTES:

SPT 'N' VALUE SHOWN THUS.....•

ALL LEVELS ARE IN METERS

SCALE = 1 : 100

SEC = 25 : 25

AFCONS

DATE: 22-1-96

DRG. NO: 3008/20

10.25 SECTION 25-25

In this section, completely weathered laterite is having a thickness of around 5.0/6.0 m, at location of D-39, below ground level. Standard Penetration Tests conducted in this stratum, have shown refusal i.e. N > 100, in the entire stratum.

Thus, at location D-39, open foundations can be laid at a depth 1.5 m /1.8 m below ground level and the same can be designed on the basis of N > 100.

Bearing capacity calculations have been done for open footings of 2 m x 2 m, founded at 1.8 m depth on the basis of N = 50.

(N value has been taken conservatively as N = 50, instead of N = 100).

a. Assuming laterite is behaving like very dense sand, with N ≥ 50, the ultimate bearing capacity for such a stratum is given as

$q_{ult} = q \times (N_q - 1) \times S_q \times d_q + \frac{1}{2} \times \gamma \times B \times N_\gamma \times S_\gamma \times d_\gamma \times W'$

For N ≥ 50, ø = 40° (IS - 6403 - 1981)

For ø = 40°, Nq = 64.20, N_γ = 109.41

For ø = 40°, $\sqrt{N_\phi}$ = tan (45+20°) = 2.144

For ø = 40°, dq = 1.193, d_γ = 1.193 and Df = 1.8 m, B=2.

For $\frac{L}{B}$ = 1, Sq = 1.2, S_γ = 0.8

For shallow ground water table W' = 0.5

For Df = 1.8, γ eff = 0.8 Tons/cu.m

qeff = 1.44 Tons/m²

Thus,

$q_{ult} = 1.44 \times 63.20 \times 1.2 \times 1.193 + \frac{1}{2} \times 0.8 \times 2 \times 109.41 \times 0.8 \times 1.193 \times 0.5.$

..18

= 130.287 + 41.76

= 172.055 Tonnes/m²

Adopting a factor of safety of 3

$$q \text{ allowable} = \frac{qult}{F} = \frac{172.055}{3} = 57.351 \text{ T/m}^2$$

b. Similarly, working out allowable pressure for a total settlement of 25 mm.

$$q \text{ allowable} = 3.35 \times Cb\ (N-3) \times \left(\frac{B+0.3}{2B}\right)^2 \times W_\gamma \times d_t$$

Putting Cb = 1

N = 50

B = 2.0 metres

W_γ = 0.5 for shallow ground water

dt = 1.9

q allowable = 3.35 x 1 x 47 x 0.3306 x 0.5 x 1.9

= 49.45 Tonnes/m²

Thus, 2 m x 2 m footings, can be provided at location D-39, at a depth of 1.8 m below ground level for a pressure of 45 Tonnes/m², so as to restrict total settlement within the permissible value of 25 mm.

10.26 SECTION 26-26

In this section, completely weathered laterite is having a thickness of around 5.0 m at D-27 and about 3.0 m at S-38, below ground level. Standard Penetration Tests conducted in this stratum, have shown refusal i.e. N > 100, in the first 3/4 metres below ground level.

Thus, at location D-27 and S-38 open foundations can be laid at a depth of 1.5 m/1.8 m below ground level and the same can be designed on the basis of N > 100.

Putting Cb = 1

N = 50

B = 2.0 metres

W_{γ} = 0.5 for shallow ground water

dt = 1.9

q allowable = 3.35 x 1 x 47 x 0.3306 x 0.5 x 1.9

= 49.45 Tonnes/m^2

Thus, 2 m x 2 m footings, can be provided at location D-27, at a depth of 1.8 m below ground level for a pressure of 45 Tonnes/m^2, so as to restrict total settlement within the permissible value of 25 mm.

10.27 SECTION 27-27

In this section, laterite layer is having a thickness varying between 5 m to 6 m, below ground level. Standard Penetration Tests conducted in this stratum, have consistently shown refusal i.e. N > 100, in the first 5 metres below ground level.

Thus, at locations D-40 and S-35 open foundations can be laid at a depth of 1.5 m/1.8 m below ground level and the same can be designed on the basis of N > 100.

Bearing capacity calculations have been done for open footings of 2 m x 2 m founded at 1.8 m depth, on the basis of N = 50. (Taking N as conservative value of N = 50).

a. Assuming laterite is behaving very dense sand with N ≥ 50.

$q_{ult} = q \times (N_q - 1) \times S_q \times d_q + \frac{1}{2} \times \gamma \times B \times N_{\gamma} \times S_{\gamma} \times d_{\gamma} \times W'$

For N ≥ 50, ø = 40°

For ø = 40°, N_q = 64.20, N_{γ} = 109.41

For ø = 40°, d_q = 1.193, d_{γ} = 1.153

..21

For $\frac{L}{B}$ = 1, Sq = 1.2, $S\gamma$ = 0.8

For shallow ground water table W' = 0.5

For Df = 1.8 m, γeff = 0.8 Tons/cu.m

qeff = 1.44 Tons/m²

Thus, ultimate bearing capacity is given as

qult = 1.44 x 63.20 x 1.2 x 1.153 + ½ x 0.8 x 2 x 109.41 x 0.8 x 1.153 x 0.5

130.287 + 41.768

172.055 Tonnes/m²

Adopting, a factor of safety of 3

q allowable = $\frac{qult}{F} = \frac{172.055}{3}$ = 57.351 Tonnes/m²

b. Similarly, working out, allowable pressure for a total settlement of 25 mm.

q allowable = 3.355 x Cb x (N-3) x $\left(\frac{B+0.3}{2B}\right)^2$ x Wγ x dt

Putting Cb = 1

N = 50

B = 2.0 metres

Wγ = 0.5 for shallow ground water

dt = 1 + $\frac{1.8}{2.0}$ = 1.9

q allowable = 3.35 x 1 x x 47 x 0.3306 x 0.5 x 1.9

= 49.450 Tonnes/m²

..22

Thus, 2 m x 2 m foundations can be provided at locations D-40 and S-35, at a depth of 1.8 m below ground level and can be designed for a pressure of 45 Tonnes/m^2, so as to restrict total settlement within the permissible value of 25 mm.

10.28 SECTION 28-28

In this section, below 1.0 m depth SPT tests have indicated N values in excess of 30. Thus, at area near D-41, open foundations can be laid at a depth of 2.5 m below ground level and the same can be designed on the basis of N = 30.

Bearing capacity calculations have been done for open footings of 2 m x 2 m founded at 2.5 m depth, on the basis of N = 30.

a. For cohesionless materials, bearing capacity is given as

$$qult = q \times (Nq-1) \times Sq \times dq + \tfrac{1}{2} \times \gamma \times B \times N\gamma \times S\gamma \times d\gamma \times W'$$

For N = 30, $\phi = 36^\circ$ (IS-6403-1981)

For $\phi = 36^\circ$, Nq = 39.48, $N\gamma = 60.30$

For $\phi = 36^\circ$, $\sqrt{N\phi} = \tan(45^\circ+18^\circ) = 1.9626$

For $\frac{L}{B} = 1$, Sq = 1.2, $S\gamma = 0.8$

For Df = 2.5 m, B = 2 m, dq = 1.245, $d\gamma = 1.245$

For shallow ground water table W' = 0.5

For Df = 2.5 m, $\gamma eff = 0.8$ T/cu.m, qeff = 2 T/m^2

$qult = 2 \times 38.48 \times 1.2 \times 1.245 + \tfrac{1}{2} \times 0.8 \times 60.30 \times 0.8 \times 1.245 \times 0.5$

$= 114.978 + 12.011$ T/m^2

$= 126.989$ T/m^2

Adopting a factor of safety of 3

$$q \text{ allowable} = \frac{qult}{3} = 42.329 \text{ T/m}^2$$

..23