INDRADHANUSH GAS GRID LIMITED

(Joint Venture of IOCL, ONGC, GAIL, OIL and NRL)

GUWAHATI, ASSAM

BID DOCUMENT
FOR

SUPPLY INSTALLATION ,TESTING AND COMMISSIONING OF UPS SYSTEM

SECTION-10 & 11 UNDER NORTH EAST GAS GRID PHASE-III OF IGGL

OPEN DOMESTIC COMPETITIVE BIDDING

TENDER ID: VCS21000025

Tender no.: C221052-VCS-IGGL-TENDER-004

VOLUME – II OF II: TECHNICAL

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Energising Quality

PREPARED AND ISSUED BY

VCS QUALITY SERVICES PVT. LTD.

Noida, India

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Energising Quality	**PROJECT NUMBER: C221052**	IGGL

MR FOR UPS SYSTEM			TOTAL SHEETS		34
DOCUMENT NO.	C221052	00	EL	MR	4002

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

C1	13.05.2022	ISSUED FOR CLIENT REVIEW	VV	RD	AA
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REV	**DATE**	**DESCRIPTION**	**PREP**	**CHKD**	**APPR**

ABBREVIATION

CEA	Central Electricity Authority
SEA	State Electricity Authority
BS	British Standards
IGGL	Indra Dhanush Gas Grid Limited (IGGL),
PNGRB	Petroleum and Natural Gas Regulatory Board
OISD	Oil Industry Safety Directorate
MEDB	Main Distribution Board
XLPE	Cross-Linked Polyethylene.
PVC	Poly Vinyl Chloride
NEC	National Electrical Code
UPS	Uninterruptible power systems
MOV	Motor Operated Valve
ACB	Air circuit breakers
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MPCB	Motor Protection Circuit Breaker
CT/PT	Current Transformer/Potential Transformer
ELCB	Earth Leakage Circuit Breaker
PDB	Power Distribution Board
O/ILDB	Outdoor/Indoor Lighting Distribution Board
FRLS	Flame Retardant Low Smoke

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1.0 DEFINITION

Where used in this document, the following terms shall have the meanings indicated below, unless clearly indicated by the context to this order:

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
OWNER	Indradhanush Gas Grid Limited
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of the OWNER for the Engineering Services
VENDOR / MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR.

2.0 INTRODUCTION

VCS Quality Services Pvt. Ltd. (VCS) has been appointed as a PMC (Project Management Consultant) by IGGL for **"PMC Services for North East Gas Grid Phase-III of IGGL."**

Indradhanush Gas Grid Limited (IGGL), a joint venture (JV) of IOCL, ONGC, GAIL, OIL and NRL has been entrusted with the responsibility to execute cross country natural gas pipeline connecting all states of the North East and Sikkim. The natural gas Pipeline grid in North East would connect Guwahati to capital cities / major cities of North East states like Itanagar, Dimapur, Kohima, Imphal, Aizawl, Agartala, Shillong, Silchar, Gangtok and Numaligarh. The grid would be connected with upcoming Barauni-Guwahati natural gas pipeline as a part of Urja- Ganga scheme. The grid would also connect to sustainable and viable indigenous gas sources in North-East.

The pipeline grid has been designed with flexibility for gas injection in either direction.

3.0 PROJECT BRIEF

Salient details of the tentative pipeline sections under VCS's scope of work are as under:

A) Siliguri – Gangtok Pipeline (dia. 12") – tentative length is 186 Kms.

The pipeline in this section originates from a tap off point on Barauni-Guwahati pipeline at Siliguri and traverses through plain agricultural land and forest land for initial 50 odd kilometers which includes the crossing of Teesta River. Thereafter, the pipeline traverses through hilly terrain along the new highway under construction up to Lava, which is approximately at Ch.108.000 km of this pipeline section and thereafter follows the route of NH-717A up to near Ranipool area. The total area traversed by this pipeline section thus comes out to be approximately 186 km.

B) Dimapur – Kohima-Imphal Pipeline (dia. 12") – tentative length is 199 Kms

The proposed pipeline route traverses through plain agricultural land and forest land for initial 5 odd kilometers and then enters the ghats/hilly terrain and traverses through it till Senapati town which is approximately at Ch.155.000 km of this pipeline section (end route taking the under-construction Kohima Bypass Road) and then runs through more or less plain area till Sekmai. The total area traversed by this pipeline section thus comes out to be approximately 199 km.

Summary of various stations envisaged in the proposed North East Gas Grid Phase-III of IGGL are as under:

A) SILIGURI – GANGTOK PIPELINE (SGPL)

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	1	Siliguri
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava
3	Receipt Terminal (RT/SGPL) with/ without Tap off	1	Gangtok
4	Sectionalizing Valves (SV/SGPL/01 to SV/SGPL/08) with/without Tap off	8	Along the Siliguri-Gangtok route

B) DIMAPUR – KOHIMA- IMPHAL PIPELINE (DIPL)

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT/DIPL)	1	Dimapur
2	Intermediate Pigging Station (IP/DIPL/01))	1	Tentatively at Tadubi
3	Receipt Terminal (RT/DIPL) with/ without Tap off	1	Imphal
4	Sectionalizing Valves (SV/DIPL/01 to SV/DIPL/10) with/without Tap off	10	Along the Dimapur-Kohima-Imphal route

4.0 PIPELINE SIZE, LENGTH AND DESIGN CONDITIONS

Detail of the pipeline is given below:

SL. No	Process Fluid	From	To	Size (Inch)	Length (km)	Design Pressure	Design Temp.
1	Natural gas	Siliguri	Gangtok	12”	186	92	-29 to +65
2	Natural gas	Dimapur	Imphal	12”	199	92	-29 to +65

4.1 Multi Products Pipeline Details

A) Design Pressure: 92kg/Cm2g

B) Design Temperature; -29° TO +65°C

C) Pipeline Size: - 12" (254km), 12" (186km),

D) Pipeline Material: - API 5L Gr. X 70 PSL 2

E) Pipeline Wall Thickness; -7.14mm / 8.38 mm

F) Pipeline Total Length (APPROX.): - 385 Km (Approx.)

G) Pipeline Corrosion Coating; - 3LPE (EXTERNAL

4.2 SITE CONDITIONS

Parameters	
Max / Min. Temperature	50/-5 °C
Design Temperature	50°C
Relative Humidity	95%
Altitude above Sea level	Up to 1000 Meters
Atmospheric pollution	Designed to withstand the site conditions, dust, vapour, Industrial Gases
Hazardous Area classification	Zone-2, Gas group IIA, IIB, for Temp.
Control Room/ UPS system room/ D.G. Room/Guard	Safe area

5.0 SCOPE

This document is to describe the scope of UPS system work which will be used for “NORTH EAST GAS GRID PHASE-III OF IGGL”.

In case of conflicting requirement of tender documents, following priority shall govern in general. However, in case of conflict, it shall be referred to Client for clarifications and decision of Client shall be final and binding with or without any cost implications

- The requirements of any statutory body shall govern.
- SOR/Data Sheets
- This specification / Basis of design
- Scope of Works
- Latest Code & Engineering Standards

This document establishes minimum requirements of UPS system Design Parameters and Basis for Design and Detailed Engineering of the North East Gas Grid Phase-III of IGGL Pipeline network & associated facilities covered under this project as defined briefly herein below.

The scope of specification shall provide the minimum requirements & form the basis for carrying detailed design engineering for UPS system power system, sizing of various UPS system equipment's, & their supply, installation, testing & commissioning of the UPS system for North East Gas Grid Phase-III of IGGL Pipeline network & associated facility. This document also provides the general guidelines for preparation of UPS system specification, datasheets and other relevant documents.

This section covers the details of work tendered and scope of work pertaining to UPS system work including supplying, fabrication, erection, inspection and testing, supplying material and consumable providing pre-commissioning and commissioning assistance to owner, clean up and restoration of site for North East Gas Grid Phase-III of IGGL DT, RT IP & SV Stations.

Work to be carried out by the Contractor shall include as a minimum, but not limited to, the following:

a) Supply, installation, testing & commissioning of the all-complete UPS system shall be performed as per enclosed specifications, data sheet and construction drawings.

b) Transportation of all supplied materials to workshop(s) / worksite(s) including handling, loading, unloading, stacking, storage including arranging all necessary storage area(s) thereof, as required.

c) Providing all labour, consumable materials, tools, tackles, test equipment, site transportation, supervision and services to perform all necessary works

d) Obtaining all necessary statutory approvals and permissions including safety permits from the concerned authorities/station in-charge having jurisdiction, for performing the work including shifting of any obstruction etc. as may be required and restoring any such facility disturbed during construction at its location.

e) "Receiving and Taking-over" of all materials from the OWNER designated place(s) of issue; transportation, unloading, from place(s) of issue to Contractor's own stock

yard(s) / work site(s) / workshop(s) including arranging all necessary storage area(s) thereof till the materials are installed in permanent installation. Handling, storage and safekeeping of all materials until they are used in the system or the same are handover to OWNER including making own arrangement for warehousing and security of such materials.

f) All associated civil work such as excavation, backfilling and removal of excess soil from site for directly buried cables, earth strip, cable protection pipes, earth pits, lighting pole foundation, making of earth pit chamber, grouting of base plate supports and foundation bolts, chipping of concrete or brick work and making good the same after installation of equipment, sealing of cable entries and other similar jobs; supply and spreading of sand, bricks, concrete foundation for street light poles, earth pit chamber.

g) Collection of all as-built details in appropriate formats required for generation of as-built drawings and documents and submission of an as-built dossier including drawings, project records, video records, photographs, inspection and test records and other quality records as per specifications and instructions of Engineer-in-Charge.

h) All coordination with and providing required assistance to other agencies / contractors, engaged by OWNER for, Civil, Mechanical, Piping, SCADA & Telecom works, and commissioning operations.

i) Horizontal and vertical cable laying in trenches/cable-trays/racks, pulling thru pipes on walls/columns, steel structures including supply and fixing of necessary GI saddles, saddle bars, cable tags, GI/Al clamps for cables laid on vertical walls/columns/structures.

j) Cable termination and connection of leads, both indoor/outdoor type including drilling, taping of cable insulation, crimping of lugs, supply and fixing of GI nuts, screws, bolts, washers and other necessary hardware.

Any other works not specifically listed herein but are required to complete the Works covered in the Contract.

6.0 SCOPE OF SUPPLY

All the UPS system Equipment's & materials shall be suitable for giving trouble free service under the environmental conditions given hereunder. UPS system equipment shall be specified for operation under the following site conditions:

6.1 **Power Supply available Parameters**:

i. For DT, RT & IP STATIONS station:

NORMAL POWER available	415/230V AC, 3 Phase & Neutral
Inverter Power available	230V AC
UPS Power available	230V AC

ii. For SV STATIONS station:

NORMAL POWER available	415/230V AC, 3 Phase & Neutral
Inverter Power available	230V AC
Solar Power available	96V, 48V & 24 V DC

6.2 The Bidder's scope of work includes UPS system, Rectifier, Battery Bank, ACDB / DCDB & interconnecting cables as per SOR at following terminals:

	Supply of UPS power supply system	Unit	Qty
1.0	**ITEM #1** 10kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply, FOR CATHODIC PROTECTION (PCP), INSTRUMENTATION, SCADA & TELECOM System Design, Detailed Engineering, procurement of materials, Inspection/FAT (Factory acceptance test), Supply of materials, Transportation, loading/unloading, insurance, Storage at warehouse/store (hired by bidder) of complete UPS based Power source with one autonomy (24 Hrs Backup) for 10000W AC load for twenty four hours operation per day operation as per tender SLD, specification, data sheet, scope of work and block diagram enclosed including commissioning spares as required at each station. The system shall include following- (i)UPS system (2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS (ii) Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) (iii) AC DB, 230 V As per SLD & Specification. (iv) Interconnecting cables among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required. (v) Earthing and lightning protection system as required to complete the system.		

	(vi)Erection materials & Other miscellaneous work Rating of UPS, UPS DB and battery bank shall be selected to meet the load requirement as specified above. However, each subsystem rating shall not be less than the value given below-		
1.1	UPS system-10kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply as per SLD & Specification	Set	2
1.2	Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) for 10KVA Load backup time shall be 12 hours each battery banks (total 24 hours. As per SLD & Specification	Set	2
1.3	AC DB, 230 V As per SLD & Specification	Set	2
1.4	Interconnecting cables, erection materials, Earthing materials, Glands, Jb. s among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required.	Set	2
2.0	**ITEM #2** 20kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply, FOR CATHODIC PROTECTION (PCP), INSTRUMENTATION, SCADA & TELECOM System Design, Detailed Engineering, procurement of materials, Inspection/FAT (Factory acceptance test), Supply of materials, Transportation, loading/unloading, insurance, Storage at warehouse/store (hired by bidder) of complete UPS based Power source with one autonomy (24 Hrs Backup) for 20000W AC load for twenty four hours operation per day operation as per tender SLD, specification, data sheet, scope of work and block diagram enclosed including commissioning spares as required at each station. The system shall include following- (i) UPS system (2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS (ii)Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) (iii)AC DB, 230 V as per SLD (iv) Interconnecting cables among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required. (v) Earthing and lightning protection system as required to complete the system. (vi)Erection materials & Other miscellaneous work Rating of UPS, UPS DB and battery bank shall be selected to meet the load requirement as specified above. However, each subsystem rating shall not be less than the value given below-		
2.1	UPS system- 20kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V	Set	3

	outgoing AC supply as per SLD & Specification		
2.2	Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) for 20KVA Load backup time shall be 12 hours each battery banks (total 24 hours. As per SLD & Specification	Set	3
2.3	AC DB, 230 V As per SLD & Specification	Set	3
2.4	Interconnecting cables, erection materials, Earthing materials, Glands, Jbs among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required.	Set	3
	INSTALLATION, TESTING & COMMISSIONING of UPS power supply system		
1.0	**ITEM #1** 10kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply, FOR CATHODIC PROTECTION (PCP), INSTRUMENTATION, SCADA & TELECOM System Design, Detailed Engineering, procurement of materials, Inspection/FAT (Factory acceptance test), Supply of materials, Transportation, loading/unloading, insurance, Storage at warehouse/store (hired by bidder) of complete UPS based Power source with one autonomy (24 Hrs Backup) for 10000W AC load for twenty four hours operation per day operation as per tender SLD, specification, data sheet, scope of work and block diagram enclosed including commissioning spares as required at each station. The system shall include following- (i) UPS system (2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS (ii)Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) (iii) AC DB, 230 V as per SLD (iv) Interconnecting cables among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required. (v) Earthing and lightning protection system as required to complete the system. (vi) Erection materials & Other miscellaneous work Rating of UPS, UPS DB and battery bank shall be selected to meet the load requirement as specified above. However, each subsystem rating shall not be less than the value given below-		
1.1	UPS system 10kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply as per sld & Specification	Set	2

1.2	Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) for 10KVA Load backup time shall be 12 hours each battery banks (total 24 hours. As per sld & Specification	**Set**	**2**
1.3	AC DB, 230 V As per sld & Specification	**Set**	**2**
1.4	Interconnecting cables, erection materials, Earthing materials, Glands, Jb. s among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required.	**Set**	**2**
1.5	All-inclusive per month rates for maintaining the warehouse/store at site (for supplied material) during the extended period as required (payable if site is not ready even after 6 months of Contractual completion date of Supply, Installation, Testing & commissioning as per terms & condition of contract and as defined in the tender scope of work).		
1.6	5 years comprehensive AMC (CAMC) for UPS systems (all items supplied under sl 1.) which shall cover workmanship and materials (supplied by the Bidder) for UPS system. However, AMC shall start after successful completion of warranty period/ Defect Liability period as per contract. (For detail scope & payment terms refer scope of work, annexure to SCC & contract document)		
2.0	**ITEM #2** 20kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply, FOR CATHODIC PROTECTION (PCP), INSTRUMENTATION, SCADA & TELECOM System Design, Detailed Engineering, procurement of materials, Inspection/FAT (Factory acceptance test), Supply of materials, Transportation, loading/unloading, insurance, Storage at warehouse/store (hired by bidder) of complete UPS based Power source with one autonomy (24 Hrs Backup) for 20000W AC load for twenty four hours operation per day operation as per tender SLD, specification, data sheet, scope of work and block diagram enclosed including commissioning spares as required at each station. The system shall include following- (i) UPS system (2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS (ii)Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) (iii)AC DB, 230 V as per SLD (iv) Interconnecting cables among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required. (v) Earthing and lightning protection system as required to complete the system.		

	(vi)Erection materials & Other miscellaneous work Rating of UPS, UPS DB and battery bank shall be selected to meet the load requirement as specified above. However, each subsystem rating shall not be less than the value given below-		
2.1	UPS system 20kVA rating 2nos X100% PARALLEL REDUNDANT with Bypass arrangement UPS, 415 V, 3 Ph incoming & 230V outgoing AC supply as per sld & Specification	**Set**	**3**
2.2	Ni-Cd (1.2V/Cell) Pocket Plate Battery Bank (2nos X50%) for 20KVA Load backup time shall be 12 hours each battery banks (total 24 hours. As per sld & Specification	**Set**	**3**
2.3	AC DB, 230 V As per sld & Specification	**Set**	**3**
2.4	Interconnecting cables, erection materials, Earthing materials, Glands, Jbs among UPS, battery bank, ACDBs, junction boxes etc including supply of all accessories like cable glands, cable tray, tinned-cu lugs etc as required.	Set	3
2.5	All-inclusive per month rates for maintaining the warehouse/store at site (for supplied material) during the extended period as required (payable if site is not ready even after 6 months of Contractual completion date of Supply, Installation, Testing & commissioning as per terms & condition of contract and as defined in the tender scope of work).	months	12
2.6	5 years comprehensive AMC (CAMC) for UPS systems (all items supplied under sl 2) which shall cover workmanship and materials (supplied by the Bidder) for UPS system. However, AMC shall start after successful completion of warranty period/ Defect Liability period as per contract. (For detail scope & payment terms refer scope of work, annexure to SCC & contract document)	LS	1

Details of Location

S. No.	TERMINAL DESCRIPTION	Section	UPS Rating in KVA	Nos.
	SGPL			
1	DT	SGPL	20	1
2	IP	SGPL	10	1
3	RT	SGPL	20	1
	DIPL			
1	DT	DIPL	0	0

2	IP	DIPL	10	1
3	RT	DIPL	20	1

Note: 1) Rating and locations of the UPS may change during the detail engineering, Bidder shall provide the changed UPS system accordingly without any cost & time implications.

6.3 The Vendor shall be completely responsible for the design, materials, manufacture & fabrication, testing, inspection, preparation for shipment and transport of the above equipment strictly in accordance with the MR and all attachment thereto.

6.4 Vendor shall appoint any one of the following TPIA for inspection purpose. Vendor has to propose minimum 4 nos. of below listed agencies to be approved by IGGL/Consultant.

a) Lloyd Register of Industrial Services b)Meenar Global
c) Technische Ulierwachungs Verein (TUV) d)Moody International
e) Det Norske Veritas (DNV) f)Certification Engineer International Limited (CEIL
g) AB-Vincotte h)Germanischer Lloyd
i) Bureau Veritas j)Dr. Amin Controllers Private Limited
k) SGS l)M/s IRCLASS Systems and Solutions Private Limite
m) American Bureau Services n) M/s Edlipse Engineering Global Private Limited
n) VCS Quality Services Pvt. Ltd . o)Velosi

6.5 Apart from inspection by TPIA, inspection shall also be performed by Consultant / IGGL delegate, as set out and specified in the codes and particular documents forming this MR.

6.6 Submission of UPS System design calculations (Charger sizing, battery sizing), datasheets & GA drawings, detail engineering, various drawings/layouts for review and approval, BOM, preparation of site engineering drawings, procedures, PG test procedures and details for installation works wherever applicable or required by Correction, updating and submission of all Owner's drawings for as-built status.

6.7 Design, Detailed Engineering, Manufacturing, Inspection/FAT (Factory acceptance test), Supply, Transportation, loading/unloading, insurance, storage at designated store hired by the Bidder in Various states as mentioned above, of complete UPS system along with battery set mentioned below & as per tender specification, data sheet enclosed including commissioning spares as required at terminals.

6.8 Supply of 10 KVA & 20 KVA industrial UPS system, Rectifier, Battery Bank, Convertors, ACDB / DCDB & interconnecting cables as per SOR are in Bidder's scope of work. However, Incoming cables for UPS DB all outgoing cables and cabling work from various equipment's are not in Bidder's scope of work, the same shall be done by other Bidder through separate tender.

6.9 Manufacturer Confirmation on availability of spares for a period of 15 years along with Bid. Supply of UPS system as per SOR at designated stores hired by the Bidder.

6.10 Supply of Two years O&M spares for UPS systems as per datasheet.

6.11 Price of 2 years O&M spares (as mentioned in Annex-IV of UPS datasheet) are inclusive of prices quoted by the Bidder in the bid for the UPS system. Unit Price schedule for 2 years O&M spares in SOR is for Addition/Deletion purpose only.

6.12 All commissioning & start up spares are in bidder's scope (Included in this package). Any commissioning & startup spare consumed during the startup & commissioning, is included in the supply of this package, for which no extra payment is made.

6.13 Bidder to note that all interconnecting cabling among UPS, Charger, Rectifiers, Converters & DCDBs (including supply & laying) & other electrics for the UPS System shall be supplied along with the package and no separate payment shall be admissible for the same.

6.14 Bidder to note that the exact cable routing shall be decided at site based on actual site conditions. Exact cable quantities/sizes shall be based on actual measured route lengths at site by Bidder in coordination with Engineer-in-Charge/Client. Bidder shall ensure that there is no surplus or shortage of cables at site and procure cables accordingly

6.15 The UPS Bidder shall be entirely responsible for Co-ordination with respective Terminal Bidders & it should be ensured that all works related to UPS systems should be timely executed.

6.16 If the Bidder fails to timely execution of the UPS work as per tender, necessary penalty clause shall be applied as per the direction of the Engineer-in-Charge

7.0 SCOPE OF INSTALLATION, TESTING & COMMISSIONING

7.1 Loading/unloading, transportation from designated store (Hired by Bidder) to site, fabrication, assembly, all mechanical works for installation, erection, commissioning and performance test at site of complete UPS system along with battery sets as mentioned below & as per tender specification, data sheet, PJS enclosed including commissioning spares as required at terminals. The scope also includes submission of first trial/commissioning reports of each location, submission of engineering drawings & documents for approval from IGGL / consultant for UPS System Installation, all other work not indicated here but required for completion of installation & commissioning as per the scope of work in the scope of bidder. Work shall be carried out as per relevant international & national standard, scope of work & specifications, approved drawings & documents.

7.2 Installation, testing & commissioning of 10KVA & 20 KVA UPS systems at the specified location is in the scope of the Bidder, Rectifier, Battery Bank, ACDB / DCDB & interconnecting cables as per SOR are in Bidder's scope of work.

7.3 UPS & Battery commissioning includes capacity test at site including arrangement of all required equipment’s in the scope of the Bidder i.e., DG set, Load bank wires and cables etc.

7.4 If any item/s damages during the above activities, it is responsibility of the Bidder to replace the same without any time and cost implication to the Owner.

7.5 The job includes repairing of all civil cabin panels works damaged during installation of electrical facilities.

7.6 The scope of work under this contract shall be inclusive of breaking of walls, floors and chipping of concrete foundations, (if required) necessary for the installation of equipment, materials, and making good of the same.

7.7 Preparation of buried cable trenches, including, back filling, compacting providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies, if any.

7.8 Minor modifications wherever required to be done in the owner free supplied equipment's / devices to enable cable entry, termination, etc.

7.9 All electrical equipment's are to be doubly earthed by connecting two earth wires from the frame of the equipment to be earth grid. The cable armours will be earthed through cable glands.

7.10 All non-current carrying metallic parts of electrical equipment's such as lighting and power panels, push button stations, cable trays etc. shall be earthed.

7.11 Sealing of opening made in the walls / floors for cables trays, cables, bus ducts, etc. using acceptable practice and standards.

7.12 Test certificates, catalogues, vendor drawings, installation, operation and maintenance manuals for all equipment materials in Bidder's scope of supply.

7.13 All supplied items installation, testing and commissioning, warehouse maintenance & CAMC shall be in suppliers scope". Supply and installation of all other accessories not specifically mentioned herein, but never the less necessary for completion of the job.

8.0 JOB SPECIFICAITONS

8.1 Various electrical works covered under this contract like equipment erection, cabling and grounding works, etc. shall be performed in accordance with specifications attached with this tender & relevant Indian standard. (Certain clauses of specifications, which are applicable to equipment's or system not covered under this contract, shall not be applicable).

8.2 Erection and commissioning of certain special equipment's shall be performed in accordance with instructions and directions of the Engineer-in-charge at site under supervision by equipment supplier/s.

8.3 The equipment's/materials to be supplied by the Bidder shall conform to the requirements of the applicable specifications enclosed in the tender document.

8.4 All works relating to statutory approvals of the complete installation of equipment's / material supplied by Bidder, from competent authority like CEA, PESO, State electricity authority/Board etc., shall be in the scope of Bidder, if any.

8.5 All equipment's / materials supplied by the Bidder shall be as per the list of approved makes enclosed with this document subject to submission of Certification and approvals.

9.0 QUALITY ASSURANCE, INSPECTION & TESTING AT MANUFACTURER'S WORK

9.1 All the equipment supplied and installed by the Bidder shall be inspected by the Owner/ or their approved inspection agency (TPI) at the manufacturer's works prior to dispatch. The equipment will be inspected as per the tests pre-identified in the approved QAP to ensure conformity of the same with relevant approved drawings, data sheets, specifications, National/International standards. The TPI shall be arranged by the Bidder for the testing of the material/equipment's at the vendor works.

9.2 Performance tests of any equipment's which cannot be conducted/demonstrated either partially of wholly at the manufacturer's work, shall be conducted after erection at site in the presence of Owner & their inspection agency. In all the cases, prior approval of the approval shall be obtained.

9.3 In case of waiver category of items, the same shall be pre identified. For such items, the Bidder shall furnish necessary certificates, test reports etc. for Review/Approval to Owner/Inspection agency. The issue of Inspection Certificate/Waiver Certificate for any equipment or component thereof does absolve the Bidder from his contractual obligations towards subsequent satisfactory performance of the equipment at site. Should any equipment be found defective, in whole or part thereof after receipt at site or during erection/commissioning and testing shall be Rectified/Changed by Bidder free of cost.

9.4 Bidder shall submit test plan for the equipment's with four-week advance notice**.**

10.0 TESTING & COMMISSIONING AT SITE

10.1 All the equipment supplied and installed by the Bidder shall be tested and commissioned as required and no separate payments shall be made for the same. Any damage or defect noticed shall be brought to the notice of the engineer- in-charge and will be rectified without any delay and no payments shall be made for rectification.

10.2 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the Bidder shall carry out the rectification at his own cost.

10.3 The Bidder shall carry out all the tests as enumerated in the technical specifications and as per applicable codes and standards.

10.4 Before the electrical system is made live, the electrical bidder shall carry out suitable tests to establish to the satisfaction of engineer-in-charge that the installation of equipment's, wiring and connections have been correctly done and are in good working condition and that it will operate as intended.

10.5 All the tests shall be conducted in the presence of Owner/ Engineer-in/charge or his authorized representative unless he waives this requirement in writing. The Bidder shall arrange all testing equipment necessary to carry out the test. The tests shall be recorded on approved Performa and certified records of the tests shall be submitted to Owner/ Engineer-in-charge.

10.6 After the completion of all tests and rectification of all defects pointed out during final inspection, plant start-up trials would be commenced. During the start-up trials Bidder shall provide skilled / unskilled personnel and supervision round the clock at his cost. The number and category of workmen and duration up to which required, will be decided by the Engineer in-charge. Any defects noticed during the start-up trial relating to the equipment supplied and work carried out by the Bidder, will be rectified by the Bidder at his own cost.

10.7 Engineer-in- charge shall have the right to get these defects rectified at the risk and cost of the Bidder if he fails to attend to these defects immediately as desired.

10.8 After the operating conditions are fully achieved in the plant and the other requirements as stated in the General Conditions of Contract are fulfilled, the Bidder would be eligible for applying for a completion certificate.

11.0 DOCUMENTATION

11.1 Drawings and design documents

i. The following documents shall be submitted along with the offer:

a) Filled up data sheets & Check lists
b) HSE Policy
c) QAP
d) Bar Charts & Project completion schedule
e) Un-priced List of two years operation and maintenance spare

ii. The following drawings (in three sets) & documents shall be submitted for approval within 3 weeks of award of contract.

a) Equipment detailed design & sizing calculations along with formulae used
b) Battery Sizing calculations
c) Various Installation & PG Procedures
d) Equipment GA drawings & datasheet.
e) Equipment installation & erection details drawings.
f) Tentative Bill of Material.
g) Vendor Data requirement as per Annexure-1.
h) Quality Assurance Plan of equipment's.

iii. After the job completion, Bidder shall prepare As-Built drawings/data sheets and documents, submit catalogues/manuals (O&M) of major brought out items. Final certified as built drawings, documents and manuals etc. shall be submitted by the Bidder to owner in bound volume with one set in soft copy (CD) plus two sets of prints to owner & one set to Consultant. Other drawings and documents shall be submitted by Bidder along with As-Built Drawings/Datasheets-

a) Test documents & drawings for bought out items.
b) Detailed commissioning report of UPS system.

12.0 ESCALATION

The Rates quoted shall be kept firm till completion of work and no price Escalation shall be paid.

13.0 DRAWINGS, STANDARD SPECIFICATIONS AND INSTALLATION STANDARDS

13.1 The equipment's / materials to be supplied by the Bidder shall conform to the requirements of the applicable specifications. Also, the installation of various material / equipment shall conform to the installation standards /norms.

13.2 The drawings accompanying the tender documents when read with specification shall depict the electrical system of the Terminal. These are indicative of the nature of work and issued for tendering purposes only. Purpose of these drawings is to enable the tendered to make an offer in line with the requirements of the Owner. Construction shall be as per drawings / specifications issued / approved by the Engineer-in-charge during the course of execution of work.

13.3 After the job completion, Bidder shall prepare AS-BUILT drawings and documents, submit catalogues/manuals (O&M) of UPS system.

13.4 Final certified as built drawings, documents and manuals etc. shall be submitted by the Bidder to owner in bound volume with one set in soft copy (CD) plus two sets of prints.

13.5 List of Standard Specification/Datasheet/QAP/Block diagrams/Schematic Route diagram

13.6 DOCUMENTS TO BE SUBMITTED/ PRODUCED ALONGWITH R.A. BILLS

a) Computerized R.A. Bill/ Manual Bill, with IT No./ ST No./ Labor License No. printed thereon.
b) ESI/ EPF clearance certificates for the last month along with RA. Bills.
c) Insurance Policy as per relevant clauses of Contract Agreement.
d) Attendance Register and Salary Records.
e) Photocopy of the measurement book to be attached with R.A. Bills.
f) Any other document required for the purpose of processing the bills.
g) Registration Certificate with Sales tax authorities of state concerned

13.7 SCADA COMMUNICATION AND MAPPING DETAILS

Dedicated RS485 Interface port to be provided for SCADA communication apart from local diagnostic port. Modbus RTU protocol will be the communication protocol between UPS and RTU. Below attachment mentioned parameter needs to be configured in contiguous Modbus register by UPS vendor for SCADA as per Modbus Register Address mentioned below attachment.

14.0 GENERAL REQUIREMENTS

Contractor shall procure and supply all materials other than Company supplied materials, required for permanent installation of UPS system in sequence and at appropriate time. All equipment, materials, components etc. shall be UPS system for the intended service. Approved vendor list has been enclosed with the bid package for various items. For items which are not covered in the vendor list, Contractor shall obtain Company's prior approval for the vendor. Necessary details i.e., data sheets & specifications for the items in the Contractor's scope of supply, as required, shall be enclosed with the bid package.

i) Preparation of Material requisition, request for quotation, bid evaluation and recommend vendors for Company's approval. Only single offer shall be provided by the bidder fully complying to specification requirements for Company's review and approval.

ii) Stores management including receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling / handing over surplus material to Company for Company supplied items at Company's storage yard.

iii) Carryout proper documentation of inspection and quality assurance programmers for bulk materials duly approved by Company. Contractor shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.

iv) Contractor shall immediately report to the Company of all changes which will affect material quality, and recommend any necessary corrective actions to be taken.

v) All purchase requisitions including purchase orders shall be approved by Company.

vi) Compliance with vendors and supplier's instructions and recommendations for transportation, handling, installation and commissioning

The Contractor shall also provide the following:

vii) **Major Items**- UPS, Battery charger, Battery, Panel, DB, controllers, Converter. Cables, Inverter, Lighting Fixtures,

a) All temporary materials required for installation/ testing/ commissioning. All consumables required for the works.
b) All construction equipment/machineries, tools and tackles, devices, apparatus, equipment, safety devices, etc. including ladders and scaffolding etc complete as required.
c) CT, PT, Isolators, switchgears (MCB, MCCB etc.)
d) Lighting switches box plates, Junction boxes.
e) Consumables for erection such as lugs, ferrules, glands, etc; electrodes;
f) Cement, aggregates, sand, bricks, structural steel
g) Structural and support steel & paint
h) Earthing materials (earth strip, Earth conductor, treated & non-treated earthing

electrodes, earthing bus bars etc)

i) Lightning Protection materials including conductors, earth Electrodes

j) Other consumables such as cable ties, cable tags, cable tiles, sand, cable markers, ferrules/shrink sleeves etc

k) Expendable materials (e.g., clothes, grease, cleaning materials, welding rods, solder, etc.)

l) All materials namely hardware like GI bolts, nuts, washers etc, anchor fasteners, small civil work, fixing cleats for surface run cables & conduit clamps etc

m) Equipment and materials, as per applicable specification, required for successful completion of the job except those specified as supplied by OWNER.

n) Any other material not specifically mentioned above but required for successful completion of the job.

15.0 CONSTRUCTION

Contractor scope of work for UPS system items construction shall include, but not limited to the following:

All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall need prior approval from the Company followed by subsequent revision of relevant drawings upon approval; Contractor shall do the follow up with the concerned authorities to get the permissions to execute the job in time. However, all statutory payments required for such permissions shall be reimbursed by Company at actuals. Contractor shall obtain permits / clearance from concerned authorities before actual commencement of the job at site including preparation and establishment of safety procedures.

i) Contractor shall also inform all local authorities in advance and obtain all necessary approvals for works wherever encountered along the system. Contractor shall be required to carry out all the works as mentioned in the work permit.

ii) Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements of the bid package;

iii) Providing all equipment, manpower, machinery, consumables, apparatus, tools and tackles for fabrication, installation, inspection, testing, pre-commissioning and commissioning complete as required including facilities for inspection and interpretation of testing results by Company's Representative;

iv) Obtaining all necessary approvals and work permits from Company / Concerned local authorities having jurisdiction including all work permit as applicable for performing the work in existing terminal facilities.

v) Coordination and supervising the work of sub-Contractors.

vi) Transportation of appropriate materials to worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.

vii) Fabrication of all, structural components as per approved drawings.

viii) All associated civil, structural, UPS system, instrumentation; and telecom works shall be performed in accordance with relevant specifications, drawings and requirements.

ix) Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.

x) Receiving and taking-over Company supplied free issue items from designated warehouse, loading, transportation, unloading, handling, and stacking of items at Contractor's worksite(s)/ workshop till the materials are installed in permanent installation.

xi) Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables and other resources etc. as required for the execution of complete work.

xii) Installation of UPS system cable trays (perforated type) along with cover and suitable accessories as per approved cable routing drawings and Project requirements.

xiii) Cable laying, dressing and termination of UPS system cables between instruments, JBs and cabinets are required.

xiv) Preparation of as built drawings, documents, photographs, project records as per specification and instructions of the Company including furnishing of all Test Certificates/Inspection Reports for all materials used for permanent installation.

xv) All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work and the associated facilities and making the entire system ready for operation.

xvi) Other miscellaneous works (civil works, co-ordination, etc.): All related civil works shall be included in the scope of the Contractor.

xvii) The job includes repairing of all civil works damaged during installation of UPS system equipment.

xviii) The scope of work under this contract shall be inclusive of breaking of walls and floors, and chipping of concrete foundations necessary for the installation of equipment, materials, and making good of the same.

xix) Minor modifications wherever required to be done in the Company free supplied equipment's or devices to enable cable entry, termination, etc.

xx) Sealing of openings made in the walls / floors for cable trays, cables, bus ducts, etc. suitably using acceptable practice and standards.

xxi) Supply and installation of all other accessories not specifically mentioned herein, but nevertheless necessary for completion of the job

xxii) As-built drawing & document shall be provided for all work done including old systems where any integration has been done. All documentation to be provided as printed documents and computer files compatible with MS Office and AutoCAD.

16.0 ANNEXURE-I

BIDDER DATA REQUIREMENT

UPS AND BATTERY BANK					
S.NO.	**DESCRIPTION**	**WITH BID**	**AFTER BID**	**DOCUMENT CATEGORY**	**No. of copies for review/ Construction**
Project Management, Quality And HSE					
1	Proposal and General Data & filled data sheets.		√	R	1E
2	Bill of Material with unit rate of addition / deletion of each item		√	R	1E
3	Proven track record.		√	R	1E
4	Supplier list.		√	R	1E
5	Quality Assurance Plan.		√	R	1E
6	Inspection and Test Plan.		√	R	1E
7	Inspection and Test Plan for various Equipment.		√	R	1E + 3H
8	Inspection and Test Procedure for various Equipment.		√	R	1E + 3H
9	Routine Test Certificates for various Equipment.		√	R	1E + 3H
10	Type test certificates for various Equipment.		√	R	1E + 3H
11	Bill of Materials / Parts List & filled data sheets.		√	R	1E + 3H

12	FAT & SAT Procedure.		√	R	1E + 3H
13	Painting Procedure as per Specification.		√	R	1E + 3H
DESIGN AND ENGINEERING					
1	Basis of UPS & Battery bank Design.	√	√	R	1E + 3H
2	UPS Panel & Power System Design Summary.	√	√	R	1E + 3H
3	Site installation details of UPS & battery bank		√	R	1E + 3H
4	Sizing calculation document for UPS.	√	√	R	1E + 3H
5	General arrangement / Outline / Dimensions / Support Details for UPS.		√	R	1E + 3H
6	Completely filled in datasheets for UPS and Battery bank.		√	R	1E + 3H
7	Cross–Sectional with Part & Material List.		√	I	1E + 3H
8	Control wiring diagram.		√	I	1E + 3H
9	Equipment Data Sheet and Specification.		√	R	1E + 3H
10	Single line diagram.		√	R	1E + 3H
11	Listing of each and all exceptions to the Specifications.		√	R	1E + 3H
12	UPS System Design Drawings.		√	R	1E + 3H
13	UPS Design Details & MTO.		√	R	1E + 3H

INSPECTION, TEST AND CERTIFICATIONS					
1	Material Test Report.		√	R	1E + 3H
2	Code Certification / Supporting Document.		√	R	1E + 3H
3	Test Certificates.		√	R	1E + 3H
4	Inspection, Test Procedure.		√	R	1E + 3H
5	Site Inspection test report.		√	R	1E + 3H
6	Site installation procedures.		√	R	1E + 3H
PACKING AND PROTECTION					
1	Shipping and Handling Instructions With Lifting Plan.		√	I	1E + 3 H
2	Preservation Procedure.		√	I	1E + 3H
INSTALLATION, OPERATIONS AND MAINTENANCE					
1	Quality Assurance Plan for Various Equipment.		√	R	1E + 3H
2	Installation, Start-up and Maintenance manual.		√	R	1E + 3H
3	Installation drawings with loading data information.		√	R	1E + 3H
4	Operating and Maintenance Instruction.		√	I	1E + 3H
5	Manufacturer's Record Book(s).		√	I	1E + 3H
6	SUB CONTRACTOR Data Book(s).		√	I	1E + 3H
7	Certified As Built drawings.		√	R	1E + 3H

8	Field Coating and Surface Preparation Procedure.		√	R	1E + 3H
9	Drawing for Information of Existing System.		√	R	1E + 3H
10	Installation, Commissioning / Startup Manuals.		√	R	1E + 3H
11	Progress Reports.		√	R	1E + 3H
SPARES AND AS BUILT					
1	Recommended Spare Parts List for Three Years Operation (Priced.)	√	√	R	1E + 3H
2	Recommended Start-Up/ Commissioning Spare Parts List.	√	√	R	1E + 3H

17.0 ANNEXURE-II

SCADA COMMUNICATION AND MAPPING DETAILS

Dedicated RS485 Interface port to be provided for SCADA communication apart from local diagnostic port. Modbus RTU protocol will be the communication protocol between UPS and RTU. Below mentioned parameter needs to be configured in contiguous Modbus register by UPS vendor for SCADA as per Modbus Register Address mentioned below.

STANDARDIZED UPS PARAMETER FOR SCADA							
SN	Terminals with Power Source as UPS with Grid	Signal Type	Start Addr Mod-bus	Mod-bus End Addr	Read / Write	HIST. AMS REQd	Remark
UPS-1 (Modbus Device Address 1)							
Analog Parameters (Two 16 bit register to map one float parameter)							
1	Incoming Voltage Phase 1	Serial			Read	NO	
2	Incoming Voltage Phase 2	Serial			Read	NO	
3	Incoming Voltage Phase 3	Serial			Read	NO	
4	Incoming Current Phase 1	Serial			Read	NO	
5	Incoming Current Phase 2	Serial			Read	NO	
6	Incoming Current Phase 3	Serial			Read	NO	
7	Output Voltage	Serial			Read	NO	
8	Output Current	Serial			Read	NO	
9	Output Frequency	Serial			Read	NO	
10	UPS Output Power (In KVA)	Serial			Read	NO	
11	UPS Output Power (In KW)	Serial			Read	NO	
12	Rectifier Voltage	Serial			Read	NO	
13	Battery Voltage	Serial			Read	NO	
14	Battery Current	Serial			Read	NO	
DIGITAL							
1	Battery Status (0 - None / 1 – Charging / 2 - Discharging)	Serial			Read	NO	

2	MAINS HIGH (0 –Normal 1 – Main's volt greater than Main's High volt reference	Serial					
3	MAINS LOW (0 – Main's Normal, 1 – Main's volt less then Main's)	Serial					
4	MAINS FREQ O TOL (0 – Main's Freq within Tolerance 1 – Main's Freq Out of Tolerance)	Serial					
5	MAIN'S FAIL (0 - Normal, 1 –Main's Fail)	Serial					
6	RECT OVER TEMP (0 -Temp. Normal 1 – Temp. High)	Serial					
7	MAINS LOW TRIP (0 – Normal, 1 – Rectifier Trip Due to Main's Low)	Serial					
8	MAINS HIGH TRIP (0 - Normal 1 – Rectifier Trip Due to Main's High)	Serial					
9	LOW BATTERY TRIP (0 - Battery Voltage normal 1 – Battery Disconnected)	Serial					
10	LOAD ON BYPASS (0 - Load is not on Bypass 1 - Load is on Bypass)	Serial					
11	OUT LOW (0 – O/P Voltage is above then Lower threshold 1 – O/P Voltage is Low)	Serial					
12	OUT HIGH (0 – O/P Voltage is below then Higher threshold 1 – O/P Voltage is High)	Serial					
13	Inverter trip (0 - Inverter is not Tripped, 1 - Inverter is tripped)	Serial					
14	UPS OVERLOAD (0 - No Overload on UPS, 1 - UPS is Overloaded)	Serial					
15	LOW BATTERY (0 - Battery Voltage Normal 1 - Low battery voltage	Serial					
16	SC COMM FAIL (0-Communication between the Control Card & UI	Serial					

	Card is OK ,1 - Communication Fail between the Control Card & UI Card.						
UPS-2 (Modbus Device Address 2)							
SN	Terminals with Power Source as UPS with Grid	Signal Type	Start Addr Mod-bus	Mod-bus End Addr	Read / Write	HIST. AMS REQd	Remark
1	Incoming Voltage Phase 1	Serial			Read	NO	
2	Incoming Voltage Phase 2	Serial			Read	NO	
3	Incoming Voltage Phase 3	Serial			Read	NO	
4	Incoming Current Phase 1	Serial			Read	NO	
5	Incoming Current Phase 2	Serial			Read	NO	
6	Incoming Current Phase 3	Serial			Read	NO	
7	Output Voltage	Serial			Read	NO	
8	Output Current	Serial			Read	NO	
9	Output Frequency	Serial			Read	NO	
10	UPS Output Power (In KVA)	Serial			Read	NO	
11	UPS Output Power (In KW)	Serial			Read	NO	
12	Rectifier Voltage	Serial			Read	NO	
13	Battery Voltage (0 - None / 1 - Battery Charging / 2 - Battery Discharging	Serial			Read	NO	
14	Battery Current	Serial			Read	NO	
DIGITAL							
1	Battery Status (0 - None / 1 – Battery Charging / 2 -Battery Discharging)	Serial			Read	NO	
2	MAINS HIGH (0 – Main's Normal 1 – Main's volt greater than Main's High volt reference)	Serial					
3	MAINS LOW (0 – Main's Normal 1 – Main's volt less then Main's Low volt reference	Serial					

4	MAINS FREQ O TOL (0 – Main's Freq within Tolerance, 1 – Main's Freq Out of Tolerance)	Serial					
5	MAIN'S FAIL (0 - Normal, 1 –Main's Fail)	Serial					
6	RECT OVER TEMP (0 -Rectifier Temperature Normal, 1 – Rectifier Temperature High)	Serial					
7	MAINS LOW TRIP (0 - Normal 1 – Rectifier Trip Due to Main's Low)	Serial					
8	MAINS HIGH TRIP (0 - Normal 1 – Rectifier Trip Due to Main's High)	Serial					
9	LOW BATTERY TRIP (0 - Battery Voltage normal 1 - Battery Disconnected due to low voltage)	Serial					
10	LOAD ON BYPASS (0 - Load is not on Bypass 1 - Load is on Bypass	Serial					
11	OUT LOW (0 – Output Voltage is above then Lower threshold 1 - Output Voltage is Low	Serial					
12	OUT HIGH (0 – Output Voltage is below then Higher threshold 1 - Output Voltage is High	Serial					
13	INV TRIP (0 - Inverter is not tripped 1 - Inverter is tripped	Serial					
14	UPS OVERLOAD (0 - No Overload on UPS 1 - UPS is Overload	Serial					
15	LOW BATTERY (0 - Battery Voltage Normal 1 - Low battery voltage	Serial					
16	SC Signals (0-Communication between the Control Card & UI Card is OK .1 – Communication Fail between the Control Card & UI Card.	Serial					

	Hardwire Signals						
	UPS-1						
1	Rectifier Trip	Hard wire DI					
2	Inverter Trip	Hard wire DI					
3	Battery Discharge (Load on Battery)	Hard wire DI					
4	Load On Bypass	Hardwi re DI					
5	Common Alarm	Hard wire DI					
	UPS-2						
1	Rectifier Trip	Hard wire DI					
2	Inverter Trip	Hard wire DI					
3	Battery Discharge (Load on Battery)	Hard wire DI					
4	Load On Bypass	Hard wire DI					
5	Common Alarm	Hard wire DI					
COMMUNICATION PARAMETERS FOR EACH UPS – Modbus Slave Address 1 (1&2-for two UPS)							
	PROTOCOL	Interfa ce	Baud Rate	Data Bits	Parity	Stop Bit	
	MODBUS RTU	RS 485	9600	8	None	1	

Annexure-III- Scope of works AMC of UPS for 5 year

COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT (CAMC):

The UPS system is to be maintained for a period of five years after the expiry of warranty period as per the details given below:

- After expiry of warranty period, Cost of all spares, consumables, equipment, instruments & services, to take care of maintenance (Preventive & Breakdown), including all statutory taxes and duties including entry tax, service tax etc. has to be borne by the Vendor during the CAMC period. In case of failure to attend within 2 days, these will be attended through alternate agency at vendor's risk and cost.
- Four Nos. normal visits (once in three months) per annum for carrying out regular maintenance work, for checking the operation of system and do preventive maintenance and Four No. emergency visits per annum (as & when required) are included in scope of C.A.M.C (Annual Maintenance Contract) at each location. M/s IGGL will have the right to reschedule the visits and adjust the total no. of regular and emergency visits. Each Visit shall conclude only after the deliverables are achieved as per the approved check list/work specified by IGGL before start of the visit.
- During warrantee and AMC period, any replacement of parts/rectification shall form an integral part of the contract and agreed contract price. Since the equipment is under warranty and CAMC obligations, no extra payment towards replacement of components, parts etc shall be allowed.
- The effective date of Annual Maintenance Contract shall be from the date of successful completion of warranty period as per contract and on request from the purchaser. During regular maintenance / breakdown visits any replacement/consumable required will be provided by the Vendor.
- The vendor's service engineer will check and service UPS systems installed under this contract and its accessories and maintain them in good working condition. Any consumables required for servicing the equipment shall be arranged by the Vendor at no extra cost to IGGL during CAMC.
- Vendor shall ensure availability of consumables and critical spares for smooth working of UPS systems during CAMC. The vendor should do proper spares management by carrying out periodical testing of the spares, safeguards against obsolescence, any up gradation, timely replenishment, etc.
- IGGL can terminate the annual maintenance contract by giving One months' notice in advance to the vendor for CAMC.
- In case the Bidder does not undertake the AMC contract later when awarded or does not abide by the terms of the contract for supply of spares as well as the AMC contract, then IGGL reserves the right to encash the performance bank guarantee available with them besides blacklisting and putting the Bidder on holiday list of IGGL for a period of five years.
- Any software upgrades required shall be included in the scope of the Bidder during annual maintenance. The Bidder shall seek permission from the Project / Terminal incharge before

loading the new version of the software in the clients / server. The data backup shall be taken before upgrading the software. If during CAMC /Warranty period a new version of Software is released by the Vendor/ OEM, the same is to be updated at the location without any additional charges.

- If new OS, say Windows 10 or above is introduced by IGGL for the automation system, the UPS system shall be integrated with the same within a reasonable time period and without any cost implication to IGGL.
- The vendor shall ensure availability of spares for the UPS System for a minimum period of 15 years after warranty period. In the event of non-availability of spares due to fast obsolescence of hardware and software, the vendor shall arrange to upgrade/ replace the equipment's with equivalent or higher hardware and software at no additional cost till end of CAMC period for the items supplied by the Vendor.
- The Vendor must note that all commissioning spares and the spares / consumables during warranty and comprehensive CAMC shall be supplied by the vendor free of cost.
- For payment terms and penalty clauses refer the annexure to SCC-Payment Terms (Annexure-5 to SCC).
- Bids will be evaluated taking into account the charges towards CAMC for 5 years. However IGGL reserves the right to award the CAMC contract & these items subsequently at the end of the warranty period or earlier.
- For all Windows OS & other Microsoft product, the security/ functionality patches which are mandatory in nature shall be upgraded /installed in all machines during project execution, system stabilization, warranty & CAMC. Vendor shall carry out such updates in coordination with IGGL. Using IGGL's software deployment/ upgrade infrastructure.

Energising Quality

ANNEXURE - IV

LIST OF2 YEAR OPERATION & MAINTENANCE SPARES

	Description	UOM	QUANTITY			
1	IGBT (5 KVA)	Sets	0	1	0	0
2	IGBT (10 KVA)	Sets	0	0	2	0
3	IGBT (20 KVA)	Sets	1	0	0	2
4	Rectifier/ Charger Card*	Sets	1	1	2	2
5	Inverter Card*	Sets	1	1	2	2
6	Power supply card*	Sets	1	1	2	2
7	DC-DC Converter card*	Sets	1	1	2	2
8	MCB's & MCCB's (consist of one no. of each rating MCB & MCCB)**	Sets	1	1	2	2
9	Fuse & Indication lights of all ratings**	Sets	1	1	2	2
10	Cooling fan	Nos.	2	2	4	4

(1) * 1 Set=One of card of each rating/type of each rating UPS
(2) ** 1 Set= 10% of each rating (minimum one number) of each type of UPS

Note: Prices of 02 year O&M spares are inclusive of prices quoted by the Bidder for the UPS System(Separate prices for each years)

-x-x-x-

Energising Quality	**PROJECT NUMBER: C221052**	IGGL

ELECTRICAL LIST OF ATTACHMENT				**TOTAL SHEETS**	**03**
DOCUMENT NO	C221052	00	EL	LST	4002

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

C1	24.06.2022	ISSUED FOR BID	VV	RD	AA
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

TABLE OF CONTENTS

ELECTRICAL

ELECTRICAL

1.0 LIST OF ATTACHMENTS

CONTRACTOR shall carry out all works strictly in accordance with the drawings/documents/specifications indicated in subsequent paragraphs.

2.0 PROJECT DOCUMENTS

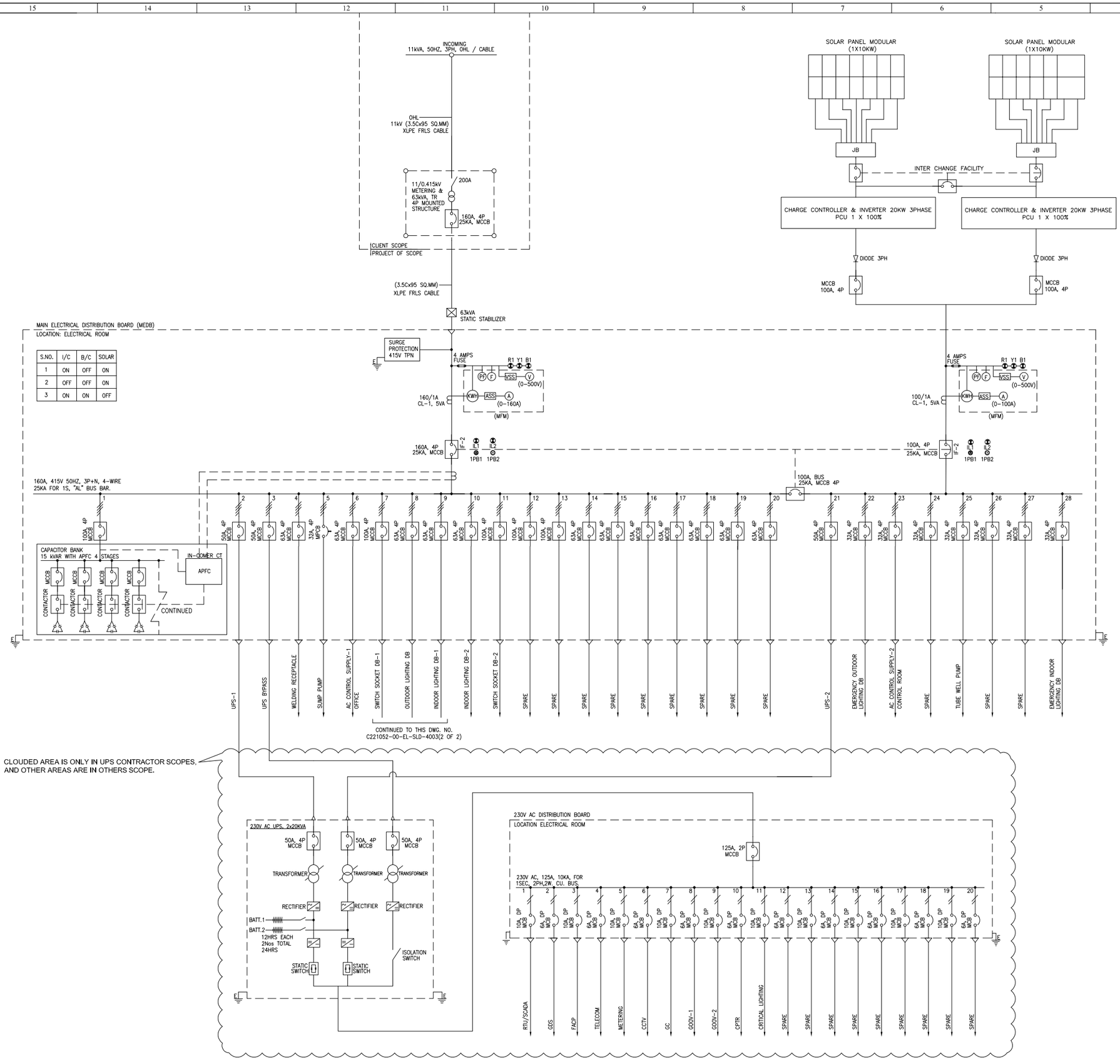
Sr. No	Document Number	Description	Rev No	Pages
1.	C221052-00-EL-MR-4002-C1	SCOPE OF WORK/ SUPPLY & MR FOR UPS POWER SYSTEM	C1	35
2.	C221052-00-EL-LST-4007 -C1	LIST OF ATTACHMENT	C1	3
3.	C221052-00-EL-SLD-4001&3	TYPICAL SLD FOR RECEIPT STATION	C1	01

3.0 STANDARD DATA SHEETS

Sr. No	Data Sheet Number	Description	Rev No	Page No
1.	VPC–DS–EL-031	DATA SHEET FOR UPS SUPPLY SYSTEM	02	5
2.	VPC–DS–EL-033	DATA SHEET Ni-Cd BATTERIES	02	04
3.	.----------.	QUALITY ASSURANCE PLAN	01	02
4.	.----------.	VENDOR LIST	04	05

4.0 STANDARD SPECIFICATIONS

Sr. No.	Specification number	Description	Rev No	Page No
1.	VPC-SS-EL-011	STANDARD SPECIFICATION FOR UPS SYSTEM	02	23
2.	VPC–SS–EL -009	STANDARD SPECIFICATION FOR STATIONARY NICKEL CADMIUM BATTERIES	02	09



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-DT-EL-LST-4001
ELECTRICAL DESIGN BASIS	C221052-00-EL-DB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA.
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL. AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM WITH MFM & SMALL CONTROL OPERATION FOR LOCAL & REMOTE MONITORING.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING OF UPS BATTERY BANKS.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY, IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.	PB	PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	kWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ELI	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	24.06.22	ISSUED FOR BID	SY	VV/RD	AA

CLIENT: INDRADHANUSH GAS GRID LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL

TITLE: ELECTRICAL SLD FOR DISPATCH & RECEIPT STATION (TYPICAL)

SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 2
SIZE	JOB NO.	DRAWING NUMBER	REV.
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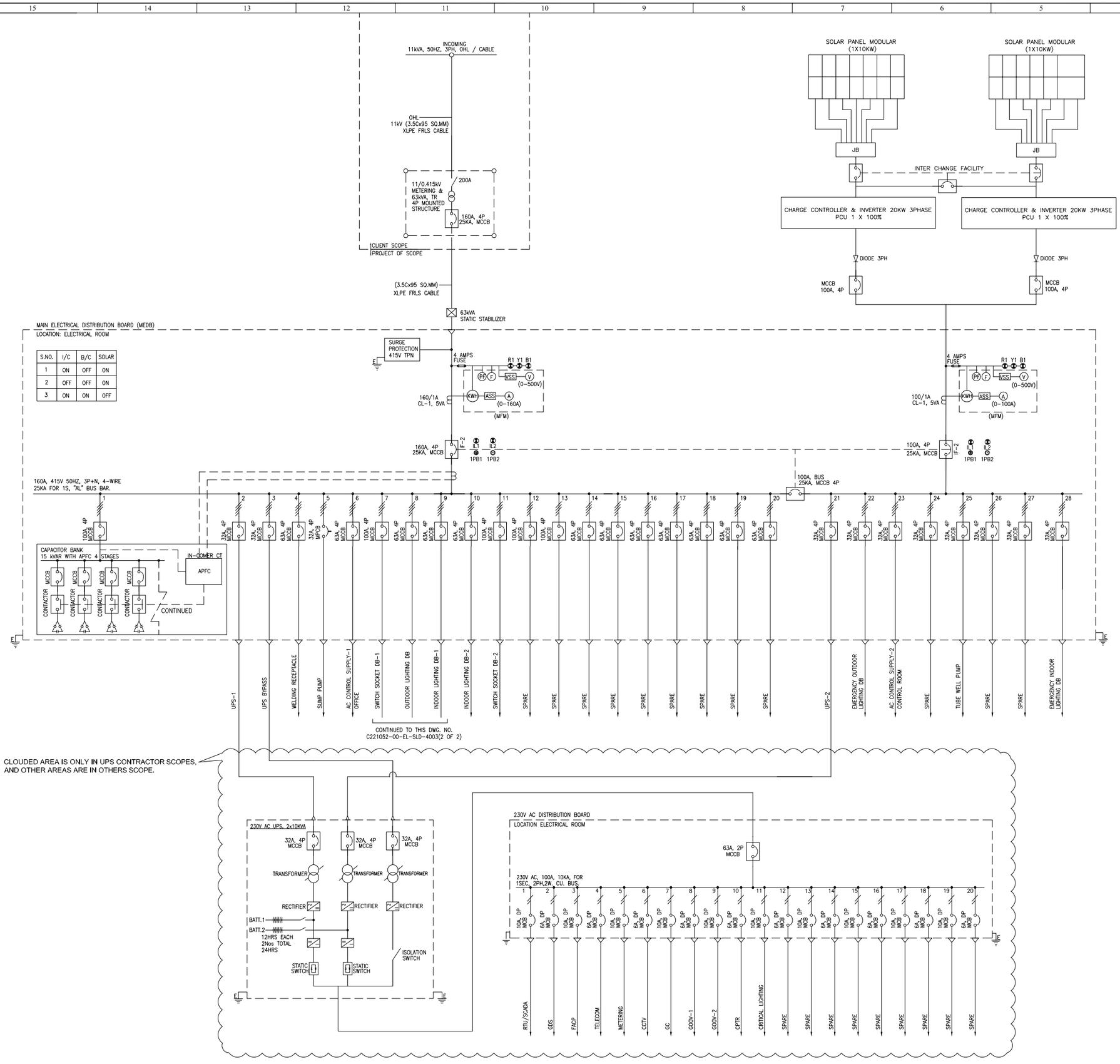
FORMAT NO C221052-FMT-005_00



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
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ELECTRICAL DESIGN BASIS	C221052-00-EL-DB-4001

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REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
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A1	C221052	C221052-00-EL-SLD-4003	D1

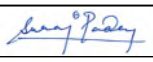
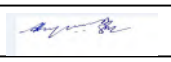
FORMAT NO C221052-FMT-005_00

Energising Quality

VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION
FOR
UPS POWER SYSTEM

VCS–DS–EL-4031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01	14.09.2020	MG	VV	AD	SK
00	14.11.2017	MG	RD	AD	SK
Rev	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description	
00	14.11.2017	MG	RD	AD	SK		
01	14.09.2020	MG	VV	AD	SK		
02	04.04.2022	SP	RD	AA	HK		

GENERAL INFORMATION

Applicable To: Proposal Purchase As Built

Vendor shall complete Data Sheet with information not otherwise provided by Buyer.

Client: IGGL

Facility: PIPELINE

Location:

Service:

Tag Number

Manufacturer/Model No.:

INPUT POWER SUPPL [TECHNICAL DATA SHEET] (ANNEXURE -1)

1.0	**INPUT POWER SUPPLY**		
1.1	Voltage/freq./ phas		415 V (+) 10% & (-)15%, TPN, 50 Hz ± 5% or 230V AC single
1.2	System fault level		10 kA for 1 Sec
2	**SITE CONDITION**		
2.1	Design Maximum / Minimum temperature		50 degree C/20 degre C
2.2	Max. Relative Humidity		95%
2.3	Altitude		Below 1000.0 M MSL
3	**OUT PUT REQUIREMENT**		
3.1	Voltage/ Phase		230V ± 1% AC, Single phase 2 wire
3.2	Output waveform & frequency		Pure Sinusoidal Wave 50 Hz ± 0.1% Voltage distortion (THD): Less than 3% for linear loads & Less than 5% for non linear loads.
4	**SYSTEM REQUIREMENTS**		
4.1	Rating KVA		As per SOR
4.2	Type of inverter		The inverter circuit should be IGBT based, fully microprocessor controlled with PWM Technology or Latest proven technology
4.3	Overload capacity		125% of the rated output for 10 minutes & 150% for 1 minute.
4.4	Mode of operation		Dual/Parallel Redundant with static bypass & Dual Redundant rectifier as specified in SOR/Design basis/SLD
4.5	Inverter efficiency		>85% at 100% of load and >80% at 25% of load
4.6	Installation		Floor Mounted
4.7	Type of enclosure		Minimum IP-31
4.8	External Cable Connection		From Bottom
4.9	Internal protection		All live parts shrouded
4.1	Earthing		Doubly Earthed (Two distinct terminals to be made available)
4.11	coolling		Forced ventilation with fans
4.12	Noise Level		• <65 dB at full Load from 1 mtr distance (for UPS of rating 5kVA, 7.5kVA & 10kVA) • <75 dB at full Load from 1 mtr distance (for UPS of rating 15kVA & 25kVA)

4.13	Crest Factor		≥3:1
4.14	Input Power Factor		> 0.95
4.15	Load Power Factor		0.8 (with variation between 0.6 to 1.0)
4.16	Overall efficiency		> 80%
4.17	Harmonics		As per IEEE 519 (Total demand distortion not more than 5.0%)
50 Rectifier/Charger			
5.1	Input voltage		415 V (+) 10% & (-) 15%, TPN, 50 Hz ± 5% or 230V ACsingle phase (voltage range-160V AC to 270V AC) or 230V ±1% AC from UPS (As per SOR).
5.2	Automatic phase selection device		As per SOR
5.3	Output DC voltage/Load		**As per Manufacturer Design**
5.4	Input Power factor		> 0.95 at rated load
5.5	Input current THD (Total Harmonic Distortion) at nominal load		<= 5 %
5.6	Overload Capability		125% minimum for 10 min. 150% minimum for 1 min
5.7	Inrush current		Limited by soft-start circuit
5.8	Output voltage tolerance		+/- 1%
5.8	DC voltage ripple		<1% With battery connected <2% Without battery connected
5.1	Rectifier		IGBT based
5.11	Filter		Input side line filter
5.12	Harmonics		As per IEEE-519 (Voltage THD <5%, largest single voltage harmonics <3%, Input Current THDi <5%
5.13	Charging		Automatic Float and Boost charging (selection as per battery charging state (voltage level))
6 Bypass			
6.1	Automatic Bypass		Static bypass to provide an un interruptible transfer of load in case of failure of any system component or malfunctioning or overload & the load shall return on the UPS when the malfunctioning or overload is cleared
6.2	Input connection		Separate for each UPS
6.3	The switching time from inverter to bypass & vice versa		No break type
6.4	Manual/Maintenance Bypass		Shall be provided
6.5	Overload on bypass		125% minimum for 10 min. 150% minimum for 1 min.
6.6	Connectivity		Ethernet / Preferably Modbus RS 485 (To be decided during detailed engineering)

7.0	**BATTERY BANK**	
7.1	Type of Battery	As per approved vendor
7.2	Battery Arrangement	Ni-Cd type battery bank
7.2	i) Battery end cell voltage ii) Battery stand formation iii) Battery back up time iv) De-rating factor	As per specification (clause no. 3.5) As per battery manufacturer As per SOR (i) Ageing -- 0.8 (ii) State of Charge -- 0.88 (iii) Temp. Correction -- As per min. site temp. (Ref. 2.1 above) The rectifier/charger output current & voltage shall be limited to the battery supplier's recommendation
8	**Alarms, Indications and LCD Display**	
8.1	Single line Power Flow Diagram (Mimic diagram) with LED indications of UPS status (i.e. Mains present, Battery charging & discharging, Low battery Voltage and unit on bypass).	
8.2	Digital panel Meter with LCD display (touch screen / touch pad) shall be provided for monitoring viz	a) Input AC Voltage, current, frequency b) Output AC Voltage, current, frequency. c) Battery current and voltage d) Total run time e) Mains ON/OFF/TRIP, Mains Over/Under voltage, Phase fail f) Inverter ON/OFF, Inverter Over/Under voltage, inverter overload, over heat & load in % on inverter. g) Battery voltage low, Battery AH in % h) Battery Operation Boost Charge, Float Charge with of status - "in charge" or "discharge" i) Load on bypass or inverter. Detailed UPS Status with Operation/faults history
8.3	Audible Alarms With LCD Display	a) Mains Failure b) Battery Low c) UPS fault (Continuous) d) Inverter Under-voltage e) Over Temperature (Continuous) f) Inverter Overload (Continuous)
9	**Protective features**	
6.1	Input	Mains Over voltage, under voltage, phase failure
6.2	Inverter	Over voltage, short circuit, overload, over temperature
6.3	Battery	Under voltage at battery terminal, Battery over charge, Battery Over current
6.4	Rectifier & Battery charger	Maximum current limiting Over temp. Trip Boost charging and float charging current limiting with back up protection against over charging

10.0 Distribution boxes

10.1	Distribution Board Details	(As per tender drawings / SOR) (1)ACDB 230V, Single Phase (1 No.) : Incomer: 63A/100A/160A MCCB (As per UPS capacity10KVA/20 KVA) or more for higher capacity UPS. Outgoing: Combination of DP MCB's : **10KVA UPS System-** ASs per SLD /SOR (The rating of above mentioned feeders may change during detail engineering, Bidder shall provide all required feeders as per requirement without any financial implications.)
11	Battery Monitoring System	Yes with communication
12	UPS communication	Float and Boost selection
13	Selector switch	DSP type, Dual MPPTPCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown
14	Toggle switch	Float and Boost selection
15	**TECHNICAL DATA FROM MANUFACTURER (To be filled up by the Tenderer)**	
1	**INVERTER**	
1.1	Manufacturer's Model No. (Enclose catalogue)	
1.2	Rating (at specified ambient) / no. of phases	
1.3	Applicable code AND STANDARD	
1.4	Steady state output volt/freq (230 V + 1%) (50 Hz + 0.1%)	
1.5	Input voltage - DC	
1.6	Synchronization (inv. phase locked with main) in percentage	
1.7	Synchronization manually adjustable in steps of	
1.8	Allowable unbalance between phases (for 3 Phases only)	
1.9	Harmonics distortion for linear & non-linear loads	
.1.10	Mode of operation	Dual/Parallel Redundant with static bypass as specified in SOR /Design basis/Block diagram

1.11	Dynamic Responses at following conditions a) ± 50% step load (for parallel redundant UPS) b) ± 100% step load (for hot standby and single UPS system). c) Power supply interruption and restoration. d) Load Transferred to bypass line e) When one inv. gets faulty and load transferred to healthy inv. (for parallel		

1.12	Recovery time to reach steady state after above disturbance (not more than 100m Sec)		
1.13	Overload capacity (125% minimum for 10 min. 150% minimum for 1 min.)		
1.14	Short circuit capacity and duration (in % and m sec.)		
1.15	Noise Level (dB at 1 m) • <65 dB at full Load from 1 mtr distance (for UPS of rating 5kVA, 7.5kVA & 10kVA) • <75 dB at full Load from 1 mtr distance (for UPS of rating 15kVA & 25kVA)		
1.16	Efficiency at 100%/75%/50% loads (not less than 85% at 100% load		
1.17	Type of control circuit		
1.18	Out put voltage & phase angle (for 3 Phase only) a) For 30% unbalance load b) For 40% unbalance load c) For 50% unbalance load d) For 100% unbalance load		
1.19	**Crest Factors**		
2	**STATIC SWITCHES**		
2.1	Nos. of static switches in each set		
2.2	Current rating at specified ambient		
2.3	Transfer time (m sec.) a) Synchronized mode (not more than 4msec) b) Unsynchronized mode (not more than 20msec)		
3	**BATTERY CHARGER**		
3.1	Rating (Amp.) / MAKE (Enclose back up calculation		
3.2	Type of charger /basis configuration		
3.3	Output volt under float/boost charging condition		
3.4	Volt. Accuracy under specified input (± 1%)		
3.5	Max. Ripple content on DC side (% RMS) (not more than 2% without battery & 1% with		
3.6	Efficiency at 100%/75%/50 % of load		
3.7	Mode of Change over from float to boost and vice- versa		

4	**BATTERY**		
4.1	**Make**		
4.2	Type (Enclose catalogue)		Sizing calculation after award of bid
4.3	AH rating (Enclose back up calculation)		(2X50%) Sizing calculation after award of bid
4.4	End cell voltage at specified discharge rate (V/ cell)		
4.5	Output (Nominal) volts		
4.6	Nos. of battery banks		
4.7	Nos. of cells in each banks		
4.8	Battery charging requirements (V/ cell) a) Volts/Cell/Nominal b) Float c) Boost		
4.9	Voltage variation from fully charged battery to discharged battery (volts)		
4.10.	Charging time (Hrs.)		
4.11.	Max. Permissible ripple content (% RMS)		
4.12.	Overall dimension (L*W*H)		
4.13.	Container type		
4.14.	Accessories for battery as per specification included		Cell testing Voltmeter, Pair of Gloves, Insulated Spanner, Extra Electrolyte, Hydrometer, Thermometer etc
4.15.	Type/Formation of battery stand		
5	**MANUAL TRANSFER DEVICES**		
5.1	Rating (Amp.)		
5.2	Make/Type		
6	**STEP DOWN BYPASS TRANSFORMER WITH SOLID STATE VOLTAGE STABILISER**		
6.1	Make/type		
6.2	Rating and Voltage ratio		
6.3	Accuracy of stabilizer (not more than ± 2%)		
6.4	Type of control (Solid state)		
6.5	Type of cooling		Natural

7	**AC DISTRIBUTION BOARD**		
7.1	Nos. of feeder/rating		
7.2	Cable entry from (Bottom)		Ni-Cd
7.3	Max. Rating of outgoing feeders possible for fault clearance by UPS with and without supply back up (as percentage of UPS rating) not less than 25% a) With fast acting semi conducting fuses		
8	Indications and Alarm		Sizing calculation after award of bid
9	Metering		
10	**UPS Dimension (L x W x H) except Battery:**		
	(Including inverter, charger, rectifier, bypass stabilizer, ACDB etc.)		
11	**OVERALL EFFICIENCY OF UPS SYSTEM**		
11.1	Ratio of output load to input drawn from mains when inverters are on and synchronized with bypass. a) At 100% load b) At 75% load c) At 50% load		
12	**RELIABILITY** a) Safety factor used for selecting electronic components/ other electrical components (not less than 200%/ 125% respectively) b) MTBF / MTFR c) Availability factor		
13	**Heat loss** for total system (W)		
14	Potentail free contacts(duplicating the fault status in remote panle		
15	DEGREE OF PROTECTION OF THE PANEL (Minimum IP – 31)		
16	Fault status shall be compatible to hook-up with Owner's PC through Ethernet/ preferably RS 485 interface (To be decided during detailed engineering).		

4.15	**TECHNICAL DATA FROM MANUFACTURER-II**		
1	**2x100% RECTIFIER UNITS**		
1.1	**Mains Input**		
	a) Voltage & Frequency		415 V (+) 10% & (-) 15%, TPN, 50 Hz ± 5% or Power supply details mentioned in SOR or 230V AC single phase (voltage range-160V AC to 270V AC) or 230V ± 1% AC from UPS.).
	b) Input harmonics (max.) at full load.		5% RMS (Voltage)
1.2	**Out put details**		
1.3	Efficiency of Rectifier (at 50%, 75%, 100% load)		
1.4	Power Factor of Rectifier (at all load		0.6 to 0.7 (lag)
1.5	**Annunciator details**		
7.1	a) Audio – Visual		DC over voltage Rectifier Failure Load C.B. Trip
7.2	b) Push buttons		Acknowledge, reset
7.3	c) Remote		One no. potential free common alarm annunciation contact
1.6	Indication Lamps		AC Power ON, Rectifier ON
1.7	Meters		A.C. input ammeter and voltmeter. Output ammeter and voltmeter.
1.8	MTBF (Hrs.)		60,000 Hrs.
1.9	MTTR (Hrs.)		4 Hrs. (Approx.)
1.10.	PTRV (Peak Transient reverse voltage)		600 V on AC side 200 V on DC side
1.11.	**Construction Details**		
	a) Type of Cooling		Natural
1.1	b) Cable entry		Same as UPS Panel
1.2	c) Access		Same as UPS Panel
1.3	d) Painting		Same as UPS Panel
1.4	e) Degree of Protection		Same as UPS Panel
12	Safety Factor		2

CHECK LIST (To be submitted by the Bidder) **ANNEXURE – IV**

S.NO	Description		Remark
1	Deviation from specification		
2	Charger sizing calculation enclosed		
3	Battery sizing calculation enclosed		
4	Battery catalogue enclosed		
5	UPS Panel Catalogue enclosed		
6	Confirm compliance to Block diagram		
7	Confirm Inspection for UPS and battery as per specification.		
8	Dimension for UPS Panel, rectifier and Battery Bank enclosed.		
10	Break up for two years operation & maintenance spares enclosed for UPS & Rectifier		

NOTES:

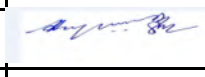
	*	Data to be filled by supplier with its bid in the supplier data column, those data shall be in accordance with standard specification

Energising Quality

VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION
FOR
NICKEL CADMIUM BATTERY

VCS–DS–EL-4033

					
02	25.04.2022	SP	RD	AA	HK
01	14.09.2020	MG	VV	AD	SK
00	14.11.2017	MG	RD	AD	SK
Rev	Date	Prepared By	Checked By	Approved By	Authorized By

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CONTROLLED COPY	:	If in soft and signed

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description	
00	14.11.2017	MG	RD	AD	SK		
01	14.09.2020	MG	VV	AD	SK		
02	25.04.2022	SP	RD	AA	HK		

Energising Quality	**STANDARD DATA SHEET FOR NICKEL CADMIUM BATTERY**	Doc number:	VCS–DS–EL-4033
		Rev :	02

GENERAL INFORMATION

Applicable Proposal To: Purchase As Built

Client: _____

Facility: _____

Location: _____

Service: _____

Vendor shall complete Data Sheet with information not otherwise provided by Buyer.

Tag Number: _____

Manufacturer/Model No.: _____

[TECHNICAL DATA SHEET]

1	Item No. as per MR/PO	
2	Manufacturer's name	
3	Type of construction	
4	Type and catalogues no of cell	
5	Ampere hour capacity	
6	No. of cells	
7	Nominal cell voltage	
8	End Cell voltage at the full discharge	
9	Specific gravity of electrolyte at the end of full charging at 27ºC	
10	Specific gravity of electrolytes at the end of full discharge at 27ºC	
11	Quantity of electrolyte per cell (liters)	
12	Weight of each cell with electrolyte (kg)	
13	Max boost charging voltage per cell	
13B	Permissible ripple content	
14	Manufacturer Suggested boost charging rate (amperes)	
15	Max boost charging voltage per cell	
16A	Recommended Float charging voltage per cell	
16B	Maximum float charging voltage range per cell.	
17A	Float charging current range (amperes)	
17B	Permissible ripple content	
18	AH Efficiency at 10 hours / 5 hour rate	
19	Short circuit current of the battery bank	
20	Short circuit withstand time (sec.)	
21	Max. allowable temp. of electrolyte which the cells can withstand without injurious effects	
	Continuously	
➢ 6	For short periods	
➢ 2	Type of positive plate	
➢	Type of negative plate	
	No. of +ve and –ve plates per cell	
	Material and thickness of separators	
	Amper hour capacity at min. ambient 27ºC	
	10 hour rate to end cell voltage at Sl. No 8 above	
	5 hour rate to end cell voltage at Sl. No 8 above	
	2 hour rate to end cell voltage at Sl. No 8 above.	

	1 hour rate to end cell voltage at Sl. No 8 above.	
	30 minutes rate to end cell voltage at Sl. No. 8 above.	
	Dimensions of battery rack (WXDXH) in mm	

QUALITY ASSURANCE PLAN FOR UPS SYSTEM

Energising Quality	CONTRACTOR		**QUALITY ASSURANCE PLAN FOR UPS SYSTEM & BATTERY**	CLIENT: **M/s IGGL**
				PROJECT: **UPS SYSTEM FOR IGGL NORTH EAST GAS GRID PIPELINE PROJECT** Section 1A,1B,1C,1D,2A,2B,2C,2D
	ORDER NO. & DATE			PACKAGE NO. SECTION -10&11
	SUB-CONTRACTOR			PACKAGE NAME **UPS System**
	DOC NO. & DATE	C221052-UPS-EL-QAP-4001		

INSTRUCTIONS FOR FILLING UP :

1. QAP shall be submitted for each of the equipment separately with break up of assembly/sub-assembly & part/component or for group of equipment having same specification.
2. Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment
3. Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together.
4. Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATIONS USED :

CONTR : CONTRACTOR

MFR : MANUFACTURER

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS:

Code Description

1. Visual
2. Dimensional
3. Fitment & Alignment
4. Physical Test (Sample)
5. Chemical Test (Sample)
6. Ultrasonic Test
7. Magnetic Particle Test (MPT)
8. Radiography Test
9. Dye Penetration Test
10. Measurement of IR Value
    a) Before HV Test
    b) After HV Test
11. High Voltage test/Dielectric test

Code Description

12. Routine test as per relevant IS other standard
13. Type test as per relevant IS/ other standard
14. Impulse Test
15. Partial Discharge Test
16. Heat run risc test\tempr.
17. Enclosure Protection Test
18. Calibration
19. Noise & Vibration
20. Test certificates for bought out components
21. Tank Pressure Test
22. Paint shade verification

Code Description

23. Short time rating
24. Operational & functional check
25. Over Speed Test
26. Flame Proof Test
27. Clearance and creepage Distance
28. Acceptance Test
29. Harmonics measurement .

DOCUMENTS:

D1. Approved GA drawings
D2. Approved single line/ schematic diagram
D3. Approved data sheet
D4. Approved bill of materials
D5. Unpriced P.O. copy
D6. Calibration Certificate of all measuring instruments and gauges

EQUIPMENT DETAILS							INSPECTION AND TESTS								
Sl. No.	Description (With equipment heading, place of use, and Breif Specifications)	Indentificatuin No.	Quantity No/M	Quantity T	Manufacturer's Name and Address	Expected schedule of Final Inspection	Raw Material and inprocess stage inspection MFR	Raw Material and inprocess stage inspection CONTR	Raw Material and inprocess stage inspection VCS	Final Inspection/Test by MFR	Final Inspection/Test by CONTR/ TPIA	Final Inspection/Test by VCS/ IGGL	Test Certificates & documents to be submitted to VCS	Acceptance Criteria Standards /IS/ BS/ASME/ Norms and Documents	REMARKS / SAMPLING PLAN
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	**UPS – System**		**Set**				**1,2,3,4, 24, 27,28**	-	-	**1,2,3,12, 16,22,23 24,27,28**	**1,2,3,12, 16*, 22, 23,24,27, 28,29**	**1,2,3,12, 16*, 22, 23,24,27, 28,29**	**D1, D2, D3, D4, D5, D6, 20, 12,13**	**Tech. Specification, Approved Drawings & Data Sheets**	**(*) 12 hour heat run test**
2.	**Battery Set-UPS**		**Set**				**1,2,3,4, 24,27**	-	-	**1,2,3,12, 13,28**	**1,2,28**	**IWC***	**D1, D3, D4, D5, D6, 12,13,28**	**Tech. Specification, Approved Drawings & Data Sheets Test certificates**	**12, 13 Document to be reviewed by VCS**

For Manufacturer (Stamp & Signature)

For CONTR (Stamp & Signature)

For VCS (Stamp & Signature)

Q.A.P. NO C221052-UPS-EL-QAP-4001

SHEET 1 OF 1 R-0

*IWC- TPIA shall witness Inspection of Battery sets at Manufacturer's works & VCS shall issue IWC(Inspeciton Waiver Certificate) based on TPIA's IRN, Inspection Report & other Inspection documents.

ENERGISING QUALITY	**LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS**				
				TOTAL SHEETS	5
DOCUMENT NO			VCS-00-00-VL-0001		

LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS

04	03-06-2022	Issued for Vendor's	Mahesh Chand	Anjum Afroz	Hashim Khan
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

ELECTRICAL

LIST OF SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 BATTERIES (NICKEL CADMIUM)

a. Amco Saft Batteries Ltd.

b. HBL Power Systems Ltd.

2.0 BATTERY CHARGER/DC-DC CONVERTER

a. Amara Raja Power System(P)Ltd.

b. BCH.

c. Chhabi Electricals Pvt. Ltd..

d. Caldyne Automatics Limited.

e. HBL Nife Power Systems Ltd..

f. ~~Universal Industries Products~~.

g. Universal Instrument Mfg. Co Pvt Ltd.

h. Hitachi HI-REL Power Electronics P. Ltd

i. Mass-Tech Controls Pvt Ltd

j. Dubas Engineering Pvt Ltd

k. Chloride Power Systems & Solutions Ltd

l. Synergee

m. Enertech

n. Vertiv

3.0 CABLE – LT / MV POWER AND CONTROL

a. Cords Cable Industries Ltd.

b. Universal Cable Ltd.

c. KEI Industries Ltd.

d. Havells.

e. Delton.

f. Elkay Telelinks.

g. Evershine Electricals.

h. Ecko.

i. Ravin.

j. Rallison.
k. Suyog.
l. Netco.
m. Uniflex.
n. Paramount.
o. Gloster.
p. Associated cables Pvt Ltd.
q. CMI.
r. Gemscab.
s. Industrial cables.
t. NICCO.
u. Polycab.
v. Torrent.

4.0 CABLE – GLAND

a. Baliga.
b. Comet.
c. Flexpro.
d. Flameproof.
e. FCG.
f. Electro Werke.
g. Dowels.
h. CCI.
i. Sudhir Switchigear
j. Keyson Techno Equipments,

5.0 CABLE – LUGS & TERMINAL BLOCKS

a. Dowels.
b. Jainson.
c. Sharma Electrical
d. Punitam
e. Yamuna Powers
f. Rapid Manufacturer
g. Varun Controls.

6.0 MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB

a. ABB.
b. Hagger.
c. Havell's India Ltd.
d. Indo Asian Fusegear Ltd.
e. Legrand.
f. MDS Switchgear Ltd.
g. Schneider.
h. Siemens Ltd..
i. HPL.
j. L & T
k. Siemens

7.0 MOULDED CASE CIRCUIT BREAKER (MCCBS)

l. ABB.
m. Andrew Yule.
n. Larsen & Toubro.
o. Schneider.
p. Siemens.
q. Control and Switchgear.
r. Indo Asian,
s. Hager.
t. Merlin Gerin.
u. Havell's India Ltd
v. General Electric

8.0 LOW/MEDIUM VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB

a. ABB.
b. BCH.
c. BHEL.

d. C & S.
e. Elecmech Switchgear & Instrumentation.
f. KMG ATOZ.
g. L&T.
h. Pyrotech Electronics Pvt. Ltd.
i. Risha Control Engineers Pvt. Ltd.
j. UDKAM PROCESS EQUIPMENT INDIA PVT. LTD
k. Tricolite Electrical Industries.
l. Unilec Engineers ltd.
m. Vidyut Control India Pvt. Ltd.
n. Control and Schematic.
o. Zenith Engineering.
p. Schneider Electric,
q. AEG,
r. HAVELL'S,
s. MDS
t. Synergee

9.0 UPS SYSTEM AND INVERTER

a. DB Power.
b. Keltron.
c. Hi-Rel/HITACHI.
d. Dubas.
e. Toshiba Corporation.
f. Fuzi Electric Co Ltd.
g. Emerson.
h. Synergy System.
i. Eaton.
j. Enertech

Energising Quality

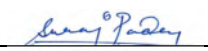
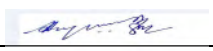
VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION

FOR

UNINTERRUPTED POWER SUPPLY

VCS – SS – EL - 4011

					
02	05.03.2022	SP	RD	AA	HK
01	16.10.2019	MG	VV	AD	SK
00	05.07.2017	MG	RD	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	**:**	**If printed**
CONTROLLED COPY	**:**	**If in soft and signed**

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MG	RD	AD	SK	Issued for use as Standard
01	16.10.2019	MG	VV	AD	SK	New revision system updated
02	05.03.2022	SP	RD	AA	HK	New revision system updated

ABBREVIATION

BIS/IS	Bureau of Indian Standards
IEC	International Electro-Technical Commission
BS	British Standards
IEEE	Institute of Electrical and Electronics Engineers
NEMA	National Electrical Manufacturers Association
OISD	Oil Industries Safety Directorate
CCE	Chief Controller of Explosive
DGMS	Director General Mines Safety
IE Rules	Indian Electricity Rules
CPRI	Central Power Research Institute
CRCA	Cold rolled cold annealed
UPS	Uninterrupted Power Supply
DCS	Distributed Control System
IGBT:	Insulated Gate Bipolar Transistor
SMPS	Single Mode Power Supply
RMS	Root Mean Square
LCD	Liquid Crystal Display

CONTENTS

1.0 SCOPE

1.1 The scope of this Specification is to define the requirements of design, manufacture, testing, packing and dispatch of static Uninterrupted Power Supply (UPS) system.

1.2 Deviation from this specification shall be acceptable only when the manufacturer shall inform the deviation in quotation before placing the order & shall take the necessary written approval for deviation from the Consultant / Owner. In absences of a list of deviation, it will be assumed that the Manufacturer complies fully with this specification.

2.0 REFERENCE DOCUMENTS

2.1 The equipment shall comply with the requirements of latest revision of following Standards issued by BIS (Bureau of Indian Standards) unless otherwise specified:

IS: 5:	Colours for ready mixed paints and enamels
IS: 1248:	Direct acting indicating analogue electrical measuring (Part1,2, 4 and 9) instruments and their accessories
IS: 2147:	Degree of protection provided by enclosures for low voltage Switchgear and control gear.
IS: 3700:	Essential ratings and characteristics of semi-conductor (Part I to 11) devices.
IS: 3715:	Letter symbols for semi-conducting devices. (Part 1 to 4)
IS: 4411:	Code for designation of semi-conductor devices.
IS: 5001:	Guide for preparation of drawings of semi-conductor devices (Part I & 2) and integrated circuits.
IS: 5469:	Code of practice for the use of semi-conductor junction (Part 1 to 3) devices
IS: 7204:	Stabilized power supplies D.C. output (Part 1 to 4)
IS: 12021:	Control transformers for switchgear and control gear for voltages not exceeding 1000V AC
IS: 13314:	Solid state inverters run from storage batteries
IS: 13703:	Low voltage fuses for voltage not exceeding 1000V AC or (Part 1 to 4) 1500V DC
IS: 13947:	Specification for low voltage switchgear and control gear (Part-4 / Sec-1)

2.2 In case of imported equipment's Standards of the country of origin shall be applicable Standards are equivalent or stringent than the applicable Indian Standards.

2.3 The equipment shall also conform to the provisions of Indian electricity rules and other statutory regulations currently in force in the country.

2.4 In case Indian Standards are not available for any equipment, Standards issued by IEC/BS/VDE/IEEE/NEMA or equivalent agency shall be applicable.

2.5 In case of any contradiction between various referred Standards/Specifications/ Data Sheet and statutory regulations, the following order of priority shall govern:

a. Local Statutory Regulations
b. Data Sheets
c. Job Specification
d. This Specification
e. Codes and Standards

3.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY	OWNER of the particular Project (Project Specific).
CONSULTANT	The party which is doing engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
BIDDER / SUPPLIER / VENDOR	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.

4.0 MATERIALS

4.1 UPS panels, ACDB and cell booster enclosures shall be fabricated from Structural/CRCA sheet steel. The frames shall be fabricated by using minimum 2mm thick CRCA sheet steel while the doors and covers shall be made from 1.6mm thick CRCA sheet steel. Wherever required suitable stiffeners shall be provided.

4.2 The panels shall be free standing, fitted with suitable louvers for ventilation and cooling fans as required. Hinged doors shall be provided at the front and back with dust tight gaskets. Inter panel sheet steel barriers shall be provided. The enclosure shall provide minimum IP-42 degree of protection, if not specified otherwise in the Data Sheet. The maximum and minimum operating height of the switches shall be 1800 mm and 300 mm respectively.

5.0 DESIGN

5.1 GENERAL REQUIREMENTS

5.1.1 The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.

5.1.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 15 years from the date of supply.

5.1.3 Vendor shall give a notice of at least one year to the end user of equipment before phasing out the product/spares to enable the end/user for placement of order for spares and services.

5.1.4 The UPS system shall be an integrated system comprising static rectifiers, battery, static inverters, static switches, auto / manual by pass switch, AC distribution board, voltage stabilizer in bypass, isolating and protection devices and all other equipment/ accessories required for completeness of the system whether specifically mentioned herein or not, but necessary for completeness and satisfactory performance of the system.

5.1.5 The UPS system shall be suitable to feed all loads connected to the output which are primarily instruments, (DCS), computers, disc drives and other SMPS equipment leading to high crest factor of the load.

5.1.6 The inverter shall be thyristor / transistorised (IGBT) type or with the latest proven technology. All components shall be of a high quality and reliability that satisfy with the requirements of a secure AC power to vital equipment with respect to performance, controlling, monitoring and safeguarding function in continuously operating petrochemical process units, petroleum refineries, gas processing facilities, utility and other miscellaneous industrial plants. Components shall be capable of withstanding the thermal and dynamic stresses resulting from internal and external short circuits and switching surges etc.

5.1.7 The design of the UPS shall be such as to minimize the risk of short circuits and shall ensure human and operational safety.

5.1.8 The vendor shall be responsible for design, engineering and manufacturing of the complete system to fully meet the intent and requirements of this specification and enclosed data sheets. Selection, sizing and suitability of all equipment and components used for UPS system shall be Vendor's responsibility.

5.1.9 The UPS shall be single phase or three phase system as indicated in the Data Sheets.

5.1.10 For the Batteries detail see technical requirement.

6.0 TECHNICAL REQUIREMENTS

6.1.1 INPUT POWER SUPPLY

a. The UPS shall be suitable for input power supply as defined in the Data Sheet. If not specified therein the UPS shall be suitable for the following input power supply.

   Voltage 415V ± 10%

   Frequency 50 Hz ± 3%

b. In addition to above variations, the input voltage may be subjected to transient variations comprising voltage dip to 20% of normal voltage during motor start-up as well as voltage variations due to fault condition. UPS system shall be designed to operate satisfactorily while deriving the input power from an emergency diesel generator set.

c. UPS system shall also operate satisfactorily on input power supply having:

   i. the ratio of negative to the positive sequence components not exceeding 5% and

   ii. Total harmonic distortion of not more than 5%.

d. Total Harmonic Distortion is the ratio in percentage of r.m.s. value of the harmonic content to the r.m.s. value of the fundamental component of alternating quantity.

e. The incoming power supply to UPS will be provided by 2 Nos. feeders. one feeder shall feed the rectifier(s) while other shall supply power to stabilized bypass supply.

6.1.2 UPS CONFIGURATION AND OPERATIONAL REQUIREMENTS

The UPS system shall have one of the following basic configurations as specified in Data Sheet and drawings:

a. Single UPS with Bypass

i. In UPS system having this configuration a single rectifier and inverter shall be provided. Under normal conditions when AC mains power is available, the rectifier shall simultaneously feed DC power to inverter as well as for float/rapid charging of the battery. The AC supply to loads shall be fed from inverter output. In case of any fault in the inverter, the load shall be automatically transferred to stabilized bypass supply and retransfer of load from stabilized bypass supply to the inverter shall be possible in auto as well as in manual mode.

ii. In case of AC input power failure or battery charger failure, the battery shall supply power to inverter without any interruption. The charger shall be designed for simultaneously feeding complete inverter load and for float/rapid charging the battery to its rated capacity. Charger shall be equipped with 'On Line' automatic as well as manual charging facility.

b. Parallel Redundant UPS with bypass

i. In UPS system having this configuration two sets of rectifiers and inverters shall be provided. Under normal conditions, when AC mains power is available, both the rectifiers shall operate in parallel and supply DC power for float/rapid charging the battery and simultaneously to inverters. In case of failure in one rectifier, the other rectifier shall feed the complete load and the battery without any interruption. In case of incoming supply failure or failure of both rectifiers the battery shall feed the inverters without any interruption. Each rectifier shall be designed for simultaneously feeding complete inverter load and float/rapid charging of the battery to its rated capacity. Each rectifier shall be equipped with 'On Line' automatic as well as manual charging facility.

ii. Normally both inverters will be synchronized with each other and with stabilized bypass supply. Both inverters shall operate in parallel and share the load equally. When a disturbance/fault occurs in any one of the inverters, the faulty unit shall automatically get disconnected and the entire load shall be fed from the other inverter. In case both the inverters develop a fault, the complete load shall be transferred to stabilized bypass supply through the static switches and retransfer of load from stabilized bypass supply to the inverter shall be possible in auto as well as in manual mode.

c. Parallel Redundant UPS

i) In UPS system having this configuration two sets of rectifiers and inverters shall be provided. Under normal conditions, when AC mains power is available, both the rectifiers shall operate in parallel and supply DC power for float/rapid charging the battery and simultaneously to inverters. In case of failure in one rectifier, the other

rectifier shall feed the complete load and the battery without any interruption. In case of incoming supply failure or failure of both rectifiers the battery shall feed the inverters without any interruption. Each rectifier shall be designed for simultaneously feeding complete inverter load and float/rapid charging of the battery to its rated capacity. Each rectifier shall be equipped with 'On Line' automatic as well as manual charging facility.

ii) Normally both inverters will be synchronized with each other. Both inverters shall operate in parallel and share the load equally. When a disturbance/fault occurs in any one of the inverters, the faulty unit shall automatically get disconnected and the entire load shall be fed from the other inverter.

d. Hot stand-by Redundant UPS with bypass

i. In UPS system having this configuration, the arrangement of rectifiers/inverters and the operating philosophy is same as described above, except that only one inverter shall be operating at one time. The other inverter shall not be sharing the load but shall be synchronized with the running inverter and stabilized bypass supply and remain ready to accept the load in case of fault in the running inverter. Retransfer of load from stabilized bypass supply to the inverter shall be possible in auto as well as in manual mode.

ii. In all UPS configurations, the facility for uninterrupted manual transfer in either direction through static switches shall also be provided.

iii. For ease of maintenance, it shall be possible to isolate inverters and static switches from load through manually operated make before break switches. In case of larger rating UPS, where it is not possible to provide one power switch with make before break feature, combination of breakers with the control scheme having make before break logic may be provided which ensures momentary paralleling before tripping of selected breaker.

6.1.3 UPS DESIGN AND PERFORMANCE REQUIREMENTS

a. Incoming AC supply shall be converted to DC through three phases full wave-controlled rectifiers. The rectifiers shall operate according to the constant voltage current limiting principle and shall incorporate a "Soft Start" feature to gradually accept load on initial energizing.

b. The rectifier section of the UPS system shall be capable of precise regulation to prevent damage to the battery. The output voltage of rectifier's DC bus without the battery shall be stabilized to within ± 1% of set value during load variation between 0 to 100% of the rectifiers and specified mains input supply voltage variation.

c. Suitable protection shall be provided in the control circuits to guard against instability of phase-controlled rectifiers due to electrical oscillations which may be present in the input supply as caused by emergency DG set.

d. The UPS system including the stabilized by-pass shall be galvanically isolated from input power supply system by providing double wound transformers. All transformers shall be natural air cooled, dry type suitable for location inside the panel. All rectifiers shall also have a double wound transformer at its input.

e. An RFI filter shall be provided. The production of radio frequency interference voltage shall not exceed the value of suppression grade N' as defined in VDE-0875. The performance of UPS system shall not get affected or in any way be degraded by the

use of portable radio transmitter receiver in the vicinity of the UPS system and or UPS room.

f. Transient/surge protection circuit shall be provided in the input circuit to rectifiers to protect the UPS from surges & voltage spikes.

g. The UPS system shall be designed to draw power from mains supply at a minimum power factor of 0.85 while working at rated load in normal operating UPS configuration.

h. The UPS shall be provided with automatic sequence and power walk in circuit(s) with time delay of up to 15 sec. such that the rectifiers and inverters can start operating automatically when incoming AC power is restored allowing the UPS to be loaded automatically.

i. Facility for initial charging of batteries shall also be provided. The inverters may be disconnected during initial charging of the battery.

j. For battery sizing, the following factors shall be considered unless specified otherwise in the Data Sheet:

   i. Load Power Factor of 0.8.

   ii. Minimum ambient temperature as specified in Data Sheet.

   iii. $$\text{Battery Current} = \frac{\text{Inverter rated KVA x Rated load p. f.}}{\text{Inverter Efficiency* x End cell voltage No. of cells}}$$

   * At 50 % load on each inverter for parallel redundant UPS.

   iv. Aging factor of 0.8.

   v. Back up time of 8 / 10 / 12 hours in case of mains power failure unless specified otherwise in Data Sheet.

   vi. Minimum end cell voltage for lead acid/VRLA battery 1.85 V per Cell and 1.0 V per cell for Ni-Cd battery.

   vii. Battery state of charge factor of 0.95.

k. The rectifiers/chargers shall be designed to completely charge the Lead acid and Nickel cadmium batteries in a maximum time of 8 / 10 / 12 hours after complete discharge. Facilities shall be provided to initiate battery rapid charge operation by manual & automatic means. An auto charging sequence should be provided for the rapid and float charging based on current sensing. Battery charger for VRLA battery shall be sized to provide boost charging of the battery up to 90% of rated Ampere hours within duration of 24 hours and to 100% within 4 days. In addition to above, the charging shall he transferred from rapid to float mode after a preset time adjustable through 0-24 hours timer as back up protection against overcharging.

l. The rectifiers shall be sized based on the maximum inverter input load when inverter is delivering its rated output at 0.8 p.f. lagging and recharge the battery to nominal rated capacity of the battery. The DC load imposed by the inverters shall be considered under the most severe operating conditions where only one rectifier is operating but the UPS load is equally shared by all the inverters. The rating of each rectifier shall be not less than the value calculated as follows:

For Lead Acid Batteries = Inverter input current + 0.14Ah (10 hr. Rating of the battery)

For Nickel Cadmium Batteries = Inverter input current + 0.2Ah (5 hr. Rating of the battery)

For VRLA Batteries = Inverter input current + 0.2Ah (10 hr. Rating of the battery)

$$\text{Where Inverter input current} = \frac{\text{Rated KVA capacity of UPS} \times \text{Load power factor}}{\text{Battery charging voltage} \times \text{Inverter efficiency}}$$

m. The DC rectifiers shall sense the battery charging current and adjust the DC bus voltage to maintain the charging current to preset level. A separate current limit circuit shall also be provided for adjustment of battery current. The rectifiers shall be protected against reverse battery connection at DC link voltage bus. Subsequent to a discharge cycle when battery is connected to rectifier, the battery current shall be monitored, controlled and limited to set value automatically irrespective of the inverter input current.

n. The battery may be taken out of service for maintenance, during which period it shall be possible for the inverter to continue operation by drawing power from the rectifier. Ripple content at the DC link shall not exceed 2% even with battery disconnected.

o. Battery / D.C. link shall be provided with a sensitive earth leakage protection.

p. The inverter shall be of the current limiting type (short circuit proof) and have nominal output voltage and frequency as specified in the data sheet. The inverter output voltage and frequency shall not exceed the operational tolerances, as measured at the output terminals of the unit during the following conditions of UPS loading:

i. Load variations between 0-100% of the rated output of UPS

ii. Load power factor over the range of 0.7 lagging to unity.

iii. Load current waveform having a relative harmonic content varying between zero and50% the latter waveform having a crest factor not exceeding 2.5 and individual harmonics not exceeding the following values:

- 3rd harmonic- 44% of fundamental
- 5th harmonic- 33 % of fundamental
- 7th harmonic- 1.8 % of fundamental
- 9th harmonic- 7% of fundamental
- 11th harmonic-10% of fundamental

iv. The Relative harmonic content is the ratio of the r.m.s. value of the harmonic content to the r.m.s. value of the total non-sinusoidal periodic waveform i.e. relative harmonic content =

$$\sqrt{[1-(\frac{\text{Rms value of the fundamental component of the current or voltage}}{\text{Rms value of total waveform of current or voltage}})^2}$$

v. The UPS output voltage waveform shall be pure sine wave under linear load conditions, and not exceeding 5% under the non-linear load conditions specified above.

q. The inverter shall control the output voltage of the UPS such as to maintain synchronism with the mains bypass voltage during variations in mains frequency up to the limits specified.

   During variations in mains frequency exceeding these limits, the inverter shall revert to internal frequency control.

r. It shall be possible to vary the inverter output voltage steplessly within ± 5% of the specified output voltage. This adjustment shall be possible to be made when the inverter is in operation.

s. The steady state output voltage and frequency (free running) variation of inverters shall not exceed ± 1% from the set value for specified input power supply conditions from no load to full load condition and load power factor variation from 0.7 lag to 1.0.

t. The UPS system shall be able to operate satisfactorily on rated loads (in KVA) with power factors in the range of 0.7 lag to 1.0. The overall efficiency of the UPS system shall not be less than 80% at rated load and 0.8 p.f.

u. The UPS shall have capacity to deliver a minimum overload of 125% for 10 minutes and 150% for 10 sec. UPS shall be provided with current limit circuit to avoid excessive loading beyond its permissible overload withstand capability.

v. The inverters shall be 'phase locked' to the stabilized bypass power supply as long as stabilized bypass supply frequency remain within ± 4% of nominal. When bypass supply frequency variation, exceeds the above limits, the inverters shall be delinked from mains. Free running frequency tolerance limit shall not exceed ± 1%. Facility shall also be provided for adjustment of range of synchronizing frequency.

w. Unless otherwise specified, the UPS system output voltage variation shall not exceed ± 10% and complete recovery to normal steady state shall be within 0.1 Sec. The above requirement shall be complied for following transient disturbances.

   i. 100% step load and unload (For single UPS and hot stand by UPS)
   ii. 50% step load (for parallel redundant UPS)
   iii. Momentary interruption in power supply
   iv. Load transfer to stabilized bypass supply
   v. Complete load transfer to other healthy inverter when one of the two parallel inverters develop a fault.

x. For 3 phase UPS system, the maximum output voltage and angle variation between the phases should not exceed 5% and 3 degrees respectively even under the condition of 100% unbalanced loading of the 3 phase output.

y. UPS system shall be suitable for floating output in case of single phase system.

z. The stabilized bypass supply shall be designed to regulate the output voltage within ±2% of the rated voltage over complete range of load from no load to full load and for specified input supply voltage variation. The type of Voltage stabilizer in stabilized bypass supply shall be as indicated in data sheet.

aa. The stabilized bypass supply shall have a continuous current rating equivalent to the rated output of the UPS unit and be capable of conducting a current ten times the rated output for the duration more than the fault clearing time of the type of fuse provided. The load transfer devices shall comprise of continuously rated static elements in both inverter and stabilized bypass supply.

bb. Adequately rated static switches in required number & configuration shall be provided in the inverter(s) output and stabilized bypass supply to ensure positive isolation of faulty inverter section such that the other inverter and bypass circuits do not feed into the fault leading to under voltage / trip. The short time rating of all the static switches shall be at least 10 times the rated output for the duration more than the fault clearing time of the type of fuse provided.

cc. Facility shall be provided to manually and automatically initiate transfer of the load from inverters to the stabilized bypass supply and from stabilized bypass supply to the inverters. Under voltage and over voltage sensing levels to initiate transfer shall be adjustable. The maximum transfer time between inverters and bypass supply shall not exceed 4 msec and 20 msec in synchronous and asynchronous mode respectively.

dd. The criteria for load transfer:

i. Load transfer from inverter to the stabilized bypass supply shall be as follows:

- The load transfer shall only be possible when:
  - The stabilized bypass output voltage is within ± 5% of rated UPS output voltage and the mains bypass frequency is within ± 4%.
  - Auto-transfer of the load from inverter to stabilized bypass supply shall be inverted when:
  - The inverter output voltage drops below 95% of nominal output voltage under steady state condition and/or if the inverter output voltage falls below 90% of the nominal value under transient conditions.

OR

  - The inverter output voltage exceeds 105% of the nominal output voltage under steady state condition and/or if the inverter output voltage reaches 110% of the nominal value under transient conditions.

OR

  - The inverter output current exceeds its tolerable limits.

ii. Retransfer of load from stabilized bypass supply to the inverter shall be as follows:

- The load transfer shall be possible when:
  - The inverter output voltage is within ± 5% of nominal output voltage for more than 5 sec. and
  - Inverter output and stabilized bypass supply are synchronized.

Retransfer of load from stabilized by pass to the inverter shall be done manually only unless otherwise specified in the Data Sheet.
If automatic retransfer of load to the inverter is specified in the Data Sheet, then the retransfer of load to the inverter shall be inhibited following four automatic transfers of load to stabilize by pass within a period of 5 minutes.

ee. All breakers shall be adequately rated for continuous rating as well as breaking capacity as applicable. Paralleling of breaker/ switch/ contactor poles to achieve the required current rating is not acceptable. All output isolating device shall be double pole type.

ff. All electronic power devices including thyristors, transistors (IGBTs), diodes etc. shall be rated under operating conditions for approximately 200% of the maximum current carried by the device. All other electrical components such as transformers, reactors, breakers, contactors, switches, bus bars etc. shall be rated for at least 125% of the maximum required rating. No electronic device shall be subjected to PIV greater than 50% of its rated value.

gg. All the thyristors, power transistors, diodes and other electronic devices of UPS shall be protected with high speed semiconductor fuses. I^2t co-ordination between fuse and semi-conducting power devices shall be ensured.

hh. The outgoing circuits of ACDB shall be protected by semiconductor fuses. Each inverter shall be designed to clear a fault in any of the branch circuits upto a maximum rating of 25 % of the system capacity without the assistance of the stabilized bypass supply. In case of any fault in branch circuits, the load connected to the healthy circuits shall not get affected. The fault clearing time shall be less than 4 msec.

ii All PCBs shall be provided with a transparent epoxy coating for environmental protection and tropicalisation. They shall be suitably located away from heat sources.

jj. All electronic control and monitoring printed circuit cards shall be installed in Standardized electronic equipment frames and shall be fitted with suitable means for easy removal. The frames shall incorporate guides for PCBs to facilitate correct insertion of PCB's and shall allow access to the wiring side of the connectors. All PCBs shall be placed in a manner to avoid replacement of a PCB by a wrong spare PCB. Monitoring points shall be provided on each of the PCBs and the PCB shall be firmly clamped in position so that vibration or long usage does not result in loose contacts. Failure of each PCB shall be indicated by visual alarms. Visual fault diagnostics shall preferably identify faults up to various sections in the card.

kk. Forced ventilation of panel, if provided, shall be supplemented by 100% redundant fans. In normal operation, normal & redundant fans shall run together. The power supply for the fans shall be tapped from the inverter output. However, the rating of the UPS as specified in the Data Sheet shall be the net output of UPS after deducting power consumption for fans etc. However in case of non-operation of 50% of running fans the UPS output shall not be affected. The fans shall be arranged to facilitate removal of faulty fan for maintenance without requiring system shutdown.

iii. Maximum noise level from UPS system at 1meter distance, under rated load with all normal cooling fans shall not exceed 75dBA.

6.1.4 CELL BOOSTER

a. Cell booster shall be suitable for charging one to six cells within a time duration as specified. It shall be suitable for charging not only the new cells before being introduced to the battery bank but also any treatment to be given to the individual weak cells. Quantity of such boosters shall be as defined in the MR. Cell booster shall be suitable for 240 V ± 10%, 50 Hz ±3% SPN input power supply. Cell booster output voltage shall be in the range of 0-18V and 0-12V for Lead Acid and Nickel Cadmium batteries respectively. Cell booster shall be sized as under:

I. For Lead Acid battery = 0.14 x Ah of cell (10 hr. Rating of the cell)

II. For VRLA battery = 0.2 x Ah of cell (10 hr. Rating of the cell)

III. For Ni-Cd battery = 0.2 x Ah of cell (5 hr. Rating of the cell)

b. Cell booster shall have heavy duty switch fuse or MCCB on AC incomer and DC output, AC voltmeter, DC ammeter and voltmeter, indicating lamp for AC/ DC power ON. The output voltage and current of cell booster shall have manual control using a suitably rated variac or a full wave-controlled rectifier bridge. Suitable interlock shall be provided so as to ensure that the variac/controlled rectifier is at its minimum position while switching on the cell booster. Cell booster shall be portable type with wheels. Each cell booster shall be supplied with 5 m long flexible copper conductor. PVC insulated and braided cable for AC incomer power supply and DC output connection to the battery.

6.1.5 A.C. DISTRIBUTION BOARD

a. Sheet steel enclosed AC distribution board shall be provided as part of the complete UPS package. It shall accommodate AC feeders as indicated in the Data Sheet. The distribution board shall be floor mounted fixed type with compartmentalized construction unless otherwise indicated in the Data Sheet. It shall be possible to operate the switches without opening the doors. Switches shall be provided with door interlock. Vertical cable alley of minimum 200mm width with suitable supports shall be provided for the termination of outgoing cables. Suitable supports shall be provided for supporting incoming and outgoing cables. All outgoing switches shall be air insulated load break type. Fuses on outgoing feeders shall be fast acting semiconductor type and cable entry shall be from bottom. The gland plate of the distribution board shall be non-magnetic type where single core cables are used as specified in the Data Sheet. Cable glands shall be of brass and single compression type and cable lugs shall be of tinned copper.

6.1.6 ALARM, CONTROL, INDICATION AND METERING REQUIREMENTS

If not specified otherwise in the Data Sheets, following schedule shall be followed for alarm, control, indication and annunciation. Any additional devices/features considered necessary for reliable operation and maintenance shall also be included in various panels and same shall he highlighted separately.. An illuminated one line diagram indicating operational status shall be provided on the front of the panel, metering, indications, audio-visual alarm shall be provided. Parameters/ information indicated shall be available in LCD panel or by other means directly or indirectly.

a. Metering

i. Rectifier

- Incoming line voltages (For all the three phases).
- Input line currents.(For all the three phases).
- D.C. voltage at each rectifier output.
- Battery current.

ii. Inverters

- AC voltage at each inverter output (AC voltages for 3 phase inverter).
- AC current at each inverter output (AC currents for 3 phase inverter).
- Frequency meter at each inverter output.

iii. Stabilised bypass supply

- Frequency meter for incoming supply.
- Voltmeter with selector switch for incoming supply.

- Ammeter with selector switch for incoming supply.

iv. ACDB

Following shall be provided for each of the ACDB incomers:

- Voltmeter (voltmeter selector switch shall also be provided for 3 phase inverter).
- Ammeter (ammeter selector switch shall also be provided for 3 phase inverter).
- Power factor meter.

b. Indications

All indication lamps shall be provided with series resistors. Clustered/Jumbo LED's of minimum 10mm dia. may be provided in place of lamps subject to their having at least equal illumination.

- AC mains 'ON' - Rectifier.
- AC mains `ON' - Bypass.

i. Rectifiers (for each rectifier)

- Rectifier output 'ON'
- Battery on float charge
- Battery on rapid charge

ii. Inverters (for each inverter)

- DC input 'ON'
- Load on inverter
- Inverter synchronized with mains

iii. Load on bypass

c. Audio-Visual Alarm (separately for each circuit)

- Mains failure
- Battery charger failure
- Battery fault
- Inverter temperature high
- Low voltage from inverter
- Load on bypass
- Inverter overloaded
- All power Fuse failures

i. 2 nos. changeover contacts shall be wired to the terminal strip, 1 no for common remote alarm of 'UPS fault' in owner's panel and 1 no. for load on bypass supply annunciation.

d. Controls

- All the switches for starting, shut down and testing sequence.
- Primary input circuit breakers for feeding chargers, bypass line and dc bus from battery including backup protection.
- Inverter ON/OFF switch (to initiate inverter operation).
- Static switch transfer test Push Button.

6.1.7 RELIABILITY

All necessary care shall be taken in selection, design, manufacture, testing and commissioning of the equipment for ensuring high system reliability. Following design consideration shall be taken into account to ensure maximum availability of the system.

a. There shall be no common device, between main and redundant units (e.g. master oscillators etc.) in order to ensure that the failure of the same does not cause shutdown of more than one unit.

b. It shall be possible to take out any individual power circuit for maintenance without affecting the total UPS supply.

c. Series-parallel combination of smaller devices to achieve required rating shall not be acceptable.

d. Vendors shall offer their nearest higher Standard size that will meet the requirement of the specified UPS rating.

6.1.8 FAULT DIAGNOSTIC UNIT

a. If specified in the Data Sheet, each UPS set shall have provision for adding microprocessor based 'ON line' fault diagnostic unit. This shall supervise the UPS operation continuously. It shall identify and locate faults immediately so that corrective action can be taken. Fault Diagnostic unit shall be compatible to hook up with Owner's PC through RS232/RS485 interface. The software shall be provided on a CD ROM.

b. The fault diagnostic unit shall have provision for automatic print out facilities for time, input/output voltages, currents, frequency as a minimum under the following conditions.

- UPS power source changeover from mains to battery.
- UPS power source changeover from battery to mains.
- Changeover from inverter to stabilized bypass supply and vice versa.
- Changeover from one inverter to other inverter.
- Changeover time in case of inverter to stabilized bypass supply and from one inverter to other inverter.
- UPS failure.
- Type of failure incident along with diagnostic report.

c. In addition to the above, any other feature which vendor feels may be useful shall be provided and highlighted separately.

d. If any additional equipment (e.g. bin connector, adaptor cards etc.) are required for connecting this unit with UPS system as well as with Owner's PC. The same are also to be included in the vendor's scope.

7.0 FABRICATION

7.1 Rectifier/charger and inverter, stabilized bypass supply and static switch sections shall be suitably housed in sheet steel panels complete with all interconnections.

a. UPS panels, ACDB and cell booster enclosures shall be fabricated from Structural/CRCA sheet steel. The frames shall be fabricated by using minimum 2mm thick CRCA sheet steel while the doors and covers shall be made from 1.6mm thick CRCA sheet steel. Wherever required suitable stiffeners shall be provided.

b. The panels shall be free standing, fitted with suitable louvers for ventilation and cooling fans as required. Hinged doors shall be provided at the front and back with dust tight gaskets. Inter panel sheet steel barriers shall be provided. The enclosure shall provide minimum IP-31 degree of protection, if not specified otherwise in the Data Sheet. The maximum and minimum operating height of the switches shall be 1800 mm and 300 mm respectively.

7.2 Power cables shall be with aluminum / copper conductors and control cables shall be with copper conductors. All the cable connections shall be from bottom and front of the panel, if not specified otherwise in the Data Sheet. A removable bolted gland plate shall be provided along with single compression type nickel plated brass cable glands for external cable connections. Clamp type terminals shall be used for connection of all wires up to 10 mm^2. Bolted type terminals suitable for cable lugs shall be provided for wire size above this. Tinned copper lugs for all external connections shall be provided with the panels.

7.3 Bus bars shall be used in all power circuits which are rated minimum 100 Amp. Copper conductor PVC insulated cables or wires of 660V grade shall be used for power circuits rated less than 100 Amp. Bus bars shall be colour coded and live parts shall be shrouded to ensure complete safety to personnel intending routine inspection by opening the panel doors. All the equipment inside the panel and on the doors shall have suitable name plate and device tag numbers as per the schematic diagram. All wires shall be ferruled and terminals shall be numbered.

7.4 MCCBs and load break power switches shall be mounted inside the panel. The control switches shall be rotary type, mounted on the door and shall be externally operable. An11 W CFL lamp controlled through a door switch shall be provided for illumination in each panel. All instruments shall be analogue/digital, switchboard type, back connected, (72x72) mm. square (Analogue type) of reputed make. Analogue instruments scale shall have red mark indicating maximum permissible operating rating. Separate test terminals shall be provided for measuring and testing of the equipment to check the performance.

7.5 A suitably sized earth bus shall be provided at the bottom of the panels including ACDB running through the panel’s line up with provision for earth connection at both ends to purchaser's main earth grid. The minimum size of earth bus shall be (25x3) mm copper (or equivalent aluminum). All potential free metallic parts of various equipment shall he earthed suitably to ensure safety.

7.6 All panels shall be of same height so as to form a panel lineup which shall have good aesthetic appearance.

7.7 Inside the panels, the controls connections shall be done with 660V grade PVC insulated wires having stranded copper conductors: 1.5 mm2 size wire shall normally be used for circuits with control fuse rating of 10 Amp. Or less. For control circuit having fuse of 16 Amps., 2.5 mm2 size wire shall be used. Control wiring for electronic circuits shall he through flat ribbon cable or through copper wire minimum of 0.5 mm dia.

7.8 All control wiring shall preferably be enclosed in plastic channels or otherwise neatly bunched together. Each wire shall be identified at both ends by PVC ferrules. Ferruling of wires shall be as per relevant IS.

7.9 All metal surfaces shall be thoroughly cleaned and de-greased to remove mill scale, rust, grease and dirt. Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The undersurface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under-surface shall be made free from all imperfections before undertaking the finished coat.

7.10 After preparation of the under-surface, the panels shall be spray painted with two coats of epoxy-based final paint or shall be powder-coated. Spray painted finished panels shall be dried in stowing ovens in a dust-free atmosphere. Panel finish shall be free from imperfections like pinholes, orange peels, runoff paint, etc. The vendor shall furnish the painting procedure along with the bids.

8.0 INSPECTION AND TESTING

8.1 During fabrication, the equipment shall be subjected to inspection by Consultant/Owner or by an agency authorized by the Owner. Manufacturer shall furnish all necessary information concerning the supply to Consultant's/Owner's inspector. Tests shall be carried out at manufacturer's works under his care and expense.

8.2 UPS system shall be tested in accordance with applicable Standards. The following acceptance tests shall be performed on each ups system as a minimum. All tests shall be witnessed by Owner or its authorized representative and 4 weeks prior notice shall be given before the date of commencement of tests. The tests certificates indicating test results shall be furnished.

Following system acceptance tests shall be conducted on each UPS system:

8.2.1 INSULATION TESTS

a. Insulation tests shall be performed as per IEC 60146-1-1.

b. The insulation tests shall be carried out using an AC power frequency voltage or by using DC Voltage at the choice of the vendor. In case of AC power frequency voltage test, the test voltage at the frequency available in the test facility or at the rated frequency, but not exceeding 100 Hz, of the full value starting at a maximum of 0.5 p.u. The unit on test shall withstand the specified voltage for 1 minute.

c. In case DC voltage is used for the test, the value of DC voltage shall be equal to the crest value of the test voltage specified in the table.

Vp/√2 (V*, is the highest crest voltage to be expected between any pair of terminals)	Test Voltage (AC rms value)
≤60 V	500 V
≤125 V	1000 V
≤250 V	1500 V
≤500 V	2000 V

8.2.2 INTERCONNECTION CABLE CHECK

The interconnection cables are to be checked for correct wiring, insulation and quality of the terminations

8.2.3 A.C. INPUT FAILURE TEST

The test is performed with the test battery and carried out by tripping a.c. incoming circuit breakers or by switching off rectifiers and bypass supply at the same time. Output voltage and frequency variations are to be checked for specified limits.

8.2.4 A.C. INPUT RETURN TEST

The test is performed by closing A.C. incoming circuit breakers or is simulated by energizing rectifiers and bypass supply. Proper operation of rectifiers starting and voltage and frequency variations of output are to be checked.

8.2.5 SIMULATION OF PARALLEL REDUNDANT UPS FAULT

The test is applicable for UPS with parallel redundant configuration. Fault of rectifier or inverter are to be simulated and output transients are to be recorded.

8.2.6 TRANSFER TEST

Transients shall be measured during load transfer from inverter to bypass supply caused by simulated fault and load retransfer after clearing the fault.

8.2.7 REGULATION TEST

a. This test shall be carried out by measuring input voltage, input current, output voltage, output current, DC link voltage, output distortion, input active power, output active power and frequency at no load, 50% load and 100% load at 0.7 and 0.8 p.f.

b. Following parameters of rectifiers and inverters are to measured:

i. Measurement shall be carried out in the rectifier float charge mode and in rapid charge mode. Measurement shall be at nominal A.C. voltage and at no load, 50% load and 100% of rectifier full load. Rectifier measurement shall comprise of:-

- Input voltage, frequency, phase current and input power. D.C. output voltage and current.
- Ripple current at the DC link bus shall be recorded after isolating the test battery.

ii. Inverter measurement shall also be at no load, 50% load and 100% load of inverter rated output current and shall be repeated for inverter D.C. input voltages corresponding to battery float charge operation as well as rated inverter maximum and minimum input D.C. voltage. Measurement shall comprise of:

- Input voltage, input current.
- Output voltage, frequency and waveform distortion, output power and current.

8.2.8 UPS EFFICIENCY

This shall be determined by the measurement of the active power input and output at rated p.f. for 50%, 75% and 100% load.

8.2.9 CURRENT DIVISION IN PARALLEL UPS

Load sharing between UPS units shall be measured with a dummy load under parallel redundant UPS configuration.

8.2.10 LIGHT LOAD TEST

The test is to verify that all functions of the UPS system operate properly. The load applied is limited to some percentage of rated loads. The following points are to be checked.

a. Output voltage and frequency and correct operation of meters.
b. Operation of all control switches and other means to put UPS system into operation.
c. Functioning of protective and warning devices

8.2.11 BURN-IN TEST FOR PRINTED CIRCUIT BOARDS

PCB's and other electronic components sub assemblies shall undergo a burn- in test for 96 hours at 50°C at a voltage varied between the maximum and minimum supply voltage. In case of failure of any component during testing, the tests shall be repeated after replacement of the faulty component.

8.2.12 CONTINUOUS FULL LOAD TEST AT 0.8 POWER FACTOR WITH TEMPERATURE RISE MEASUREMENT

a. The test is required to be performed by connecting resistive load or resistive and inductive load to the UPS system output. The load shall be placed outside the test room to avoid influences of its heat upon UPS ventilation.
b. UPS system in this test shall undergo a complete full load test for 32 hours at 0.8 power factor. Out of these 32 hours, each inverter section shall be subjected to full load test for 8 hours. Both invertors sections operating in parallel shall be subjected to full load test for 8 hours and the for remaining 8 hours, the bypass section shall be subjected to full load test. Steady state temperature of rectifier transformer, Rectifier set, D.C. choke, inverter set, static switch etc. shall be recorded during the test. The temperature of all UPS panels is also to be recorded.

8.2.13 AUXILIARY EQUIPMENT AND CONTROL CIRCUIT TESTS

The correct functioning of all measuring instruments, alarms, indications, protection devices and controls are to be verified. The functioning of auxiliary devices such as lighting, cooling fans, annunciation etc. should be checked.

8.2.14 SYNCHRONIZATION TEST

Frequency variation limits of inverter are to be tested by feeding bypass supply incoming line by variable frequency generator and inverter synchronization limit is to be checked as specified.

8.2.15 UNBALANCED LOAD TEST (FOR 3 PHASE UPS ONLY)

Unbalance load at specified limits is applied to the UPS system. The specified voltage and phase angle variation may be checked for compliance with specified values.

8.2.16 OUTPUT VOLTAGE UNBALANCE (FOR 3 PHASE UPS ONLY)

Output voltage unbalance shall be checked under symmetrical load conditions and unbalance load conditions. Phase to phase and phase to neutral output voltage are to he observed. The voltage unbalance is the ratio of highest phase voltage minus lowest phase voltage to the average value. Phase angle variation may be measured for phase to phase and phase to neutral voltages

8.2.17 OVERLOAD CAPABILITY TEST

Specified values of short time overload are to be applied for specified time interval. Values of output voltage and output current are to be recorded.

8.2.18 SHORT CIRCUIT CURRENT CAPABILITY TEST

Specified short circuit current capability is to be tested by application of a short circuit to UPS output if necessary via a suitable fuse. Short circuit current is to be recorded.

8.2.19 SHORT CIRCUIT FUSE TEST

Fuse tripping capability of the UPS system is to be tested by short circuiting the UPS system output via a specified rating of fuse. The test is carried out at an appropriate UPS load under normal operation.

8.2.20 RESTART

Manual restart to be tested after complete shutdown of UPS system.

8.2.21 OUTPUT OVER VOLTAGE

Operation of output over voltage protection is to be checked.

8.2.22 DYNAMIC RESPONSE TEST

Output recording at different loads and operating condition to be done.

8.2.23 HARMONIC COMPONENTS

Harmonic components of output voltage are to be recorded at no load, 50% load and 100% load conditions. Harmonic voltages caused by UPS system components in the A.C. incomer side shall be recorded at site.

8.2.24 EARTH FAULT TEST

An earth fault is to be applied to the output terminal of UPS system. UPS output transients are to be measured. An earth fault is also to be applied to the battery terminal and UPS system output transient shall be measured.

8.2.25 AUDIBLE NOISE TEST

a. The audible noise is required to be measured at 1meter distance from UPS system in at least 4 to 5 locations and its value shall be within permissible limit.
b. The detailed test schedule and test procedure shall be formulated in line with above. Before giving call for the witness of the tests, vendor shall get Consultant approval on the test procedures. Vendor shall also indicate the max. Allowable tolerance for each test result along with the test procedures.
c. If tests show that certain requirements of the specifications are not met, 'Vendor' shall make necessary corrections to the equipment so that it satisfies all the requirements before acceptance is made.

8.2.26 SITE ACCEPTANCE TESTS

Vendor shall furnish Site Acceptance Tests procedure to be followed. Final acceptance testing along with the batteries shall be done at site. It shall be Vendor's responsibility to arrange necessary instruments and tools as required by their commissioning engineer for these tests.

9.0 MARKING, PACKING AND SHIPMENT

All the equipment shall be divided in to several shipping sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polyethylene sheets before being placed in wooden crates /cases to prevent damage to the finish. Crates /cases shall have skid bottoms for handling Special notations such as Fragile', 'This side up', ' center of gravity', `weight', 'Owner's particulars', `PO nos.' etc. shall be clearly marked on the package together with other details as per purchase order. The equipment may be stored outdoors for long periods before installation. The packing shall be suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed.

Energising Quality

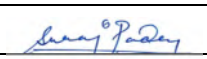
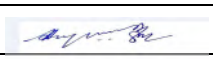
VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION

FOR

STATIONARY NICKEL CADMIUM BATTERIES

VCS – SS – EL - 4009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REVISION RECORD

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MG	RD	AD	SK	Issued for use as Standard
01	16.10.2019	MG	VV	AD	SK	New revision system updated
02	25.02.2020	SP	RD	AA	HK	New revision system updated

ABBREVIATION

BIS/IS	Bureau of Indian standards
IEC	International Electro-Technical Commission
BS	British Standards
IEEE	Institute of Electrical and Electronics Engineers
NEMA	National Electrical Manufacturers Association
OISD	Oil Industries Safety Directorate
CCE	Chief Controller of Explosive
DGMS	Director General Mines Safety
IE Rules	Indian Electricity Rules
CPRI	Central Power Research Institute
DC	Direct Current
Ah	Ampere hour
PVC	Poly Vinyl Chloride

CONTENTS

1.0 SCOPE

The intent of this Specification is to define the design, manufacture, testing & supply of stationary Nickel Cadmium batteries for DC power system /AC UPS application.

2.0 REFERENCE DOCUMENTS

2.1 The equipment shall comply with the requirements of the latest revision of the following Standards issued by BIS (Bureau of Indian Standards) unless otherwise specified.

IS-10918: Specification for Vented type Nickel Cadmium batteries

2.2 In case of imported equipment, Standards of the country of origin shall be applicable if these Standards are equivalent or more stringent than the applicable Indian Standards.

2.3 The equipment shall also conform to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.

2.4 In case Indian Standards are not available for any equipment, Standards issued by IEC/ BS/ VDE/ IEEE/ NEMA or equivalent agency shall be applicable.

2.5 In case of any contradiction between various referred Standards/Specifications/Data Sheets and statutory regulations, the following order of priority shall govern:

a. Statutory regulations.
b. Data Sheets.
c. Job Specification.
d. Standard Specification.
e. Codes and Standards.

3.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY	OWNER of the particular Project (Project Specific).
CONSULTANT	The party which is doing engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
BIDDER / SUPPLIER / VENDOR	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.

4.0 MATERIALS

4.1 The terminal posts shall be of nickel plated steel. The terminals shall be suitable for short circuit current and specified discharge current without damage to the cell as a result of terminal heating.

4.2 Stationary Nickel Cadmium cells shall be designed to withstand the mechanical stresses encountered during normal transportation and handling.

5.0 DESIGN

5.1 GENERAL REQUIREMENTS

5.1.1 The offered equipment shall be brand new with state-of-the-art technology and proven field track record. No prototype equipment shall to be offered.

5.1.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.

5.1.3 Vendor shall give a notice of at least one year to the end user of equipment before phasing out the product/ spares to enable the end user to place order for spares and services.

5.2 TECHNICAL REQUIREMENTS

5.2.1 The Nickel Cadmium cell/battery shall be suitable for float duty operation with a constant voltage permanently applied to its terminals which is sufficient to maintain it in a state close to full charge and shall be designed to supply load in the event of normal power supply failure. Type of plate construction for batteries shall be as per the Data Sheet.

5.2.2 The standard rated ampere hour capacity of the cell/ battery shall be at a reference temperature of 27°C, constant current discharge at 5 hours rate (C5) and an end cell voltage of 1.0 V/cell.

5.2.3 Ampere hour of the battery shall be selected based on the following:

a. Minimum site ambient temperature of 10°C or as defined in the Data Sheet.
b. Discharge duty cycle.
c. End cell voltage.
d. Ageing factor of 0.8
e. Design margin of 10%, if not defined in the Data Sheet
f. Capacity rating factor.

5.2.4 Number of cells and end cell voltage shall be decided by the Vendor on the basis of maximum permissible voltage to the load when batteries are float charged while feeding the Load and minimum DC system voltage. However the number of cells and end cell voltage shall be as per the Data Sheet, unless otherwise specified. .

5.2.5 The battery shall be suitable. For being boost charged to fully charged condition from fully discharged condition within 10 hours, unless otherwise specified.

Battery assembly shall be supplied dry and uncharged. Dry electrolyte and required quantity of electrolyte liquid with 10% extra shall be delivered with the battery in suitable non-returnable sealed containers, unless otherwise specified.

5.2.6 Each cell shall have a separate container. The cell container shall be of high strength alkali resistant material and designed to withstand mechanical stresses, shocks and vibrations. The cell container shall be translucent/transparent.

5.2.7 The terminal posts shall be of nickel plated steel. The terminals shall be suitable for short circuit current and specified discharge current without damage to the cell as a result of terminal heating.

5.2.8 Stationary Nickel Cadmium cells shall be designed to withstand the mechanical stresses encountered during normal transportation and handling.

5.2.9 Flame arrestor shall be mounted on the cell so that all the vented gases diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back into the cell to cause explosion.

5.2.10 The following information shall be permanently marked on the cell.

a. Nominal voltage
b. Name of manufacturer/model reference
c. Rated capacity in ampere hours (Ah) with End Cell Voltage
d. Voltage for float operation at 27°C with tolerance of ±1%,Month and year of manufacture
e. Polarity Marking.

5.2.11 Each set of battery shall be supplied with all the accessories, including, but not limited to the following:

a. Battery stands in formation as per Data Sheet. Mild steel stand pretreated and epoxy painted /PVC coated.
b. Inter cell, inter row and interbank connectors and end take offs. These shall be of tin plated copper/flexible-insulated copper cable.
c. Stand insulator.
d. Cell number plates, Lugs for cable termination, as required.
e. Other accessories and their quantity as per Data Sheet.

5.3 PERFORMANCE

Nickel Cadmium batteries shall have been type tested to meet the performance requirements for each design and Ah rating of cells as per Standards IS-10918.

6.0 FABRICATION

6.1 Flame arrestor shall be mounted on the cell so that all the vented gases diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back into the cell to cause explosion.

6.2 Each cell shall have a separate container. The cell container shall be of high strength alkali resistant material and designed to withstand mechanical stresses, shocks and vibrations. The cell container shall be translucent/transparent.

7.0 INSPECTION AND TESTING

7.1 Batteries shall be subject to inspection by Consultant/Owner or by an agency authorized by the Owner to assess the progress of work. The manufacturer shall furnish all the necessary information concerning the supply to Consultant/Owner's representative.

7.2 Consultant/Owner’s Representative shall be given free access in the works from time to time for stage wise inspection and progress reporting. Four weeks advance notice shall be given to witness the final routine tests and other tests as agreed upon.

7.3 Following tests shall be carried out as a minimum foreach Ah rating of cells/battery:

a. Routine test
   i. Physical examination test.
   ii. Polarity and absence of short circuit.
   iii. Dimension, Mass and layout.
   iv. Marking and packing.

b. Acceptance test
   i. Marking and packing.
   ii. Verification of dimensions.
   iii. Test for Ah capacity
   iv. Test for voltage during discharge
   v. Internal resistance test.

c. Type test
   i. Verification of constructional requirement.
   ii. Test for voltage during discharge.
   iii. Test for Ah capacity.
   iv. Test for charge retention/loss of capacity if specified in the data sheet.
   v. Air pressure test.
   vi. Ampere hour and Watt-hour efficiency test.

7.4 Battery duty cycle test to meet the load cycle requirement shall also be performed at site after installation as part of commissioning unless otherwise defined in the Data Sheet.

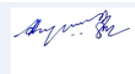
8.0 MARKING, PACKING AND SHIPMENT

8.1 All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to finish. Crates/cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Centre of gravity', 'Weight', `Owner's particulars', 'PO nos.' etc., shall be clearly marked on the package together with other details as per purchase order.

8.2 The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

ENERGISING QUALITY	**LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS**		
		TOTAL SHEETS	59
DOCUMENT NO	VCS-00-00-VL-0001		

LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS


REV	DATE	DESCRIPTION	PREP	CHK	APPR
05	07-07-2022	Issued as Standard	Mahesh Chand	Anjum Afroz	Hashim Khan
04	03-06-2022	Issued for Vendor's	Mahesh Chand	Anjum Afroz	Hashim Khan

TABLE OF CONTENT

A. MECHANICAL & PIPELINE

1.0 CARBON STEEL PIPES

1.1 PIPE CARBON STEEL TO INDIAN STANDARDS

a. A.S.T. Pipes Pvt. Ltd. (AST Group)
b. Advance Steel Tube Ltd.
c. Apl Apollo Tubes Ltd. (Er. Bihar Tubes Ltd.
d. Asian Mills Pvt. Ltd.
e. Asrani Tubes Limited
f. Dadu Pipes (P) Ltd.
g. Essar Steel Limited(Er Hazira Pipes Mill)
h. Gaurang Products Pvt Ltd. (Ast Group)
i. Goodluck Steel Tubes Ltd.
j. Hi-Tech Pipes Limited
k. Indus Tube Limited
l. Jindal Industries Ltd
m. Jindal Pipes Ltd.
n. Jindal Saw Ltd (Kosi Works)
o. Jotindra Steel & Tube Ltd
p. Lalit Pipes And Pipes Ltd.
q. Maharashtra Seamless Ltd.
r. Man Industries (India) Ltd. – Pithampur
s. Man Industries (India) Ltd. Anjar
t. Mukat Tanks & Vessels Ltd.
u. Nezone Tubes Limited
v. North Eastern Tubes Limited
w. Pratibha Industries Limited
x. Pratibha Pipes & Structural Ltd.
y. Psl Ltd (Chennai)
z. Psl Ltd (V1, V2 & NC)
aa. Rama Steel Tubes Ltd.
bb. Ratnamani Metals And Tubes Ltd.
cc. Ravindra Tubes Limited

dd. Samshi Pipe Industries Limited

ee. Surya Roshni Ltd.

ff. Swastik Pipes Ltd.

gg. Utkarsh Tubes & Pipes Ltd. (Formly Bmw)

hh. Welspun Corp. Limited (Dahej)

ii. Zenith Birla (India) Limited

1.2 PIPE & TUBULARS TO A.P.I. STANDARDS

a. Arcelormittal Tubular Products Roman Sa, Romania

b. Bhel (Trichy),India

c. Dalmine Spa (Enquiry To Tenaris),Uae

d. Eewkorea Co. Ltd (Germany), Korea

e. Eew Korea Co. Ltd. (Korea), Korea

f. Eisenbau Kramer Gmbh, Germany

g. Hyundai Rb Co. Ltd. South Korea

h. Ilva Lamiere E Tubi Srl (Enq To Ilva Spa, Italy

i. Inox Tech. Spa, Italy

j. ISMT Ltd. Ahmedngr, India

k. TATA Steel, India

l. PSL

m. Jindal Pipes Ltd., India

n. Jindal Saw Ltd. (Kosi Works), India

o. Jindal Saw Ltd. (Nashik Works), India

p. Lalit Pipes And Pipes Ltd. India

q. Maharashtra Seamless Ltd., India

r. Man Industries (I) Ltd. (Pithampur), India

s. Mukat Tanks & Vessels Ltd., India

t. Pratibha Industries Limited, India

u. Ratnamani Metals And Tubes Ltd., India

v. Siderca S.A.I.C (Enquiry Totenaris), Uae

w. Sumitomo Metal Ind. Ltd., India

x. Surya Roshni Ltd., India

y. Swastik Pipes Ltd, India

z. Tata Steel Uk Limited (Formerly C702)

aa. Tubos De Acero De Mexico Sa (Enq. Tenaris), Uae

bb. Tubos Reunidos Sa Spain

cc. Umran Steel Pipe Inc (Turkey), Turkey

dd. Valcovny Trub Chomutov, Czech Republic

ee. Vallourec And Mannesmann Tubes, France

ff. Welspun Corp Limited (Dahej), India

1.3 PIPE/TUBE CS (SEAMLESS) TO ASTM STANDARDS

a. Arcelormittal Tubular Products Roman Sa, Romania

b. Bhel (Trichy), India

c. Changshu Seamless Steel Tube Co. Ltd., China

d. Dalmine Spa (Enquiry To Tenaris, Uae

e. Heavy Metals & Tubes Limited (Mehsana), India

f. Ismt Ltd. Ahmedngr, India

g. Ismt Ltd. Baramati India

h. Jfe Steel Corporation, Uae

i. Jindal Sdaw Ltd (Nashik Works) India

j. Klt Automotive And Tubular Products Ltd., India

k. Mahalaxmi Seamless Limited, India

l. Maharashtra Seamless Ltd, India

m. Products Tubulares S.A.U, Spain

n. Ratnadeep Metal Tubes Ltd., India

o. Staineest Tubes Pvt Ltd., India

p. Sumitomo Metal Ind. Ltd., India

q. Tubos Reunidos Sa Spain

r. Valcovny Trub Chomutov, Czech Republic

s. Vallourec Andmannesmann Tubes France

t. Yangzhou Chengde Steel Pipe Co. Ltd Dubai (UAE)

1.4 PIPE CARBON STEEL (WELDED) TO ASTM STANDARDS

a. Eew Korea Co. Ltd. (Germany), Korea

b. Eew Korea Co. Ltd. (Korea), Korea

c. Eisenbau Kramer Gmbh, Germany

d. Hyundai Rb Co. Ltd., South Korea

e. Inox Tech. Spa, Italy

f. Jindal Saw Ltd (Kosi Works), India

g. Lalit Pipes and Pipes Ltd., India

h. Man Industeries (I) Ltd.(Pithampur), India
i. Man Industries (India) Ltd. Anjar, India
j. Mukat Tanks & Vessels Ltd., India
k. Ratnamani Metals And Tubes Ltd., India
l. Sumitomo Metal India Ltd., India
m. Tata Steel Uk Limited

2.0 VALVES

2.1 GLOBE VALVES

a. BDK (New Delhi)
b. Datre Corpn (Calcutta)
c. KSB Pumps (New Delhi)
d. L&T (New Delhi)
e. Neco Schuber & Salzer Ltd. (New Delhi)
f. Niton Valve (Mumbai)
g. Ornate Valves (Mumbai)
h. Panchavati Valves (Mumbai)
i. AV Valves Ltd.
j. BHEL (Trichy), India
k. Econo Valves Pvt Ltd, India
l. Fouress Engg (I) Ltd (Aurangabad)
m. Guru Industrial Valves Pvt Ltd
n. Leader Valves Ltd, India
o. NSSL Ltd. (Neco Schubert & Salzerltd)
p. Oswal Industries Ltd, India
q. Petrochemical Engineering Enterprises, India
r. Sakhi Engineers Pvt Ltd
s. Shalimar Valves Pvt Ltd
t. Steel Strong Valves India Pvt Ltd, India
u. Petro Valves Pvt. Limited, Ahmedabad
v. Hawa Engineers Limited, Ahmedabad

2.2 CHECK VALVES

a. Advance Valves Pvt. Ltd., Noida
b. Aksons & Mechanical Enterprises, Mumbai
c. Larsen & Toubro Limited (Audco India Limited, Chennai)

d. AV valves Ltd., Agra
e. BDK engineering India Ltd., Hubli
f. BHEL, OFE&OE Group, New Delhi
g. Datre Coroportion Limited, Calcutta
h. Leader Valves Ltd., Jalandhar
i. Neco schubert & Salzer Ltd., New Delhi
j. Niton Valves Industries (P) Ltd., Mumbai
k. Precision Engg. Co., Mumbai
l. Econo Valves Pvt Ltd, India
m. Fouress Engg (I) Ltd (Aurangabad)
n. KSB Pumps Ltd (Coimbatore), India
o. NSSL Ltd. (Neco Schubert & Salzer Ltd)
p. Oswal Industries Ltd, India
q. Panchvati Valves & Flanges Pvt Ltd, India
r. Petrochemical Engineering Enterprises, India
s. Sakhi Engineers Pvt Ltd
t. Shalimar Valves Pvt Ltd
u. Steel Strong Valves India Pvt Ltd, India

2.3 PLUG VALVES

a. Breda Energia Sesto Industria Spa, Italy
b. Fisher Sanmar Ltd., Chennai
c. Larsen & Toubro Ltd., New Delhi
d. Nordstrom Valves, USA
e. Serck Audco Valves, UK
f. Sumitomo Corporation India Pvt. Ltd., New Delhi
g. Z Corporation, Korea
h. Hawa Valves (India) Pvt. Ltd., Mumbai
i. Steel Strong Valves India Pvt. Ltd., Navi Mumbai
j. Econo Valves
k. Flow-Serve PTE (Mfr. SERCK), India

2.4 BALL VALVES

a. Hawa Valves (India) Pvt. Ltd, Navi Mumbai
b. Larsen & Toubro, Delhi
c. Microfinish Valves Pvt. Ltd., Noida

d. Oswal Industries Ltd., Gandhi nagar
e. Virgo Engineers Ltd., Delhi
f. Boteli Valve Group Co. Ltd., China
g. Cameron (Malaysia) SDN BHD, Malaysia
h. Dafram S.P.A., Italy
i. Fangyuan Valve Group Co. Ltd., China
j. Franz Schuck GmbH, Germany
k. O.M.S. Saleri (Italy)
l. Pibi Viesse S.P.A (Italy)
m. Nuovo Pignone (Italy)
n. Perar S.P.A (Italy)
o. Pietro Fiorentini (Italy)
p. Cooper Cameron Valv Italy SRL-FRM, Itly
q. Petrol Valves SRL
r. Tormene Gas Technology S.P.A (VALVITALIA)
s. Petro Valves Pvt. Limited, Ahmedabad

3.0 TEE

3.1 FLOW TEE

a. Coprosider SPA, Italy
b. GEA Energy System India Limited, Chennai
c. Multitex Filteration
d. Pipeline Engineering, UK
e. Scomark Engg. Limited (U.K.)
f. Skeltonhall Limited, Engaland(U.K.)
g. Technospecial SPA, Italy
h. Tectubi SPA, Italy
i. RMA Germany
j. Pipefit Engineers Pvt. Ltd.
k. Vee Kay Vikram & Co.

3.2 SPLIT TEE

a. IPSCO, Canda
b. TD Willamsons, USA
c. Plant-Tech Power Technical Services Pvt Ltd
d. Teemans, UK

e. Vee Kay Vikram & CO.

4.0 FLANGES

a. Aditya Forge Ltd., Vadodara
b. Amforge Industries Ltd., Mumbai
c. CD Engineering Co., Ghaziabad
d. Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
e. Echjay Industries Ltd., Rajkot
f. Forge & Forge Pvt. Ltd., Rajkot
g. Golden Iron & Steel Works, New Delhi
h. JK Forgings, New Delhi
i. Metal Forgings Pvt. Ltd., Mumbai
j. Perfect Marketings Pvt. Ltd., New Delhi
k. Sky Forge, Faridabad
l. S&G, Faridabad
m. Chaudhry Hammer Works Ltd, India
n. JAV Forgings (P) Ltd, India
o. Kunj Forgings Pvt Ltd, India
p. MS Fittings
q. R.N. Gupta & Co. Ltd, India
r. R.P. Engineering Pvt Ltd, India
s. Sanghvi Forgings & Engineering Ltd
t. Shri Ganesh Forgings Ltd., India
u. Uma Shankar Khandelwal & Co., India
v. Sawan Engineers, Baroda
w. Stewarts & Lloyds of India Ltd., Kolkata
x. Engineering Services Enterprises
y. Pipefit Engineers Pvt. Ltd.
z. Jindal Forging
aa. Vivial Forges

5.0 FITTINGS

a. Commercial Supplying Agency, Mumbai
b. Dee Development Engineers Ltd.
c. Eby Industries, Mumbai
d. Flash Forge Pvt. Ltd., Vishakhapatnam

e. Gujarat Infra Pipes Pvt. Ltd., Vadodara
f. M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
g. Stewarts & Lloyds of India Ltd., Kolkata
h. Teekay Tubes Pvt. Ltd., Mumbai
i. Pipe Fit, Baroda
j. Sky Forge, Faridabad
k. S&G, Faridabad
l. Sawan Engineers, Baroda
m. Eby Fasteners, India
n. Leader Valves Ltd, India
o. R.N. Gupta & Co. Ltd, India
p. Exten Engg Pvt Ltd
q. Sivananda Pipe & Fittings Ltd
r. Jindal Forging
s. Vivial Forges
t. PK Tubes Rajasthan
u. CSA Fitting
v. Gujarat Infrapipes pvt ltd, Vadodara
w. KS Pipes Fitting Pvt Ltd, Palwal
x. Tube Bend, Kolkata

6.0 PIG LAUNCHERS/ RECEIVERS/ PIG SIGNALERS

a. Bassi Luigi Fittings B.V., Holland
b. BRAUN STAHL PIPE TEC, GERMANY
c. FORAIN, ITALY
d. Fluidel SRL, ITALY
e. RMA Maschinen- und, GERMANY
f. Siiritec Nigi, Itlay
g. SCHUCK ARMATUREN, GERMANY
h. T.D. Williamson Inc., USA
i. Tectubi SPA, Italy
j. Taylor Forge Engineering System INC, USA
k. Tormene Americana S.A. (Argentina)
l. Tormene Gas Technology S.p.A., Italy

m. PIPELINE ENGINEERING, UNITED KINGDOM

n. Krohne, Oil & Gas BV, Drive Houston,

o. Multitex Filtration Engrs. Ltd, New Delhi

p. BGR ENERGY SYSTEMS LIMITED New Delhi

q. Glapwell Contracting Services Ltd. UK

r. FULGOSI GIOVANNI S.n.c di Corrado & C, ITALY

s. VEEKAY VIKRAM & CO, GUJRAT

t. GBM S.R.L, ITALY

u. Cardew Ltd., Alexeander

v. Forain S.R.L.

w. GD Engineering, India

x. Pipeline Engineering, UK

y. Siirtec Nigi SPA

z. Control Plus

aa. Oswal Infrastructure

7.0 LONG RADIUS BENDS

a. Jindal Saw Ltd. (Kosi Works), India

b. PSL Limited (Gandhidham – Mfrg), India

c. BHEL, Trichy, Tamilnadu

d. Welspun, Gujarat

e. Sawan

f. Gujarat Infra

g. P K Tubes

h. DEE Development

i. Pipefit Engineers Pvt. Ltd.

8.0 CLEAN AGENT SYSTEM

a. ADN Fire Safety Pvt Ltd (Vashi East, Thane)

b. Chetan Corporation (Ahmedabad)

c. Chetan Engineers (Ahmedabad)

d. Mx Systems International Pvt. Ltd. (Mumbai)

e. New Fire Engineers (P) Ltd (Sil Vassa)

f. Nitin Fire Protection Industries Ltd (New Bombay)

g. Nohmi Bosai (India) Private Limited

h. Tyco Fire & Security India Pvt. Ltd (Bangalore)

i. Vimal Fire Controls Pvt Ltd (Vadodara)

9.0 INSULATING JOINTS

a. IGP Engineers
b. V K Vikram
c. Advance Electronics
d. Nupros INC

10.0 GASKETS

a. IGP Engineers (P) Ltd., Madras
b. Madras Industrial Products, Madras
c. Dikson & Company, Bombay
d. Banco Products (P) Ltd., Vadodara
e. Goodrich Gaskets Pvt Ltd
f. Starflex Sealing India Pvt Ltd, India
g. Teekay Meta Flex Pvt Ltd
h. UNIKLINGER Ltd
i. HEM Engg. Corp.
j. Unique Industrial Packing Pvt. Ltd.

11.0 FASTENERS

a. Nireka Engg. Co. (P) Ltd., Calcutta
b. Precision Taps & Dies, Bombay
c. AEP Company, Vithal Udyoug Nagar
d. Fix Fit Fasteners, Calcutta
e. Precision Engg. Industries, Baroda
f. Echjay Forgings Pvt. Ltd., Bombay
g. Capital Industries, Bombay
h. Boltmaster India Pvt Ltd, India
i. Deepak Fasteners Limited, India
j. Fasteners & Allied Products Pvt Ltd, India
k. Hardwin Fasteners Pvt Ltd, India
l. J.J. Industries, India
m. Multi Fasteners Pvt Ltd, India
n. Nexo Industries, India
o. Pacific Forging & Fasteners Pvt Ltd, India

p. Pioneer Nuts & Bolts Pvt Ltd, India

q. Precision Auto Engineers, India

r. President Engineering Works, India

s. Sandeep Engineering Works, India

t. Syndicate Engineering Industries, India

12.0 WELDING ELECTRODES FOR PIPELINE/PIPING WORK

a. For Mainline – Lincoln/ Bohler make

b. For Terminal – For root pass –Lincoln/ Bohler make

For other passes – Lincoln, D&H or equivalent makeLincon

13.0 STRAINERS

a. Bombay Chemical Equipments

b. Gujarat Auto filed

c. Multitex Filtration Engineering Limited

d. Grand Prix Engineering Limited

14.0 COLD APPLIED TAPES

a. Denso GmbH

b. Raychem

15.0 HEAT SHRINKABLE SLEEVE/ FIBREGLAS REINFORCED SLEEVE

a. Covalence - Seal For Life India Pvt. Ltd. (Formerly Covalence Raychem- Berry Plastics Corporation)

b. Canussa-CPS

16.0 STUD BOLTS WITH NUTS

a. Multi Thread Fasteners, Baroda

b. Darukhanwala

c. Precision Engineers, Baroda

d. Unbrako

e. TVC

17.0 WARNING MAT

a. Sparco Multiplast Pvt. Ltd., Ahmedabad

b. Singhal Industries , Ahemdabad

c. Puja Packing, Mumbai

d. Bina Enterprises, Mumbai

e. Shree Vijay Wire & Cable Industries

18.0 HDPE PIPES/DUCT

a. Climax Synthetics (P) Ltd., Vadodra

b. Indian Poly Pipes, Calcutta

c. Jain Irrigation Systems Ltd., Jalgaon

d. Kirti Industries (India) Ltd., Indore

e. Ori Plast Limited, Calcutta

f. Phoel Industries Limited, Delhi

g. Sangir Plastics (P) Ltd., Mumbai

h. Veekay Plast,Jaipur

i. Kisan Irrigation

j. Dutron Polymers Ltd.

k. Manikya Plastichem (P) Ltd

l. Himalyan Pipe Industries

19.0 DRY GAS FILTER & FILTER SEPERATOR

a. Grand Prix Fab (Pvt.) Ltd. (New Delhi)

b. Perry Equipment, USA

c. Faudi Filter, Germany

d. Forain S.r.l., Italy

e. ABB, Faridabad

f. Burgess Manning, USA

g. Multitex Filtration Engineers India

h. Triveni Plenty Engg. Ltd. (New Delhi)

i. Siirtec International Contractor S.P.A (Italy)

j. Flashpoint, Pune india

k. Filteration Engineers (I) Pvt Ltd, India

l. Gujarat Otofilt, India

m. Tormene Gas Technology

n. Ultrafilter (India) Pvt Ltd, India

o. Ravi Techno Systems Pvt Ltd, India

p. Siirtec Nigi S.P.A

q. Filtan Filter Anlagenbau Gmbh

r. Fairley Arlon BV

s. PECO Facet

t. EPE Epenstenner GMBH

u. Filtrex srl

v. Petromar Engineered Soln

w. Plenty Filter

x. Eurofiltec

y. PTI Technologies Inc

20.0 FILTER ELEMENT

a. Peco – Facet

b. Velcon

c. Pall – Filterite

d. Burgress Manning

21.0 NDT AGENCY

a. NDT Services, Ahmedabad

b. GEECY Industrial Services Pvt. Ltd., Mumbai

c. Corrosion Control Services, Mumbai

d. Perfect Metal Testing & Inspection Agency, Calcutta

e. Inter Ocean Shipping Co., New Delhi

f. RTD, Mumbai

g. Sievert, Mumbai

h. X-Tech, Vizag

i. Industrial X Ray and Allied Radiographers (I) Pvt. Ltd.

22.0 Cold Applied Tapes

a. Denso GmBH
b. Polyken (Berry Plastics Corporation)

23.0 PUR Coating

a. Powercrete (Berry Plastics Corporation)

24.0 Casing End Closure

a. Raci, Italy
b. Raychem RPG Limited

25.0 Casing Insulators

a. Raci, Italy

b. Raychem RPG Limited

c. VeekayVikram

26.0 FIRE FIGHTING EQUIPMENT

26.1 FIRE EXTINGUISHERS

a. Avon Services (Production & Agencies) Pvt. Ltd., Bombay

b. Kooverji Devshi & Co., Bombay

c. Reliable (Fire Protection) India Ltd., Bombay

d. Zenith Fire Services, Bombay

e. Safex Fire Services, Bombay

f. Brij Basi Hi

g. tech Udyog

h. Bharat Engg Works, India

i. Gunnebo India Ltd

j. Nitin Fire Protection Industries Ltd, India

k. Supremex Equipments, India

l. Vimal Fire Controls Pvt Ltd., India

26.2 FIRE HYDRANTS, MONITORS, DELUGE VALVE, NOZZLES

a. Zenith

b. Minimax

c. Newage

d. HD Fire

e. Vijay Fire

f. Asco Strumech Pvt Ltd, India

g. Brij Basi Hi

h. tech Udyog

i. Gunnebo India Ltd

j. Nitin Fire Protection Pvt Ltd

k. Shah Bhogilal Jethamal & Brothers

l. Venus Pumps & Engineering Works

26.3 RRL Hose

a. Jayshree

b. Newage

26.4 HOSES

a. Ashit Sales Corporation, Bombay

b. Royal India Corporation, Bombay

c. Gayatri Industrial Corporation

d. Simplex Rubber Products Ltd., Ahmedabad

e. Zaverchand Marketing Pvt. Ltd., Baroda

f. Presidency Rubber Mill, Calcutta

g. The Cosmopolite, Calcutta

h. Simplex Rubber Products, Thane

NOTE:

1) For procuring bought out items from vendors other than those listed above, the same may be acceptable subject to the following: -

   a) The vendor/ supplier of bought out item(s) is a manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing supply range.

   b) The vendor / supplier should not be in the Holiday list of CLIENT / VCS / other PSU.

   c) Should have supplied at least one single random length (i.e. 5.5 meters to 6.5 meters) for item assorted pipes / tubes and for other items, which are to be supplied in quantity on number-basis (other than assorted pipes / tubes) minimum 01 (One) number of same or higher in terms of size and rating as required for intended services. The bidder should enclose documentary evidences i.e. PO copies, Inspection Certificate etc. for the above, along with their bids.

2) For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from vendors/ suppliers who have earlier supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range. The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their offer, however in case of successful bidder, these documents shall require to be submitted by them within 30 days from date of Placement of Order for approval to CLIENT / VCS.

3) The details of vendors indicated in this list are based on the information available with VCS, Contractor shall verify capabilities of each vendor for producing the required quantity with. PMC does not guarantee any responsibility on the performance of the vendor. It is the contractor's responsibility to verify the correct status of vendor and quality control of each parties and also to expedite the material in time.

B. CIVIL AND STRUCTURAL

Sr. No.	Items/ Name of Products	Make/ Brands/ Manufactures
1.	Reinforcement Steel	TATA, SAIL, RINL, JSW.
2.	Cement	Ambuja, ACC, JK, Grasim, Ultratech, Birla, L&T, Cement Corporation of India
3.	Structural Steel	TATA, SAIL, RINL, IISCO, ESSAR
4.	Structural Steel Tubes ISI Marked	TATA, JINDAL, SURYA
5.	Mineral wool for thermal insulation of ceilings (Under deck insulation)	Rock wool (india) Ltd. Minwool Rock Fibres Ltd., Lloyd Insulation.
6.	Synthetic Enamel Paint (1st quality only)	ICI Paint (Dulux), Asian Paint (Apcolite), Berger Paints (Luxol). Goodlass Nerolac Paints (Nerolac), Jenson & Nicholson Paints Ltd (Borolac)
7.	G.I SHEET	ESSAR, JSW, SAIL
8.	Sheeting Screw	Corroshield, Buildex,
9.	Chemical for Antitermite treatment	DE- NOCIL Bombay, Pest Control of India, Trishul
10.	Factory made Panelled Door shutter	Century; Godrej ; M/s Hindustan Housing factory Ltd., New Delhi ; M/s Delhi Construction Eqp, Sadar Bazar, Delhi ; M/s Joinery manufacturing Co., Calcutta;
11.	PVC Panel Door (Solid Core)	Rajshri Plastiwood Limited, Sintex, Hindopan, Marino
12.	Pressed steel door frames/ cupboard and window frames (manufacturers)	M/s SAIL, M/s TATA
13.	Pressed steel door frames/ cupboard and window frames (fabricators)	M/s Loyal safe works Mayapuri, N/Delhi M/s Multiwyn Industrial Corpn Calcutta M/s Metal Window Corpn N/Delhi M/s Chhabra Steel Udyog, 260 Sadar Bazar, Meerut Cantt. M/s Delite safe works, Rani Jhansi Road, N/Delhi
14.	Steel Windows, Ventilators (as per IS- 1038 of 1983) & frames pressed steel door/window	M/S Multiwyn Industrial Corpn, Calcutta ; M/S Metal Window Corp, N/ Delhi ; M/S Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt ; Agent steel MFG Pvt Ltd, Ahmedabad ; Godrej ;
15.	AI Section for AI Door/ Window/ Partitions	Hindalco, Ajit India, Jindal
16.	AluminumI Door/ Window/ Glazing Fabricated and	M/s Alumilite Pvt Ltd, M/s Ajit India Pvt Ltd, M/s Ramniklal S Raste Agra, Argent Industries, M/s Aluminium Tech Industries, I-2249 DSIDC Narela,

	Anodized	Delhi, M/s VR Associates, GH-14/242 Paschim Vihar, Delhi
17.	Aluminium door and windows Fittings	M/s Elite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002. M/s Mohan Metal Industries 178/2-A, Bhole Nath Nagar, Shahadara, Delhi 110032. Mepro, Argent New Delhi, Classic, New Delhi. Jindal, Argent New Delhi,Golden Industries Pvt. Ltd. ECIE
18.	Aluminium Grill	Alu Grill, Arihant Aluminium Corporation, Decogrille
19.	Door Closer	Everite, Golden, Gandhi,
20.	Floor Spring	Prabhat, Everite
21.	Plywood for general purpose (IS-303)	National Plywood Inds Pvt Ltd, S Fancy lane, 8th floor, Calcutta-700001, Merino Plywood, Archid Ply, Ply, Swastik, Universal, Century, Greenply, National.
22.	Pre laminated Particle board	Kitply, Bhutan board, Ecoboard, Novapan, Archid ply, Merinova, Merino
23.	Laminated Sheets	Formica, Merino Lam, Greenlam, National,Century
24.	Modular Partitions	Godrej, Blowplast
25.	False Ceiling (Mineral Fibre Board)	Armstrong, Daiken, Luxalon, Llyods, Gypboard, Trac, Aerolite
26.	Aluminium False Ceiling	Lloyds, Armstrong, Luxlon,Trac
27.	Flooring Tiles (Mosaic / Terrazzo / PCC) (1st quality only)	Kajaria Ceramics, NITCO, Royal Tiles, Gem Tiles, Hindustan Tiles, M/S National Tiles & Industries, Ultra Tiles
28.	Glazed Ceramic Tiles, Non-Skid (Floor/Wall), (1st quality only)	Kajaria, Somany, NITCO. Murudeshwar Ceramic Ltd (Navin Diamond tile), Johnson (Marbonite),
29.	Vitrified/ Designer Vitrified Tiles (1st quality only)	Asian, Marbonite (Johnson), Kerrogres (Kajaria), NITCO, Orient
30.	PVC Tiles/Flooring (IS 3461) (1st quality only)	Marblex Tiles, Krishna Tiles, Polyfin, Armstrong, Wonder floor.
31.	False Flooring	Godrej or equivalent
32.	Glass Mosaic Tiles (1st quality only)	Paladio, Coral, Accura, Bisazza, Italia, Mridul.
33.	Designer Paver Tiles/ Interlocking tiles ISI marked/ Grass-jointed Tiles. (1st quality only)	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete, Unitile
34.	Wall care Putty for Base preparation (1st quality only)	Birla Wall care putty, Berger, Jenson & Nicholson, JK White

35.	White Cement (1st quality only)	Birla, JK
36.	Cement based Paints (1st quality only)	Super Snowcem, Duracem, Super Acrocem.
37.	Dry Distemper / Oil bound Distemper (1st quality only)	Goodlass Nerolac Paint, Shalimar Paint, Jenson & Nicholson, Asian Paint, Berger. ICI Dulux
38.	Acrylic Washable Distemper (1st quality only)	Asian, Berger, ICI Dulux, Jenson & Nicholson, Nerolac, Shalimar, Garware & Goodlass
39.	Plastic Emulsion Paint (1st quality only)	Asian, Berger, ICI, Nerolac, Jenson & Nicholson, Shalimar,Garware & Goodlass
40.	Exterior Acrylic Emulsion (1st quality only)	ICI (Weathercoat), Excel (Nerolac), Apex (Asian), Berger, Jenson & Nicholson, Shalimar,Garware & Goodlass
41.	Polymer based Paint	STP, CICO
42.	Textured Paint / Wall Tile (1st quality only)	Unitile, Heritage, Spectrum, Iokos, Acropaints, Asian
43.	Flexible board for Expansion joint	STP or equivalent
44.	Grout	Shrinkomp, Fosroc,Fairmate
45.	Integral water proofing compound	STP, Pidilite, Fosroc, CICO, Sika.
46.	Concrete Admixture	Pidilite, Fosroc, CICO, Sika.
47.	Water proofing for cementations surface IS-2645	Acrocrete & Acrocote, CICO, Fosroc, STP
48.	Bituminous Product	M/s Faridabad Spinning & Woolen Mills Pvt Ltd, 837, SP Mukherjee Marg Delhi, M/s STP Ltd (Formerly Shalimar Tar Products) M/s Bitufelt Pvt Ltd 123/377 Fazalm Ganj Kanpur 208012, Texas, Texas India Ltd, Multiplas
49.	Hardeners	Ironite, Ferrok, Hardonate
50.	Construction Chemicals	Choksey, CICO, Forsroc, Sika
51.	Stainless Steel Cladding	Jindal
52.	Punch Tape Concertina Coil	Global Technocrat, S.G. Engineers Delhi
53.	Stainless Steel Railing	Jindal
54.	FRP/ HDPE Garbage Bins	Sintex, Swift, Nutech, Sheetal
55.	Sanitary ware	Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Parryware (superfine), Cera (Ist quality), Classica (Ist / standard)

56.	WC seat cover ISI Marked	Parryware, Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Cera (Ist quality), Classica (Ist / standard)
57.	PVC Flushing Cistern IS: 774-1984 (ISI Certified)	Parryware, Hindustan Sanitary Wares, Cera.
58.	Faucets & Taps, Stop Valves & Pillar Taps, Surgical basin mixer, Shower rose etc.	Gem, Parko, Parryware, HSW, Jaquar
59.	Kitchen Stainless Steel Sink	Diamond, Nirali, Neel Kanth, Jayna
60.	Looking Mirror	Saint Gobain, Modi Float, Triveni Float Glass, Crown, Atul.
61.	Readymade Bathroom Cabinets	Commander Gratings (I) Pvt Ltd, Gratolite Cabinet, A- 4 Sector Viii Noida-202701, Alpina, Cera.
62.	Float Valve	Leader, Bombay Metal & Alloy Co, Bombay superflow.
63.	SGSW Pipes (IS-651) ISI Marked	Perfect Agra, Devraj Ind Gaziabad, Buran, RK, Prince,
64.	CI (Centrifugally Cast) Pipes for sewage disposal ISI marked	NICCO, SRIF, A-1 Singhal Casting Co Agra, Jindal Saw, Kesoram, NECO
65.	PVC rain water/sewage pipes (IS-4985)	Reliance, Finolex, Supreme, Kisan, Prince, Hindustan Plastic & machine corporation, Polypack industries (P) Ltd.
66.	HDPE Water storage tanks (Rotational Moulded)	Sintex, Swift, Nutech, Sheetal
67.	Cast Iron Pipes and Fittings	Hindustan Engineering Products Company Calcutta, S.L.C., Standard approved manufacturers of any other brand of fittings having ISI marking, RIF, BIS
68.	RCC Pipes	Indian Hume Pipe Company, Delhi / Allahabad / Chandigarh / Lucknow; Hindustan Pressure Pipes, Kolhapur; Dhere Concrete Products, Pune or any other approved manufacturer conforming B.I.S. Standard
69.	Brass Fittings	Leader Engineering Works, Jalandhar; L & K Mathura; Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar
70.	C.P. Fittings	Ego Metal Works, Ballabhgarh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem Sanitary Appliances Pvt. Ltd., Delhi; Essco Sanitations, Delhi.
71.	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Limited, Orissa; Ceramic Industries Limited, Sambalpur; Shrikamakshi Agencies, Madras; Binary Udyog Pvt. Limited, Howrah; Tirumati Moulds Limited, Nagpur.
72.	Asbestos Cement Pipes and Fittings	Ganga Asbestos Limited, U.P.; Hyderabad Asbestos Cement Products Limited; J.K. Super Pipe Industries, Nanded; Konark Cement and Asbestos Limited, Orissa; Maharashtra Asbestos Limited, Bombay.

List of Recommended Vender/Suppliers of Major Bought-Out Items: Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the RECOMMENDED list for structural items thereon.

Sl. No.	Items/Name of Products	Makes/Brands/Manufactures
1	Structural Steel	SAIL / TATA / RINL / IISCO / ESSAR / ISPAT
2	Structural Steel Tubes ISI Marked	TATA / JINDAL / SURYA / SWASTIK
3	Synthetic Enamel Paint 1st Quality only	ICI Paint (Deluxe), Asian Paint (Apcolite), Shalimar Paint (Superlac), Goodlass,Nerolac Paint (Nerolac), Berger Paints

Any materials not fully specified in these specifications and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.

C. ELECTRICAL

LIST OF SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 AIR CONDITIONER

a. Blue Star
b. O General.
c. Daikin.
d. Carrier
e. Hitachi.
f. LG.
g. Lloyds
h. Mitsubishi
i. Panasonic
j. Sharp
k. Samsung.
l. Blue star.
m. Haier.
n. Voltas.
o. Videocon.

2.0 BATTERIES (LEAD ACID)

a. Amco Batteries Ltd.
b. Exide Industries Ltd.
c. HBL Power System Ltd.
d. Amara Raja Batteries Ltd.
e. Su-Kam Power Systems Ltd.
f. Base Corporation Ltd.
g. Okaya Power Ltd.
h. Southern Batteries Pvt Ltd.
i. True Power International Ltd.
j. Evolute Solutions Pvt Ltd.
k. Greenvision Technologies Pvt Ltd.
l. Artheon Electronics Ltd.

3.0 BATTERIES (NICKEL CADMIUM)

a. Amco Saft Batteries Ltd.

b. HBL Power Systems Ltd.

4.0 BATTERY CHARGER/DC-DC CONVERTER

a. Amara Raja Power System(P)Ltd.

b. BCH.

c. Chhabi Electricals Pvt. Ltd..

d. Caldyne Automatics Limited.

e. HBL Nife Power Systems Ltd..

f. Universal Instrument Mfg. Co Pvt Ltd.

g. Hitachi HI-REL Power Electronics P. Ltd

h. Mass-Tech Controls Pvt Ltd

i. Dubas Engineering Pvt Ltd

j. Chloride Power Systems & Solutions Ltd

k. Synergee

l. Enertech

m. Vertiv

5.0 CABLE – FIRE ALARM & COMMUNICATION CABLES

a. Cords Cable Industries Ltd.

b. CMI.

c. Delton cables Ltd.

d. ELKAY Telelinks.

e. KEI Industries Ltd.

f. Elkay Telelinks

6.0 CABLE – HT(XLPE)

a. Universal Cable Ltd.

b. KEI Industries Ltd.

c. Industrial Cables.

d. NICCO Corporation Ltd.

e. Uniflex.

f. Polycab.

g. Torrent cables Ltd.

7.0 CABLE – LT / MV POWER AND CONTROL

a. Cords Cable Industries Ltd.

b. Universal Cable Ltd.

c. KEI Industries Ltd.

d. Havells.

e. Delton.

f. Elkay Telelinks.

g. Evershine Electricals.

h. Ecko.

i. Ravin.

j. Rallison.

k. Suyog.

l. Netco.

m. Uniflex.

n. Paramount.

o. Gloster.

p. Associated cables Pvt Ltd.

q. CMI.

r. Gemscab.

s. Industrial cables.

t. NICCO.

u. Polycab.

v. Torrent.

8.0 CABLE – GLAND

a. Baliga.

b. Comet.

c. Flexpro.

d. Flameproof.

e. FCG.

f. Electro Werke.

g. Dowels.

h. CCI.

i. Sudhir Switchigear

j. Keyson Techno Equipments,

9.0 CABLE – LUGS & TERMINAL BLOCKS

a. Dowels.

b. Jainson.

c. Sharma Electrical

d. Punitam

e. Yamuna Powers

f. Rapid Manufacturer

g. Varun Controls.

10.0 CABLE – TRAY

a. Ercon Composites.

b. Yamuna Power & Infrastructure Ltd.

c. MEM

d. Bharti

e. Profab.

f. Ratan.

g. Slotco.

11.0 CABLE TERMINATION AND JOINTING KIT

a. CCI.

b. Raychem.

c. M-Seal.

12.0 CEILING/EXHAUST/PEDESTAL FANS & CIRCULATORS

a. Bajaj Electricals Ltd.

b. Crompton Greaves Ltd.

c. Khaitan Electricals Ltd.

d. Havell's.

e. Philips

f. Usha

g. Orient

13.0 CONTRACTORS – AC POWER

a. Andrew Yule.

b. ABB.

c. BHEL.

d. C&S.

e. Havell's.

f. L&T.

g. Schneider.

h. Siemens Ltd.

i. Telemechanique.

j. GE India Industrial

14.0 CONTROL TRANSFORMER

a. AE.

b. Indushree.

c. Intra Vidyut.

d. Kalpa Electricals.

e. Transpower Industries Ltd.

f. Siemens.

15.0 GAS GENERATOR/DIESEL GENERATOR SET

a. Sterling and Wilson.

b. Jackson Limited.

c. Sudhir Gensets.

d. Power Engineering (India) Pvt Ltd.

e. Prasha Technologies Limited.

f. Kumar Generator house.

g. Ashok Leyland Ltd.

h. Powerica Limited.

i. Supernova Engineers Limited.
j. Bhaskar Power Products (P) Ltd.
k. Caterpillar India (P) Ltd.
l. Cummins India Ltd.
m. Escorts Ltd.
n. Greaves Cotton Ltd.
o. Kirloskar ltd.
p. Mahindra & Mahindra Ltd.
q. Honda.
r. Perkins.
s. Eicher.
t. Tata Motors.
u. Ashok Leyland.

16.0 FLAME PROOF LDB'S/ JB'S/CONTROL STATION/ SWITCHES

a. FCG.
b. Sudhir switchgears.
c. Prompt Engineering Works
d. Flame Proof equipments pvt. Ltd.
e. Baliga Lighting Equipments Pvt. Ltd.
f. Flexpro Electricals Pvt. Ltd.
g. Exprotecta, Beroda.
h. FFLP Control Gears.
i. Sterling.
j. Kaysons Techno Equipment
k. Bajaj
l. Phoenix Contact

17.0 HIGH MAST

a. Bajaj Electricals Limited.
b. Crompton Greaves Limited.
c. Philips India Limited.
d. Surya Roshani.
e. Transrail

18.0 HIGH VOLTAGE PCC/ MCC PANELS

a. BHEL.
b. Control and Switchgear.
c. Siemens.
d. ~~Tricolite Electrical Industries~~.
e. Schneider.
f. CGL.
g. L&T.
h. ABB.

19.0 INDICATING LAMPS

a. Alstom Ltd.
b. BCH.
c. L&T Ltd.
d. Siemens Ltd.
e. Vaishno Electricals.
f. Tecknik
g. ABB

20.0 INDICATING METERS

a. L&T
b. ABB.
c. AMCO.
d. AE
e. Alstom Ltd. (EE).
f. Conzerv/Schneider
g. Elecon Measurement Pvt. Ltd.
h. HPL Electric & Power Pvt. Ltd.
i. MECO Instruments Ltd.
j. Minilec.
k. Rishabh Instruments Pvt. Ltd.
l. Trinity energy system.

m. Kaycee.

n. Salzer.

o. Trinity

p. Secure Meters Limited

21.0 LIGHTING FIXTURES

a. GE Lighting Pvt. Ltd.

b. Bajaj Electricals Ltd.

c. Crompton Greaves Ltd.

d. Philips India Ltd.

e. Havells

f. Wipro

g. Osram

h. Siska

i. Halonix

j. Surya

k. Polycab

l. Kawlity Photonix

22.0 LIGHTING FIXTURES – FLAMEPROOF

a. Bajaj Electricals Ltd.

b. Baliga Lighting Equipment Pvt. Ltd.

c. Crompton Greaves Ltd.

d. CEAG Flameproof Controlgear Pvt. Ltd.

e. Flexpro Electricals Pvt. Ltd.

f. Philips India Ltd.

g. Sudhir Switchgears Pvt. Ltd.

h. FCG.

23.0 MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB

a. ABB.

b. Hagger.

c. Havell's India Ltd.

d. Indo Asian Fusegear Ltd.

e. Legrand.
f. MDS Switchgear Ltd.
g. Schneider.
h. Siemens Ltd..
i. HPL.
j. L & T
k. Siemens

24.0 MOULDED CASE CIRCUIT BREAKER (MCCBS)

l. ABB.
m. Andrew Yule.
n. Larsen & Toubro.
o. Schneider.
p. Siemens.
q. Control and Switchgear.
r. Indo Asian,
s. Hager.
t. Merlin Gerin.
u. Havell's India Ltd
v. General Electric

25.0 PROTECTION RELAYS

a. BCH.
b. L&T Ltd.
c. Siemens Ltd.
d. Tele-menchanique & Controls (India) Ltd.
e. Eaton
f. Alsthom
g. ABB
h. Ashida
i. Novatek Electronics
j. Cantronics
k. Control & Switchgear
l. Frick Electronics
m. Indian Technologies

n. Rao Electromechanical

o. Kudam Corporation

26.0 LOW/MEDIUM VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB

a. ABB.

b. BCH.

c. BHEL.

d. C & S.

e. Elecmech Switchgear & Instrumentation.

f. KMG ATOZ.

g. L&T.

h. Pyrotech Electronics Pvt. Ltd.

i. Risha Control Engineers Pvt. Ltd.

j. UDKAM PROCESS EQUIPMENT INDIA PVT. LTD

k. Tricolite Electrical Industries.

l. Unilec Engineers ltd.

m. Vidyut Control India Pvt. Ltd.

n. Control and Schematic.

o. Zenith Engineering.

p. Schneider Electric,

q. AEG,

r. HAVELL'S,

s. MDS

t. Synergee

27.0 PUSH BUTTONS

a. BCH.

b. Alstom Ltd.

c. L&T.

d. Siemens Ltd.

e. Tele-Menchanique & Controls (India) Ltd.

f. Vaishno Electricals.

28.0 SWITCHES-CONTROL

a. BCH.

b. Easum Reyrolle Relays & Devices Ltd.

c. Alstom.

d. Kaycee Industries Ltd..

e. L&T.

f. Siemens Ltd.

29.0 SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET

a. Anchor Electronics & Electricals Pvt. Ltd.

b. Kingal Electricals Pvt. Ltd.

c. North-West Switchgear Ltd.

d. Schneider

e. Havells

f. Cona

g. Orient

h. Panasonic

30.0 SWITCH SOCKET OUTLETS (INDUSTRIAL)

a. Alstom Ltd.

b. Best & Cromption Engineering Ltd.

c. BCH.

d. Crompton Greaves Ltd.

e. Essen Engineering Company Pvt. Ltd.

31.0 SOLAR POWER SYSTEM MODULES

a. Tata Power Solar Systems Ltd

b. REIL,

c. CEIL,

d. HBL Power.

e. Vikram Solar.

f. Waaree Solar.

g. Solar Semiconductor.

h. Sonali.

i. Mundra Solar

j. Vikram Solar

k. Bharat Electronics Limited
l. Waaree
m. Lumipex
n. Independent Qualitative Accessories
o. Statcon Energy
p. Volks Energy
q. Green Engineering

32.0 SOLAR PCU/CHARGE CONTROLLER

a. Statcon Energy
b. Enertech UPS Pvt Ltd
c. Consul Nowatt
d. OPS India
e. Schneider
f. Delta Electronics
g. ABB Ltd
h. KACO
i. SMA
j. HBP Power
k. Universal Instrument

33.0 TERMINALS BLOCKS

a. Connectwell.
b. Controls & Switchgear Co. Ltd.
c. Elmex Controls Pvt. Ltd.
d. Essen Engineering Co. Pvt. Ltd.
e. Phoenix Contact

34.0 DISTRIBUTION TRANSFORMERS

a. ABB.
b. Andrew Yule.
c. Areva.
d. BHEL.
e. Bharat Bijlee
f. Crompton Greaves.

g. EMCO Ltd.
h. Intra Vidyut.
i. Indushree.
j. Indcoil
k. Kirloskar.
l. Skippers Electricals.
m. Transformers & Rectifiers (I) Ltd.
n. Voltamp.

35.0 UPS SYSTEM AND INVERTER

a. DB Power.
b. Keltron.
c. Hi-Rel/HITACHI.
d. Dubas.
e. Toshiba Corporation.
f. Fuzi Electric Co Ltd.
g. Emerson.
h. Synergy System.
i. Eaton.
j. Enertech

36.0 GI-OCTAGONAL POLE

a. Bajaj.
b. Transrail.
c. Wipro.
d. K.L. Industries.

37.0 ELECTRICAL MOTORS

a. Siemens.
b. Crompton Greaves.
c. Kirloskar.
d. BHEL.
e. Bharat Bijlee.
f. Hindustan motors.
g. Alstom.
h. Texmo.

i. GE India.

j. National Motors.

k. ABB.

38.0 ELECTRICAL PROCESS HEATER

a. Escorts Limited, Faridabad, Haryana.

b. Spherehot / Kanti Lal Chuni Lal & Sons Appliances Pvt Ltd.Surat.

c. Kerone, Bhayander(E), Thane – 401105.

d. Excel Heaters, Andheri (West), Mumbai - 400 053, India.

e. Nirmal Industrial Controls Pvt. Ltd., Mulund(W), Mumbai - 400 080.

39.0 CATHODIC PROTECTION AGENCIES/CONTRACTOR/ VENDERS

a. CALTECH Engineering Service.

b. Universal Corrosion Prevention India.

c. Cathodic Technology Limited.

d. Cathodic Control Company Pvt. Ltd.

e. CORRTECH International Pvt Ltd.

f. MITCORR Cathodic Protection Pvt Ltd.

g. Underground Pipeline & NDTS Pvt. Ltd.

h. JG Corrosion Solution.

i. Mercury Cathodic Protection Service.

j. UNDTS Corrosion Service.

k. SARK EPC Projects Pvt. Ltd.

40.0 BACKUP AGENCY FOR INTERFERENCE SURVEY & MITIGATION

a. PLE Germany

b. Vendor Velde

c. Nippon Japan

d. SSS India CIPL / interference survey.

e. Balslev Denmark, .

f. SSS Germany

g. Jef Techno Slutions Pvt. Ltd.

h. SARK EPC Projects Pvt. Ltd.

41.0 PERMANENT REFERENCE CELL

a. PERMACELL/ HARCO (USA)

b. CORRTECH (ZULU), INDIA

c. TINKER RASOR, USA

d. SILVION, UK

42.0 CP CABLES

a. Brooks Cables.

b. Nicco Corporation Ltd.

c. CCI Ltd.

d. Delton Cables Ltd.

e. KEI Industries.

f. Torrent Cables.

g. Universal cables.

h. Victor Cables.

i. Associated Flexible & Wires Pvt Ltd.

j. Asain Cables (RPG Cables).

k. Fort Gloster (Gloster Cables Ltd).

l. Finolex Cable.

m. Rediant Cables.

n. NETCO Cables Pvt Ltd.

o. Havells Ltd.

43.0 CP SACRIFICIAL ANODES

a. Scientific Metals Engineers Pvt. Ltd., Karaikudi

b. PSL Holding Pvt. Ltd., Mumbai.

c. Cathodic Controls, Bangalore.

d. BHEL, Bhopal.

e. Nippon Corrosion, Japan.

f. AFIC, KSA.

g. Platt Bros. and Company, USA

h. Wilson Walton International.

i. Impalloy International.

j. Corrpro International.

k. HOCKWAY, UK

l. NAKABOHTEC, Japan .

m. Cortech International

n. Titanor Component

o. Shakti Metals, Ahmedabad

p. Shakti Enterprises, Ahmedabad

44.0 CP PORTABLE /PERMANENT REFERENCE CELL

a. M/S PERMACELL/HARCO, USA

b. M/S BORIN MANUFACTURER, USA

c. M/S M.C.MILLER, USA

d. M/S TINKER RASOR

45.0 CPTR (AC OPERATED)

a. Canara Electric

b. CATHODIC CONTROL COMPANY PVT LTD.

c. Kriston Systems

46.0 PIN BRAZING / THERMITWELD

a. SAFETRACK, SWEDEN

b. CadWeld

c. BAC, UK

d. ERICO, USA

e. THERMOWELD, USA

f. ERICO, EUROPE

47.0 CP SURGE DIVERTER/SPARK GAP ARRESTOR (EX-D)

a. Dhen,

b. OBO

c. Corrpro system

d. Sohne

e. Dairyland

48.0 CP SOLID STATE POLARISATION CELL.

a. Dairyland

b. Metricorr

c. Rustol

d. Dhen

e. Kriston Systems

49.0 PETROLEUM COKE BREEZE:

a. M/S LORESCO, USA

b. M/S ASBURY, USA

c. M/S GOA CARBON, GOA

d. M/S INDIA CARBON, CALCUTTA

e. M/S PETROCARBON & CHEMICAL COMPANY, HALDIA

50.0 CP ANODE (MMO TYPE):

a. Corrtech

b. Scientific Metal Engineers Karaikudi

c. Titanor Component Ltd., Goa, India.

d. Denora Permelic S.P.A (Italy). .

e. Oronzio De Nora S.A. Ingano Switzerland

f. CER Anode Technologies International USA

g. ACTEL, UK

h. ELTECH System Corporation, Texas

i. MAGNETO-CHEMIE, Netherlands

j. MATCOR (USA)

51.0 HEAT SHRINK CAP FOR CP ANODE

a. MATCOR (USA) To Cable Joint

b. Seal For Life

52.0 ER- PROBE (EXTERNAL CORROSION) ER- PROBE & CORROSION COUPON ASSEMBLY

a. Rose Corrosion Services UK

b. Metal Samples, USA. .

c. Roharbak Cosasco USA

d. Caproco UK

e. Emetricorr, Denmark

53.0 HEAT SHRINK CAP FOR ANODE TO CABLE JOINT

a. Raychem, USA

b. Matcor (USA)

54.0 MMO WIRE ANODES (WITH FACTORY PRE-PACKED COKE BREEZE)

a. Matcor (USA)

b. Covalence (USA)

c. Berry Plastics (USA) – (Seal for Life Industries)

55.0 MMO WIRE ANODES (WITHOUT FACTORY PRE-PACKED COKE BREEZE)

a. GROUPPO DENORA, GOA, INDIA

b. CERANODE TECHNOLOGIES, USA

c. TELPRO, USA

56.0 MMO TUBULAR/ STRIP/ RIBBON ANODES

a. GROUPPO DENORA, GOA, INDIA

b. ORANZIO DE NORA, ITALY

c. MAGNETOCHEMIE, HOLLAND

d. ACTEL LTD., U.K.

e. ELTECH SYSTEMS CORPORATION, USA

f. CERANODE TECHNOLOGIES, USA

g. MATCOR (USA)

Note: -

For any other brought out item(s) for which the vendor list is not provided in the tender , bidders can supply those item(s) from vendors/ suppliers who have earlier supplied similar item(s) for the intended services in earlier Oil and Gas projects and the item(s) offered is in their regular manufacturing/ supply range.

1) The vendor/supplier should not be in the Holiday list of OWNER/ ONSULTANT/other PSU

2) The bidder is not required to enclose documentary evidences (PO copies, Inspection & Completion with satisfactory working certificates etc.) along with their offer, however in case of successful bidder, these documents shall required to be submitted by them within 30 days from date of Placement of Order for approval to OWNER / CONSULTANT.

D. INSTRUMENTATION

LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 PRESSURE GAUGES

a. AN Instruments Pvt Ltd
b. Badotherm Process Instruments B.V.
c. Baumer Bourdon Haenni S.A.S
d. British Rototherm Co Ltd
e. Budenberg Gauge Co Ltd
f. Dresser Inc
g. Forbes Marshall (Hyd) Pvt Ltd
h. General Instrument Consortium
i. H. Guru Instruments (South India) Pvt Ltd
j. Manometer (India) Pvt Ltd
k. Nagano Keiki Seisakusho Ltd
l. Hirlekar Precision, India
m. Waaree Instruments Ltd
n. Walchandnagar Industries Ltd (Tiwac Divn)
o. Wika Alexander Wiegand & Co GmbH
p. Wika Instruments India Pvt Ltd
q. Ashcroft India Pvt Ltd.

2.0 TEMPERATURE GAUGES

a. AN Instruments Pvt Ltd.
b. Badotherm Process Instruments B.V.
c. Bourdon Haenni S.A.
d. Dresser Inc.
e. General Instruments Consortium
f. H. Guru Instruments (South India) Pvt Ltd
g. Nagano Keiki Seisakusho Ltd
h. Solartron ISA
i. Walchandnagar Industries Ltd (Tiwac Divn)
j. Wika Alexander Wiegand & Co GmbH

k. Wika Instruments India Pvt Ltd

l. Pyro Electric, Goa

m. Ashcroft India Pvt Ltd.

3.0 TEMPERATURE ELEMENTS INCLUDING SKIN TYPE

a. ABB Automation Ltd

b. Altop Industries Ltd

c. Bourdon Haenni S.A.

d. Detriv Instrumentation & Electronics Ltd

e. General Instruments Consortium

f. Japan Thermowell Co Ltd

g. Tecnomatic S.P.A

h. Tempsen Instrument India Ltd

i. Thermo Electric Co. Inc.

j. Thermo-Couple Products Co

k. Thermo-Electra B.V.

l. Wika Alexander Wiegand & Co GmbH

m. Altop Industries Ltd., Baroda

n. Nagman Sensors (Pvt.) Ltd.

o. Pyro Electric, Goa

4.0 POSITIVE DISPLACEMENT FLOW METERS

a. RMG (Germany)

b. Elster Instromet

c. Romet

d. Dresser

e. Itron

f. FMG

g. Common

h. Metreg

i. Raychem RPG

j. Vemmtec

5.0 TURBINE FLOW METER

a. Daniel

b. Elster Instromet

c. Itron

d. RMG

e. Rockwin

6.0 ELECTRONIC VOLUME CORRECTOR

a. Elgas

b. Itron

c. Plum

d. Pietro Fiorentini

7.0 ORIFICES (METER RUN, FLOW CONDITIONER, ORIFICE PLATE AND ASSEMBLY)

a. Emerson

b. FMC, USA

c. Pietro Fiorentini S.P.A (Italy)

d. Canalta Controls, Canada

8.0 ULTRASONIC FLOW METERS

a. Daniel (USA)

b. RMG (Germany)

c. Instromet International (Belgium)

d. Sick Maihak, Germany

e. FMC, Germany

9.0 MASS FLOW METERS

a. Daniel Measurement & Control Asia Pacific

b. Endress + Hauser Instruments International

c. FMC Measurements Solutions

d. Heinrichs Messtechnik GMBH

e. Rheonik MessGerate GMBH

10.0 FIELD INSTRUMENTS (P, DP, F, L, T)

a. ABB Ltd
b. Honeywell
c. Fuji Electric Instruments Co Ltd
d. Yokogawa
e. Invensys India Pvt.Ltd

11.0 LEVEL GAUGES/ LEVEL INSTRUMENTS

a. Bliss Anand
b. Chemtrols
c. V-Automat
d. Levcon
e. Nivo Controls
f. Sbeletro Mechanicals
g. TRAC

12.0 PRESSURE REGULATOR AND SLAM SHUT VALVE

a. Pietro Fiorentini S.P.A. (Italy)
b. Emerson
c. RMG-Regel Messtechnik (Germany
d. Mokveld Valves BV (Netherlands)
e. Schlumberger (USA)
f. Gorter Controls B V (Netherlands)
g. Instromet International NV
h. Nirmal Industrial Controls Pvt Ltd. (up to 6” size only)
i. ESME Valves Ltd
j. Kaye & Macdonald Inc.
k. Nuovo Pignone S.P.A (Italy) (GE Oil Co.)
l. Richards Industries (Formerly Treloar)
m. Samson AG Mess-und Regeltechnik
n. Tormene Gas Technology
o. Dresser Inc, USA (upto 8” size, 300# class only)

13.0 PRESSURE SAFETY VALVES

a. Keystone Valves (India) Pvt. Ltd.
b. Larson & Toubro Ltd.
c. Lesser GmbH & Co KG
d. Mekaster Engg Ltd..
e. Tyco Sanmar Ltd. (New Delhi)
f. Anderson Greenwood Crosby
g. BHEL (Trichy)
h. Curtiss Wright Flow Control Corporation
i. Dresser Inc.
j. Fukui Seisakusho Co. Ltd
k. Nakakita Seisakusho Co Ltd
l. Nuovo Pignone S.P.A (Italy) (GE Oil co)
m. Parcol S.P.A
n. Safety Systems UK Ltd
o. Tai Milano S.P.A
p. Weir Valves & Controls France
q. Bliss Anand Pvt Ltd.

14.0 CONTROL PANEL & ACCESSORIES

a. Keltron Controls Ltd., Kerala
b. Elechmec Corporation Ltd., Mumbai
c. Industrial Controls & Appliances Pvt. Ltd.,
d. Alstom System Ltd., Noida
e. Emerson Process Management (I) Pvt. Ltd.
f. ABB Instruments Ltd., New Delhi
g. Larsen & Toubro Ltd.
h. Control & Automation, New Delhi
i. GE Fanuc Systems Pvt. Ltd., New Delhi
j. Rockwell Automation (I) Ltd., Ghaziabad
k. Honeywell Automation Ltd.
l. Rittal
m. Pyrotech Elcronics Pvt Ltd.
n. Positronics Pvt Ltd.
o. Electronics Corporation of India Ltd.

15.0 JUNCTION BOXES AND CABLES GLANDS

a. Ex-Protecta
b. Flameproof Control Gears
c. Baliga
d. Flexpro Electricals

16.0 CONTROL AND SIGNAL CABLES

a. Associated Cables
b. Brook
c. Associated Flexibles & Wires (Pvt) Ltd
d. Universal Cables Ltd,India
e. Delton Cables Ltd, India
f. KEI Industries Ltd INDIA
g. CMI Limited
h. Cords Cable Industries Ltd, India
i. Elkay Telelinks (P) Ltd., India
j. Udey Pyrocables Pvt Ltd, India
k. Goyolene Fibres (I) Pvt Ltd, India
l. Netco Cable Industries Pvt Ltd, India
m. Nicco Corporation Ltd, India
n. Paramount Communications Ltd, India
o. Polycab Wires Pvt Ltd, India
p. Radiant Cables Pvt Ltd, India
q. Reliance Engineers Ltd., India
r. Suyog Electricals Ltd, India
s. Thermo Cables Ltd

17.0 GAS DETECTION SYSTEM

a. Crowcon Detection Instruments Ltd
b. Detection Instruments (I) Pvt Ltd
c. Detector Electronics Corporation
d. Drager Safety AG & Co. KGAA
e. General Monitors Ireland Ltd
f. Mine Safety Appliances Company

g. MSA – Mines Safety Appliances(India) Ltd
h. Industrial Scientific Oldham France S.A.
i. Riken Keiki Co Ltd
j. Simrad Optronics Icare
k. Honeywell Analytics
l. Net Safety Monitoring Inc.
m. Simtronics SAS

18.0 MOV ACTUATOR:

a. Rotork- UK, USA & INDIA
b. Limitorque
c. Auma- India
d. Biffi- Italy

19.0 PNEUMATIC ACTUATOR (SOLENOID OPERATED ON-OFF TYPE)

a. Metso Automation
b. Tyco
c. Samson Controls
d. L&T
e. Emerson
f. Fisher
g. Masoneilan Process Control
h. Instrumentation Limited (IL)-Palghat
i. Micro Finish
j. Rotex

20.0 SOLENOID VALVES

a. Avcon
b. Festo

21.0 ELECTRO – HYDRAULIC ACTUATOR

a. Avcon Rotork controls (Deutchland Gmbh)
b. Biffi Italia Srl
c. Ledeen (Italy)
d. Virgo Valves and Controls ltd.-India
e. Limittorque

f. Reineke
g. Voith
h. Bettis
i. Rotork- UK, USA & INDIA
j. Rotex
k. Schuck Group

22.0 GAS OVER OIL ACTUATOR

l. Biffi Italia Srl,
m. Ledeen(Italy)
n. Virgo Valves & Control ltd.-India,
o. Voith,
p. Bettis,
q. Rotork-UK, USA, India,
r. Rotex,
s. Schuck Group,
t. Valve Italia.

23.0 OFC

Manufacture/ Procurement, Testing and supply of suitable OFC Joint closures including all necessary accessories of any of the following make:

a. Raychem
b. 3M
c. Siemens
d. Any other make from the approved vendor list of client with supporting paper.

24.0 FLOW CONTROL VALVES

e. Fouress Engg. (New Delhi)
f. Fisher Xomox (New Delhi)
g. MIL Control Ltd. (Noida)
h. KOSO India Pvt ltd
i. Samson Control (Thane)
j. Dresser Valves India Pvt Ltd.
k. Fisher Controls
l. Valvitalia Italy

m. CCI Valve technology

n. Flowserve Pvt Ltd.

o. Metso Singapore Pvt Ltd.

p. Instrumentation Ltd Palghat

q. Dresser Inc. USA

25.0 FLOW COMPUTERS

r. Emerson

s. Instromet International (Belgium)

t. FMC Measurement Solutions (UK)

u. RMG (Germany)

v. OMNI Flow Computers Inc.

w. Thermo Fisher, USA

26.0 INDICATORS & CONTROLLERS

x. Yokogawa

y. Eurotherm Chessel

z. Honeywell

aa. Emerson

27.0 BARRIERS

bb. MTL

cc. STHAL

dd. P&F

ee. Phoenix

28.0 GAS CHROMATOGRAPH

ff. ABB

gg. Emerson

hh. Instromet International, NV

ii. RMG Regal+Messtechnik GmbH

jj. Yokogawa

29.0 I/P CONVERTERS

kk. ABB

ll. Emerson

mm. IMI Watson Smith Ltd.

nn. Moore Controls Ltd

oo. Shreyas Instruments Pvt Ltd, India

pp. Thermo Brandt Instruments

30.0 SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS

30.1 FOR CNG WORK:

qq. DK-LOK

rr. Swagelok Co.

ss. Parker

30.2 EXCEPT CNG WORK:

a. Swagelok Co.

b. Parker

c. Aura INC.

d. HOKE

e. Excelsior Engineering works

f. Swastik Engineering works India

g. Comfit and valves pvt ltd

h. Arya craft and engineering Pvt ltd

i. DK lok

31.0 SS TUBES

31.1 FOR CNG WORK:

a. Swagelok Co.

b. Parker

c. Sandvik

31.2 EXCEPT CNG WORK:

a. Swagelok Co.

b. Parker

c. Sandvik

d. Heavy metal and tube limited

e. Nuclear fuel complex India

f. Scorodite

g. Ratnamani Metals and Tubes

h. Jindal Saw

E. SHOP & FIELD PAINTING

LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 INDIAN VENDORS

a. Asian Paints (I) Ltd.

b. Berger Paints Ltd.

c. Goodlass Nerlolac Paints Ltd.

d. Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.

e. Shalimar Paints Ltd.

f. Sigma Coating, Mumabai

g. CDC Carboline Ltd.

h. Premier Products Ltd.

i. Coromandel Paints & Chemicals Ltd.

j. Anupam Enterprises

k. Grand Polycoats

l. Bombay Paints Ltd.

m. Vanaprabha Esters & Glycer, Mumbai

n. Sunil Paints and Varnishes Pvt. Ltd.

o. Courtaulds Coating & Sealants India (Pvt.) Ltd.

p. Mark-chem Incorporated, Mumbai (for phosphating chemicals only)

q. VCM Polyurethane Paint (for polyurethane Paint only)

2.0 FOREIGN VENDORS FOR OVERSEAS PRODUCTS

a. Sigma Coating, Singapore

b. Ameron, USA

c. Kansai Paint, Japan

d. Hempel Paint, USA

e. Valspar Corporation, USA

f. Courtaulds Coating, UK.

Notes:

1. Bidder can select equipment of two different makes, selected from this VENDOR LIST and mention the same in the checklist for technical evaluation attached with the tender. The offered bid must include filled datasheet indicating make, model, size, rating of offered instrument/ equipment duly supported by sizing calculation of offered equipment (wherever applicable).

2. Vendors who have already supplied above equipment in other terminals of client, shall also be considered qualified for this tender provided the supplied equipment are commissioned and running successfully and they have not been put on holiday.

3. Equipment / Instruments of any make which is offered by one bidder and acceptable to client shall be accepted for other bidder also. After placement of order, on request of the successful bidder list of other qualified makes for a particular item (for which successful bidder wants to change the vendor) shall be provided.

4. Bidder shall take prior approval of the make / model no of the offered item and it shall be from the list given above. However additional vendors will be considered in exceptional cases, provided they have supplied for similar application to reputed gas transmission/distribution companies, in quantities at least half the numbers being supplied for this tender, and working satisfactorily for minimum 6 months. Documentary evidence substantiating above shall be submitted for taking approval.

F. FOR PE & LMC WORK (GI/CU)

1.0 MDPE FITTINGS & MDPE VALVES

a. Aliaxis,

b. George Fischer,

c. Al-Aziz,

d. Kimplas,

e. Banides,

f. Agru,

g. Friatech,

h. Plasson

2.0 GI PIPE

a. Swastik Pipe Ltd.

b. Jindal Industries Ltd.

c. Vishal Pipes Ltd.

d. Indus Tubes Ltd

e. Advance steel Tubes Ltd.

f. Good Luck Tubes Ltd.

g. Surya Roshni Limited

h. APL Apollo Tubes Limited

i. Jindal Pipes Limited

j. RK Steel Manufacturing Company Private Limited

k. PSL Tubes Limited

3.0 CASTING GI FITTINGS

a. Sarin Industries Ltd.

b. Jupiter Metal Industries Ltd.

c. Jainsons Industries Ltd.

d. Jinan Meide Casting Co. Ltd.

e. Green Malleable Pvt. Ltd.

4.0 FORGED GI FITTING (FOR HIGH RISE SEGMENT)

a. Jainsons Industries

b. B.M. Meters Pvt. Ltd.

5.0 COPPER TUBES & FITTINGS

a. Jay Banas Mehta Tubes Limited- Trade Mark "MEXFLOW"

b. Rajco metal (Tubes & Fittings)

c. Paras Industries

d. MERCURE METAL & ALLOYS PVT LTD

6.0 BRASS FITTINGS

a. Chandan Enterprises

b. Paras Industries Ltd.

7.0 BRASS VALVES

a. Universal srl, Italy

b. Tiemme Raccorderie Sede, Italy

c. Enolgas Bonimu s.a.s., Italy

d. Fratelli Fortis s.r.l, Italy

e. Giacomo Climbrio, Italy

f. Parker Hannifin S.P.A., USA

g. Singapore Valve & Amp; Fittings Pte Limited, Singapore /Bengaluru

h. Rubinetterie Utensilerie Bonomi (RUB), Italy

i. Zhegiang Valogin Technology Co. Ltd., China,

j. Ningbo Zhiqing Industrial Co. Ltd., China,

k. Zhegiang Dunan Valve Co. Ltd.,

l. Ningbo Huaping, China.

8.0 BRASS FITTINGS

a. Chandan Enterprises

b. Paras Industries Ltd.

c. Chokhawala Distributors – Brass Adaptor.

9.0 STEEL RE-INFORCED RUBBER HOSE (TYPE-4)

a. Super Seal Flexible Hose Ltd.

b. Suraksha Products Pvt. Ltd.

c. Vansh Industries

d. T & L Gases

10.0 CORRUGATED FLEXIBLE METAL HOSES (ANACONDA)

a. KPC Flex Tubes

b. Vestas Hose Division

c. Alpha Flexi Tubes

d. Chandan Enterprises

Note:

1. Vendor may procure material from any of approved vendors listed.
2. For equipment/components other than the above, vendor shall submit past track record for the proposed sub-vendors and obtain written approval from Owner / Consultant before placing order.
3. In case of exigencies like long delivery periods from approved vendors, the contractor shall list down the proposed suppliers/vendors for such items and submit the same for owner review/approval along with necessary documents/PTR.
4. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication. If equipment is sourced from outside India, vendor shall obtain prior approval for make of equipment before placement of order.

Above mentioned vendor list is tentative and further addition/deletion may be done as per discretion of Owner/VCS.