



DELHI METRO RAIL CORPORATION LIMITED

(A Joint Venture of Govt. of India and GNCTD)

NAME OF WORK: CONTRACT PS-05: SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF UNINTERRUPTED POWER SUPPLY SYSTEM FOR SIGNALLING, TELECOMMUNICATION, AUTOMATIC FARE COLLECTION, PLATFORM SCREEN DOOR/GATE SYSTEM & EMERGENCY POWER SUPPLY TO E&M AT ALL ELEVATED STATIONS OF PRIORITY CORRIDOR (ISBT DEPOT, ISBT STATION, ZERO MILE, BHOOTNATH, KHEMNI CHAK & MALAHI PAKRI) OF PATNA METRO RAIL PROJECT.

ADDENDUM NO. 1 (SUMMARY SHEET)

S. No.	Section/Part	Document Name	Page no.	Clause	Addendum/Corrigendum	Remarks
1	Volume 1	Instructions to Tenderer (ITT)	8	C2.2 (r) & (s)	(r) Appendix 15 to the Form of Tender: Financial data (work Done during the latest last five financial years) - Not Applicable. (s) Appendix 16 to the Form of Tender: Financial Data (Commitment for On-going Works/ works in hand) - Not Applicable.	Replace Page 8 by 8R
2	Volume 1	Instructions to Tenderer (ITT)	24	Appendix 15 of FOT	FORM OF TENDER-APPENDIX 15 - Not Applicable.	Replace Page 24 by 24R
3	Volume 1	Instructions to Tenderer (ITT)	25	Appendix 16 of FOT	FORM OF TENDER-APPENDIX 16 - Not Applicable.	Replace Page 25 by 25R
4	Volume 3	Particular specification	7	1.2.1	"General Conditions (GC) & Particular conditions (SC)" to be read as "General Conditions of Contract (GCC) & Special conditions of Contract (SCC)".	Replace Page 7 by 7R
5	Volume 3	Particular specification	7	1.2.4	"16.1.2.2" to read as "1.2.2"	Replace Page 7 by 7R
6	Volume 3	Particular specification	7	1.3.1	"Electromechanical" to be read as "Electrotechnical" & "Specification" to be read as "Standardization"	Replace Page 7 by 7R
7	Volume 3	Particular specification	7 & 8	1.3.1	Table for Relevant Standards in clause 1.3.1 updated and attached	Replace Page 7 by 7R and 8 by 8R
8	Volume 3	Particular specification	10	1.9.5	"Delhi" to be read as "Patna"	Replace Page 10 by 10R

S. No.	Section/Part	Document Name	Page no.	Clause	Addendum/Corrigendum	Remarks
9	Volume 3	Particular specification	11	2.3	Clause 2.3 amended and to be read as: - "OCC and BCC Location"	Replace Page 11 by 11R
10	Volume 3	Particular specification	11	2.3.1	Clause 2.3.1 amended and to be read as:- "Corridor shown above will be controlled from OCC at ISBT Depot and BCC at Patna station. The remote monitoring facility for all UPSs will be provided in OCC & BCC separately"	Replace Page 11 by 11R
11	Volume 3	Particular specification	12	3.2.1(f)	Clause 3.2.1(f) to be read as:- Inverter Output isolation transformer.	Replace Page 12 by 12R
12	Volume 3	Particular specification	12	3.2.1(i)	"Trenches" Deleted	Replace Page 12 by 12R
13	Volume 3	Particular specification	15	4.5.1	"Health & Environmental Safety" to be read as "Conditions of Contract on Safety & Health and Environment"	Replace Page 15 by 15R
14	Volume 3	Particular specification	16	4.6.1(b)	"VDE 0857" to be read as "VDE 0875"	Replace Page 16 by 16R
15	Volume 3	Particular specification	17	4.9.2	Clause amended: "Platform Screen Door/Gate & E&M" Added	Replace Page 17 by 17R
16	Volume 3	Particular specification	18	5.1.1	"Electromechanical" to be read as "Electrotechnical" and "Specification" be to read as "Standardization"	Replace Page 18 by 18R
17	Volume 3	Particular specification	19	5.2.5.3	Clause amended: "IP 54" to be read as "IP 20 or better"	Replace Page 19 by 19R
18	Volume 3	Particular specification	23	5.2.9	"16.4.8.1" to be read as "4.8.1"	Replace Page 23 by 23R
19	Volume 3	Particular specification	26	5.4.4	"16.5.4.3" to be read as "5.4.3"	Replace Page 26 by 26R
20	Volume 3	Particular specification	27	5.4.7	"500C" to be read as "50 °C"	Replace Page 27 by 27R
21	Volume 3	Particular specification	31	5.8.2	Clause amended: "IP 54" to be read as "IP 20 or better"	Replace Page 31 by 31R
22	Volume 3	Particular specification	32	5.9.2 & 5.9.3	Clause amended: "IP 54" to be read as "IP 20 or better" "16.5.8.10" to be read as "5.8.10"	Replace Page 32 by 32R
23	Volume 3	Particular specification	33	5.12.1	"S&T Contractor" be read as 'UPS (PS-05) Contractor"	Replace Page 33 by 33R
24	Volume 3	Particular specification	33-34	5.12.2	Table updated: "Type C & Type D" Deleted.	Replace Page 33-34 by 33R-34R

S. No.	Section/Part	Document Name	Page no.	Clause	Addendum/Corrigendum	Remarks
25	Volume 3	Particular specification	36	6.1.1 & 6.2.7	Clauses amended as: - “Materials for inclusion in the Permanent Works shall be new unless otherwise stated in the Contract having been reviewed without objection by the Employer’s Engineer.” “Doors shall be fitted with lockable handles or other approved means of fastening and shall be provided with locking bars and guides to prevent distortion”	Replace Page 36 by 36R
26	Volume 3	Particular specification	39	7.2.2.2	“2350C” to be read as “235 °C”	Replace Page 39 by 39R
27	Volume 3	Particular specification	41	8	Clause amended as: - “The requirements specified herein are by no means exhaustive main and it remains the responsibility of Interfacing Contractors to develop and execute interface plans during execution of the work to ensure that:”	Replace Page 41 by 41R
28	Volume 3	Particular specification	42	8.6.4	“S&T Contractor” be read as ‘UPS (PS-05) Contractor”	Replace Page 42 by 42R
29	Volume 3	Particular specification	43	8.9.1	“DMRC” to be read as “PMRC”	Replace Page 43 by 43R
30	Volume 3	Particular specification	48	10.3.2	Clause amended as: - “The Contractor shall co-ordinate with relevant Project Contractors to agree the date of access to the physical are as to carry out installation activities”	Replace Page 48 by 48R
31	Volume 3	Particular specification	52	11.4.6	Following is added “(o) Paralleling of UPS-1 & UPS-2 inverter (p) Loading of system “	Replace Page 52by 52R
32	Volume 3	Particular specification	54	11.6.4	“16.11.8” to be read as “11.8”	Replace Page 54by 54R
33	Volume 3	Particular specification	55	11.7.5	“DLP” to be read as “ROD”	Replace Page 55 by 55R
34	Volume 3	Particular specification	58	13.1.1	“Annexure 1” to be read as “Annexure I”	Replace Page 58 by 58R
35	Volume 3	Particular specification	59	14.1.8	“DMRC” to be read as “PMRC”	Replace Page 59 by 59R
36	Volume 3	Particular specification	60	14.1.17	“DMRC’s” to be read as “PMRCs”	Replace Page 60 by 60R

S. No.	Section/Part	Document Name	Page no.	Clause	Addendum/Corrigendum	Remarks
37	Volume 3	Particular specification	64-69	ANNEXURE-I- SCHEDULE OF SUPPLY & SERVICES	Table amended for: Schedule A (SUPPLY) & Schedule B (CONTRACTUAL SPARES)	Replace Page 64 to 69 by 64R to 69R
38	Volume 5	Pricing Document / BoQ	Item rate BoQ	S. N. 5, 6, 7 & 8 of Schedule A	Description of Item amended as under: "Supply of VRLA maintenance free Battery Banks (Set of two banks at each site) for 160/80/60/45 KVA UPS systems each having 1 hour back up time at full load with interconnecting cables, racks, battery breaker and standard accessories. Provision of six (6) No. of spares cells along with separate charger, cabinet etc to be done for each battery bank."	"BOQ replaced"
39	Reply to Pre-Bid queries (8 Pages)					

- (c) Appendix 2 to the Form of Tender: Bill of quantities/Pricing document;
- (d) Appendix 3 to the Form of Tender: Outline Quality Plan (see paragraph C4 below);
- (e) Appendix 4 to the Form of Tender: Outline Safety & Health Plan and Outline Environment Plan (see paragraph C5);
- (f) Appendix 5 to the Form of Tender: Tenderer's Technical Proposals (see para C6);
- (g) Appendix 6 to the Form of Tender: General Information About the Tenderer;
- (h) Appendix 6A to the Form of Tender: Undertaking by JV/Consortium members;
- (i) Appendix 7 to the Form of Tender: Staffing Schedules and Organization Chart (see paragraph C12);
- (j) Appendix 7A to the Form of Tender - format for CV of Key personnel's
- (k) Appendix 8 to the Form of Tender: Schedule of Component manufactured offshore, if no offshore manufacturing is involved, the tenderer shall submit 'NIL' in this. (See paragraph C9);
- (l) Appendix 9 to the Form of Tender: Tender Index (See paragraph C23);
- (m) Appendix 10 to the Form of Tender: Non-performance of a contract (See paragraph A4.1(i)(e)).
- (n) Appendix 11 to the Form of Tender: Undertaking for corrupt & fraudulent practice;
- (o) Appendix 12 to the Form of Tender: Copyright Undertaking (see paragraph E2)
- (p) Appendix 13 & 13A to Form of Tender: The tenderer may submit minor deviations in this appendix and a confirmation that price of every such minor deviation has been given in the financial package. Minor deviation may be in the employer's requirements or in any other tender requirement which do not alter the basic functionality of the work or part thereof. If there is no such minor deviation, then the tenderer must write "NIL" in this Appendix. Tenderer to note that such minor deviations may or may not be accepted by the employer and the tenderer shall not have any right to any claim on this account. The offer in BOQ shall be given without considering any deviation in tender conditions. Tenderer to see note 1 of Appendix-13 & 13A of FOT.
- (q) Appendix 14 to the Form of Tender: Tentative project implementation programme (see paragraph C8)
- (r) Appendix 15 to the Form of Tender: Financial data (work Done during the latest last five financial years) **(Not Applicable)**
- (s) Appendix 16 to the Form of Tender: Financial Data (Commitment For On-going Works/ works in hand) **(Not Applicable)**
- (t) Appendix 17 to the Form of Tender: Work Experience
- (u) Appendix 17A to the Form of Tender: Summary of information provided in Appendix 17.
- (v) Appendix 18 to the Form of Tender: Financial Data (Financial Standing)
- (w) Appendix 18A to the Form of Tender: Affidavit for Unaudited Balance Sheet as per First Bullet of Notes of NIT Clause 1.1.3.2 B
- (x) Appendix 19 and 19A to the Form of Tender: Undertaking as per clause 1.1.3.1 v(a), v(b) & v(c) of NIT.

FORM OF TENDER – APPENDIX 15

(NOT APPLICABLE)

[As per clause E4.2 of ITT]

FINANCIAL DATA

(Following table shall be filled in for the tenderer and for each substantial member of JV/Consortium in case tenderer is JV/Consortium)

(UNINTERRUPTIBLE POWER SUPPLY (UPS) WORK DONE DURING THE LATEST LAST FIVE FINANCIAL YEARS)

NAME OF THE BIDDER (CONSTITUENT MEMBER IN CASE OF JV/CONSORTIUM):

(All amounts in Rupees in crores)

S. No.	DESCRIPTION	Financial Data for Last 5 Audited Financial Years				
		Year 2019-20	Year 2020-21	Year 2021-22	Year 2022-23	Year 2023-24
1	2	3	4	5	6	7
	Total value of UPS Work done as per audited financial statements					

NOTE:

1. Separate Performa shall be used for each member in case of JV/Consortium.
2. Attach attested copies of the Audited Financial Statements of the last five financial years as Annexure.
3. All such documents reflect the financial data of the tenderer or member in case of JV/Consortium, and not that of sister or parent company.
4. Historic financial statements must be complete, including all notes to the financial statements.
5. Foreign applicants, in whose country calendar year is also the financial year, may submit all relevant data for the last 5 years i.e. 2019, 2020, 2021, 2022 and 2023.
6. The financial data in above prescribed format shall be certified by Chartered Accountant / Company Auditor in original under his signature, stamp & membership number, UDIN No. and Firm Registration Number.
7. The exchange rate of foreign currency shall be applicable 28 days before the submission date of tender.

FORM OF TENDER- APPENDIX 16

(NOT APPLICABLE)

[As per clause E4.2 of ITT]

FINANCIAL DATA

(Following table shall be filled in for the tenderer and for each substantial member of JV/Consortium in case tenderer is JV/Consortium)

(Commitment for On-going Works / Works in hand which are awarded to tenderer but yet not started as on last day of the month previous to the month of original tender submission)

Applicant's legal name..... Date.....

JV/Consortium Member's legal name..... Page ...of....pages

— (All amounts in Rupees in Crores)

Name and brief particulars of contract (Clearly indicate the part of the UPS work assigned to the applicant (s))	Name of client with telephone number and fax number	Contract Value In Rupees Equivalent (Give only the value of UPS work assigned to The applicant(s))	Value of balance UPS work yet to be done in INR equivalent as on the last day of the previous month of original tender submission	Date of Completion as per Contract Agreement	Expected Completion Date	Delay if any, with reason	Value of UPS work to be done during next 'N' Years (prescribed completion time of the work being procured) with effect from the first day of the month of original tender submission (B)
TOTAL							

Note:

The above Appendix shall be certified by Chartered Accountant in original under his signature, stamp and membership number and Firm Registration Number and UDIN number.

STAMP & SIGNATURE OF AUTHORISED SIGNATORY

1. INTRODUCTION

1.1 General: -

- 1.1.1 The UPS system provided by the contractor shall be 160 KVA for depot, 80 KVA for Khemnichak IXL Station, 60 KVA for remaining Interlocking stations (except Khemnichak) and 45KVA for secondary stations with on-line redundant configuration. Refer to schedule of Supply & Services for details (Annexure-1).

1.2 Relevant Documents: -

- 1.2.1 This Particular Specification (PS) shall be read in conjunction with the General Conditions **of Contract** (GCC), Particular **Special** Conditions of **Contract** (SCC) and any of the documents forming part of the Contract.
- 1.2.2 In the event of a conflict between the GC, PC and the PS, the requirements of the PS shall prevail.
- 1.2.3 In the event of a conflict between the PS and any other standards or specifications quoted in the PS, the requirements of the PS shall prevail.
- 1.2.4 Notwithstanding the contents of Sections 16.1.2.2 and 16.1.2.3 above, the Contractor shall always immediately seek advice from the Employer's Engineer in the event of conflicts between specifications.

1.3 Relevant Codes and Standards: -

- 1.3.1 The UPS and their constituent parts shall comply with the relevant latest version of British Standards (BS), European Standard (EN), International ~~Electromechanical~~ **Electrotechnical** Commission (IEC) standards, International Organization for ~~Specification~~ **Standardization** (ISO), Research Design and Standard Organization (RDSO), Indian Railways Specifications (IRS), Institute of Electrical and Electronics Engineers (IEEE) Standards, National Fire Protection Association (NFPA) Standards, Indian Standard (IS), VDE and Deutscher Elektrotechniker (VDE) Standards as specified below.

The following standards (or Latest) /equivalent international standards shall be applicable:

Specification for Uninterruptible power systems (UPS)	IEC 62040, EN 62040
Safety of information technology equipment, including electrical business equipment	EN 60950, EN 62040-1
~~Power Transformers~~	~~IEC 60076, EN 60076~~
Isolating Transformers	BS EN IEC 61558
Semi-conductor Converters	IEC 60146, EN 60146,
Degree of protection provided by Enclosures	IEC 60529, EN 60529
~~Protection Class~~	~~1-EN 60950~~
Protection Class for distribution box	~~IP54~~ IP20 or better
Surge Protective Devices	IEC 61643-1
EMC – Immunity	BS EN IEC 62040-2, EN 61000-4-3

- 1.9.1** A monthly meeting to monitor and review the progress of the project shall be convened by the Engineer or Employer. These meeting will be held at dates and times to be advised by the Employer's Engineer.
- 1.9.2** The Employer's Engineer may also conduct progress review meetings and interface meeting on weekly /bi-weekly intervals depending upon the requirements or urgency of works. In these review meetings Engineer may call Contractor's Supplier/Sub Contractor/Designer etc. as per the requirements.
- 1.9.3** The Employer's Engineer may convene at his discretion, at any time upon reasonable notice to the Contractor, any meeting, either on or off the Site, to discuss and address any aspect of the Works or the Contract. The Contractor shall attend any such meetings convened by the Employer's Engineer.
- 1.9.4** Senior personnel shall attend meetings from the Contractor who shall arrive properly briefed for all aspects of the meeting and shall be empowered to make executives decisions in respect of the execution of the works.
- 1.9.5** The Tenderer shall submit with their Tender a Project Management Plan as prescribed in Employer's Requirement, inter-alia, indicated names, qualifications, professional experience, location during the contract period and corporate affiliation of all proposed key management and engineering personnel (above the level of supervisor) and specialist. Contractor shall depute Project Director/Project Manager exclusively for PS-05 contract. Project Director/Project Manager shall be based in Patna throughout the contract period. Design Liaison Engineer shall be based in Delhi Patna (India) project office till the design is finalized. Interface Manager, Installation, Testing & Commissioning Manager shall be continuously based in Patna (India) during the respective activities.
- 1.9.6** The performance of project personnel deployed will be evaluated periodically by Employer during the contract period. In case the performance of any of the project personnel is not satisfactory, the Contractor shall replace them with good personnel immediately as per directions of the Engineer.
- 1.9.7** The Contractor shall submit the detailed organisational chart of all personnel to be deployed for the work of PS-05 Contract. Contractor will submit the CVs of Project Director/Project Manager, Design Liaison Engineer and other key personnel indicating their name, qualification, professional experience, contact no. email id etc. for Employer's approval within one months from the date of receipt of Letter of Acceptance (LOA).
- 1.10 Quarterly Review Meetings: -**
- 1.10.1** The Employer's Engineer may convene Quarterly Review Meetings in Patna at approximately three-month intervals. The Employer's Engineer will notify the Contractor the date of such Quarterly Review Meetings.
- 1.10.2** The senior management of Contractor shall attend the quarterly meeting to discuss the progress of site activity, contracts requirement, financial issues etc.
- 1.11 Project Management plan: -**
- 1.11.1** Contractor shall develop and submit to employer a project management plan to define the plans for Interface, Construction & Installation, Commissioning, Maintenance, DLP, Training and spares etc.

2. OVERVIEW OF THE PROJECT

2.1 General: -

2.1.1 This Chapter gives an overview of the Project Information. Information provided in this Chapter is for reference purposes only.

2.2 Project details

2.2.1 PMRC MRTS Project as on date consists of the following:

LINE	Section	JICA/Non-JICA	Interlocking Station		Secondary Station		Depot and OCC
			o. of Station	Name of Station	o. of	ame of Station	ISBT DEPOT
Corridor-2 (Priority Corridor)	Malahi Parkri to New ISBT	Non-JICA	3	Malahi parkri Khemni Chak New ISBT	2	Bhootnath, Zero Mile	

2.2.2 The project corridors shown in paragraph 2.2.1 may get extended or modified in future.

2.3 OCC and BCC Location. for Corridors at ISBT DEPOT.

2.3.1 All lines Corridor shown above will be controlled from OCC at ISBT Depot and BCC at Patna station. The remote monitoring facility for all UPSs will be provided in OCC & BCC separately.

2.4 Common for PMRC Corridor-1 & Corridor-2

2.4.1 Patna metro, corridor-1 & Corridor-2 will utilize 25 KV, 50 Hz overhead for traction power.

2.4.2 Trains will be electric multiple unit (EMU).

3. SCOPE OF THE WORKS, SUPPLY AND SERVICES

3.1 General

3.1.1 The scope of the works includes but not limited to supply, manufacture, inspection, packing, shipping, transportation, storage, delivery, handling, insurance, installation, interfacing, integration, testing & commissioning, maintenance support, spares, special tools, test equipment, training, documentation and providing DLP for the UPS system.

3.2 Scope of supply

3.2.1 The Uninterruptible Power Supply (UPS) system for all Elevated stations (Priority Corridor) of Corridor-2, including Depot. Shall include, but not be limited to the following:

- a) Online redundant UPS;
- b) Battery bank;
- c) Spare cell charger and its associated separate battery cells.
- d) Input Isolation Transformer Cubicle
- e) Servo Controlled Voltage Stabilizer (SCVS) for bypass supply;
- f) Inverter Output isolation transformer ~~(transformer shall be placed between inverter output and static bypass switch)-~~
- g) Equipment cabinets, racks & cubicles;
- h) AC Distribution boxes;
- i) Extension of Cable trays/Trenches/Supports/Foundations;
- j) ATS (Automatic Transfer Switch);
- k) All software required for UPS system;
- l) All external cables (Zero Halogen FRLS), connectors;
- m) Accessories, Earthing's necessary for works;
- n) DLP support of 3 Years.
- o) Surge protection devices at input and output of UPS system;
- p) Special tools and test equipment;
- q) Supply of Industrial grade laptop (laptop configuration shall be minimum but not be limited to 15.6-inch, Core i7, 8th generation, 16 GB RAM, windows 10 and 500 GB SSD) with preloaded application/configuration software to diagnose & rectification of faults, configuration of UPS and its electronic cards/Boards/modules, drives etc.
- r) Remote monitoring system with accessories at OCC & BCC and Remote monitoring equipment and with accessories including voltage free contacts for Alarms at stations; (it should be able to monitor real time alarms of UPS systems with web based graphical user interface & line diagram display. Any alarm in any of the UPS / input Isolation Transformer / SCVS / Battery system/output ACDB shall pop-up the line diagram of the UPS with audio & visual alarm indications).
- s) Contractual Spares;
- t) Furniture for equipment (for workstations at OCC & BCC).

calculation shall be based on the Contractor's submitted equipment MTBF figures, MTTR figures and the configuration of each sub-system.

- 4.3.2 The Contractor shall predict the system failure rate or MTBF figures of each sub-system from the availability calculations
- 4.3.3 Equipment duplication, hot-standby protection, parallel-run, path diversity, etc. Shall be adopted whenever necessary and appropriate to meet the required availability.
- 4.3.4 Switchover between redundant equipment, or between redundant routings, shall occur automatically and immediately upon failure and shall be transparent to the users. Toggling in switchovers shall be prevented.
- 4.3.5 UPS system shall have an overall availability of better than 99.99%.

4.4 Maintainability Requirements

- 4.4.1 The System shall be designed such that the MTTR figures for restoring the operation of the System from fault condition shall not be more than four hours (all inclusive).
- 4.4.2 The MTTR figure shall be calculated from the individual equipment weighted by the failure rate of the equipment.
- 4.4.3 The MTTR figure shall be the total time calculated from the moment the occurrence of the fault at site is reported to the maintenance personnel to the time when the System is fully restored to normal operation. The MTTR does not include the time taken for designated personnel to arrive on site for the purpose of calculation of the MTTR figure.
- 4.4.4 All line replaceable items should normally not exceed the size and weight, which an average individual person can handle.
- 4.4.5 The System shall be suitably designed to minimize the need for frequent preventive maintenance.
- 4.4.6 The System shall be so designed as to avoid the need for a total shutdown for preventive maintenance. In the event that a total shutdown is inevitable, the preventive maintenance shall not require the System to be non-operational for more than two hours.
- 4.4.7 The System shall be so designed as to prevent failures or breakdown due to invalid or incorrect inputs.
- 4.4.8 Built-in self-diagnostics, power-up self-test and sufficient test points shall be provided in the System to minimize the time required to locate a fault.
- 4.4.9 All components, materials, software and supports required for repair and servicing of the System shall be available equal to lifetime of UPS systems. The expected lifetime of the UPS system is 15 years from the date of taking over/ROD.
- 4.4.10 The Mean Time to Restore (MTTR) of UPS shall be less than four (4) hours (all-inclusive).

4.5 System Safety Requirements

- 4.5.1 The Contractor shall perform the mandatory safety activities as detailed in ~~Health & Environmental Safety~~ the condition of Contract on Safety & Health and Environment document, which will be provided along with the Tender document.
- 4.5.2 The Contractor shall support other Project Contractors with the provision of information and relevant analysis where the availability and usability of the Power Supply System is a contributing factor to the overall system risk.

- 4.5.3 The design of the System shall minimize the risk of fire.
- 4.5.4 The design of the System shall minimize the build-up of static, as well as the effects of static discharge during maintenance.
- 4.5.5 No toxic or asbestos-containing materials shall be used anywhere in the System.

4.6 Electromagnetic Compatibility (EMC)

- 4.6.1 The Contractor shall ensure and demonstrate that the System is adequately protected against electromagnetic interference (EMI) among the systems of the PMRC. All equipment shall comply with.
 - a) For EMC- immunity standards should be BS EN IEC 62040-2, EN 61000-4-3 or latest.
 - b) For EMC- Emission standard should be VDE ~~0857~~ **0875**, BS EN IEC 62040-2 IEC 61000-3-2/ 61000-3-3, EN 61000-3-2/ 61000-3-3 or latest.
- 4.6.2 All equipment shall confirm with the objective of the European Directives on EMC (89 / 336 / EEC) and where appropriate shall be fixed with the CE mark.
- 4.6.3 The radio frequency interference (RFI) levels generated by the UPS equipment shall also be in accordance with the requirements of BS EN 55014-1 or latest, IEC 61000-4-3 or other international standards as stated in the schedules.
- 4.6.4 The Contractor shall ensure that all electrical and electronic apparatus is designed and constructed to operate without degradation of quality, performance or loss of function in the electromagnetic environment of the Project.
- 4.6.5 The Contractor shall meet the requirements of the BS EN50121 series of standards (Railway applications – Electromagnetic compatibility), 1996 edition, the UK's Electromagnetic Compatibility Regulation, the IEC 61000: Electromagnetic Compatibility or equivalent and other standards mentioned in the PS to be reviewed by the Employer's Engineer. EMC considerations shall be incorporated in the Contractor's procedures for product safety and design Verification.

4.7 Noise Level

- 4.7.1 Noise emanating from the UPS during operation shall not exceed 70 dBA for 160 KVA UPS and 65 dBA for 80KVA, 60 KVA & 45 KVA UPS at a distance of 1.5m from the enclosure, over a load range of 10% to 100% of the rated full load, as per the standards BS 4196: Part 6/ ISO 3746.

4.8 Environmental Conditions

- 4.8.1 All equipment shall be capable of withstanding any combination of the following external environmental conditions:
 - a) Operating ambient temperature: 0°C to 50°C
 - b) Relative humidity: Up to 95 %
 - c) Storage temperature: 0° C to 70°C
- 4.8.2 The equipment shall be designed to provide rated output at 40-degree.

4.9 Performance Parameters

- 4.9.1 The output of UPS system will be used by Signalling & Train Controls System, Telecommunication system and Automatic Fare Collection system, Platform Screen

Door/Gate& E&M and any break in power supply to these systems may lead to disruption in train services and/or other operational complexities. Therefore, it must be understood that Quality of UPS Output, Reliability and Availability requirements of the UPS system are of paramount importance.

- 4.9.2 Any break in power supply to Signalling & Train Control system, Telecommunication system and/or Automatic Fare Collection system, **Platform Screen Door /Gate & E&M** caused due to any failure of the UPS or associated sub-systems during the Defect Liability Period, may call for imposition of penalty of Rs. Two Lacs per such event on the Contractor.

5. TECHNICAL REQUIREMENTS

5.1 GENERAL

- 5.1.1 The UPS and their constituent parts shall comply with the relevant latest version of British Standards, European Standard (EN), International ~~Electromechanical~~ **Electrotechnical** Commission (IEC) standards, International Organization for Specification **Standardization** (ISO) Standards Research Designs and Standards Organization (RDSO), Indian Railways Specifications (IRS) Standards, Institute of Electrical and Electronics Engineers (IEEE) Standards, National Fire Protection Association (NFPA) Standards, Indian Standard (IS), Verband Deutscher Elektrotechniker (VDE) Standards as specified in clause 1.3.1.
- 5.1.2 Provision of suitable earth leakage detection both for DC and AC supplies and alarms shall be made individually at each location (station/depot etc.)
- 5.1.3 The UPS and the battery backup system for S&TC and Telecommunication system shall include 2-numbers 3-phase Output, N, PE (TN-S) UPS in online redundant configuration powered by Two separate Battery Banks (one for each UPS at each station and Depot, a stand by spare cell charger (for-1 to 6 UPS cells) and a spare cell bank with 6 numbers cells. The Battery Back-up time shall be tested for one hour (1 Hr) by each battery banks at full rating of associated UPS set.
- 5.1.4 The transformer insulation class shall be in accordance with heat they are likely to generate but in no case the insulation Class shall be worse than Class H insulation. The Contractor shall submit detailed calculations to substantiate his design.

5.2 Equipment Design of UPS (415V AC 3- phase)

- 5.2.1 The UPS shall include rectifier, battery, charger, inverter, solid-state bypass switch and Servo Controlled Voltage Stabilizer in bypass path. Failure of a single component shall not cause failure of the total UPS. The UPS shall be of the self-contained floor mounted, bottom entry, metal-clad type with front access.
- 5.2.2 The UPS shall be designed such that on restoration of the 415VAC 3 phase inputs supply source after its failure, the load shall be transferred on to this input source only after a delay and verification that there are no spikes and that the voltage has stabilized.
- 5.2.3 Two independent redundant 3-phase primary power input feeder cables will be made available inside the UPS Room to the UPS contractor by the E&M contractor.

5.2.4 Rectifier / charger

- 5.2.4.1 The input of the rectifier / charger shall be protected suitably.
- 5.2.4.2 The UPS shall have solid state PWM converter with IGBT rectifiers. The rectifier should have the following important features:
- Power Conversion
 - Battery Charging
 - Power Factor Improvement
 - Current Harmonic Reduction
 - Voltage Regulation
 - Transient Recovery
 - Automatic Synchronization
 - Over-current Protection

- i) Over Temperature Protection
 - j) Control Power Failure Protection
 - k) Short Circuit Protection
 - l) Current limiting function of battery charging to prevent the battery from being damaged.
- 5.2.4.3 The rectifier / battery charger shall provide a regulated DC output for the inverter and the battery. The rectifier/charger regulation shall ensure that the DC output voltage fluctuations are less than 1% of rated value, irrespective of load and mains supply voltage variations.
- 5.2.4.4 The rectifier / charger shall be equipped with a filter limiting the DC ripple voltage to a value less than 1% of the DC voltage.
- 5.2.4.5 The rectifier / charger shall have sufficient capacity to enable simultaneous supplying of full load to the inverter and recharging a fully discharged battery to more than 90% of rated value within 10 hours. Detailed calculation sheet for the rating of the rectifier arrived at considering UPS load requirement as well as battery charging requirement, shall be provided. Minimum charger current $0.1C$, C being Battery bank capacity in Ah.
- 5.2.4.6 A protective circuit shall be provided to prevent battery overcharge. After the rectifier / charger has recharged the battery to 100% capacity, the rectifier / charger shall float charge the battery.
- 5.2.4.7 Provision shall be made to prevent the battery from over-charging due to battery charger rectifier fault. An adjustable battery current limiting device shall limit the battery recharge current to the maximum value recommended by the battery manufacturer. The rectifier/charger shall be electronically current limited to protect the connections to the Inverter input and to prevent damage to the battery.
- 5.2.4.8 The battery low-volt cut-off shall be set to suit the battery manufacturer's recommendation to ensure the battery is not damaged by a deep discharge.
- 5.2.4.9 The rectifier/charger unit shall be equipped with an over-voltage protection device.
- 5.2.5 Battery System**
- 5.2.5.1 Storage battery banks shall be provided for the UPS with sufficient ampere-hour capacity to maintain the UPS output at the rated output capacity (for not less than the duration of 1 hour from each battery bank) at Depot/interlocked and secondary stations.
- 5.2.5.2 The overall capacity of the battery system shall be such as to meet the specified performance and technical requirements throughout the life of the battery. The battery cell shall be of 2V, heavy duty, rechargeable, valve regulated lead acid and maintenancefree type and the performance shall comply with IEC 60896 -21 & 22, BS EN 60896 -21 & 22 having an intended design life of at least 10 years. The battery shall be of reputed make and manufactured in India.
- 5.2.5.3 The battery bank shall be protected from internal fault by a circuit breaker. The UPS shall be automatically disconnected from the battery bank when the discharge limits of volts per cell are reached, or when signalled by other control functions. The battery circuit breaker installed at the UPS room should be complete with a metal enclosure conforming to an Ingress Protection Classification of ~~IP-54~~ **IP20 or better**. The battery shall be supplied with:

Input frequency of input feeder	50 Hz, +/- 5%
Input Power factor	> 0.95
Output voltage	415V AC Three phase
Output frequency	50 Hz, +/- 1% (except in bypass)
Voltage Regulation: Static	Better than +/-1%
Dynamic (0-100-0% Load Step)	Better than +/- 3%
Overload capacity of each UPS shall be	150 % for 60 seconds 125 % for 10 minutes 110 % for 60 minutes
a. Total Current Harmonic Distortion of each UPS at input (THDi)	<3 %
b. Total Voltage Harmonic distortion of each UPS output	<3% for 100% linear load <5% for 100% non-linear load
Crest factor of each UPS	≤ 3:1
Ambient Operating temperature	0-50 degree C (see clause 46.4.8.1)
Storage temperature	0 to + 70 degree C
Relative humidity (non-condensing)	Up to 95% at 40°C
Efficiency (AC-AC) of complete system (including input and output transformers)	Minimum 87% (From Half load to full load)
Inverter efficiency (including output transformer)	Minimum 0.93
Ripple content: With Battery Without Battery	< 1% < 2%
Battery Charging by each UPS in Boost Charging	C/10 rate
Battery Charging Characteristics and Charging Voltage	In accordance with VRLA battery specifications

#Source of power is from RSS/ASS which supplies Traction as well as Auxiliary loads of Metro operations.

5.2.10 The UPS shall comprise of the following controls and protection:

- a) Emergency power off
- b) Maintenance bypass isolator
- c) Battery isolator
- d) Low battery shut down and trip
- e) DC over-voltage

5.3.2 The UPS shall automatically analyse the condition of the battery string on a programmable period. It shall detect and enunciate the battery failure condition locally and remotely. The periodic test shall not impair the battery readiness in case of normal supply outage.

5.3.3 The Contractor shall provide the complete diagnostic software tools for monitoring and configuration in CD/DVD/any other laptop compatible electronics device in uneditable form and same shall be installed in Laptop for UPS Systems. The laptop should be industrial Grade/ industrial rugged with latest specifications as approved by the employer. The laptop configuration shall be minimum but not limited to 15.6-inch, Core i7, 8th generation, 16 GB RAM, windows 10 and 500 GB SSD.

5.4 Automatic Transfer Switch (ATS) and Isolation Transformer

5.4.1 An Automatic transfer device shall be provided for transfer of inputs supply from the primary to secondary source by automatic transfer switch, in case of failure of primary power source or vice versa, following the relevant international standards. Contractor shall also provide the details of various settings like DIP switch settings, priority of source, time delay setting etc. and demonstrate the same to DMRC representative.

5.4.2 The input cubicle shall comprise of:

- a) ATSC
- b) Isolation Transformer
- c) Metering and switchgear
- d) Surge and Transient Protection

5.4.3 Capacities of Automatic Changeover Switch and input Isolation Transformer for Secondary, Interlocking and Depot shall be suitable to deliver rated output. In any case, the capacities shall not be less than:

S.No.	Station/depot	UPS Rating (In KVA)	Transformer Rating (KVA)	ATS Switch Rating (A)
1.	Secondary Station	45	75	200
2.	Interlocking Station with 02 PF	60	96	230
3.	Khemnichak IXL Station with 04 PF	80	130	300
4.	Depot	160	250	400

5.4.4 Technical Specifications of Input Isolation Transformer-Delta-Star:

Input voltage	415 VAC, 3 Phase, 3/4 wires.
Input voltage tolerance	+10%, -20%
Transformer rating	75/96/130/250 KVA (see 46-5.4.3 above)
Input frequency	50 Hz +/- 5%
Input switch gear	MCCBs, Two nos. for two sources
Output voltage	415/240V, 3 Phase, 4W

Transformer Bypass Arrangement	Shall be provided to take care of Transformer failures
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5.4.5 Metering and Switch gears:

Output Switch gears for UPS-1, UPS-2, SCVS, Spare Cell Charger, SPARE	MCCBs (4 pole) of suitable rating
Metering	AC Voltmeter - To monitor Input voltage RY, BR, YB voltage through selector switch. AC Ammeter - To monitor Input current through selector switch. Indicators for the feeders and output

5.4.6 Surge and Transient Protection (can also be an external device): -Class 'B' as per IEEE C 62.41 & C 62.45.

5.4.7 Technical Specifications of Output Isolation Transformer for power supply to E&M

Environmental	
Operating temperature	0-40C
Relative humidity	95% RH
Storage Temperature	500C 50 °C
Mechanical characteristics	
Construction details	Box type enclosure with 1.6mm Thickness Provided
Cable Entry	Bottom
Protection level	IP-20
Electrical characteristics	
Standards Applicable	As per applicable clause of IS-2026 Part I & II -2010 & 2011 or latest, IS 11171
Input voltage	415 VAC, 3 Phase, 3/4 wires. DELTA
Input voltage tolerance	+10%, -15%
Shielding	No
Input frequency	50 Hz, +/- 5%
Class of Insulation	Class H
Vector Group	DYn11
K Rating	K1
Manual off loads taps	395 V & 435 V on Primary

- i) I_t^2 characteristic: suitable for load and circuit being protected,
 - j) Degree of protection: IP-20 for MCBs
 - k) Reference ambient temperature: 50°C.
 - l) MCBs shall have minimum power loss (Watts) per pole as per the IEC and should be proven by published value by manufacturer.
- 5.7.3 The load handling contacts shall be silver/tungsten and the contacts and operating mechanism shall be designed so as to give a wiping action both at make and break. The breaker operating mechanism shall be of trip-free type. The breaker operating dolly shall be clearly indicated for the "ON" and "OFF" positions. It should be of Quick make and Quick break type.
- 5.7.4 Circuit protection against overload and short-circuit conditions shall be provided by means of thermal-magnetic device. Double-pole (DP), triple-pole (TP) and four pole (FP) MCBs shall be integral units and interlocked internally so that an over current through any pole shall trip all the poles of the MCB simultaneously. An assembly of two or three or four single-pole units mechanically strapped together is not acceptable.
- 5.7.5 Housing shall be heat resistant and having high impact strength. All DP, TP and FP circuit breaker shall have a common trip bar and should be mechanically coupled through a pin. It shall have an electrical endurance of the order of 10000-operation cycle for current rating of up to 50A.

5.8 Distribution Boards (MCB Boards)

- 5.8.1 Distribution boards for miniature circuit breakers shall be of sheet steel construction with a minimum thickness of 1.6 mm, suitably braced to form a rigid structure. Exterior corners and edges shall be rounded to give a smooth over all appearance. Hinged swing doors shall be fitted with gaskets and shall be easily Removable to simplify installation.
- 5.8.2 IP ratings for distribution boards shall be ~~IP54~~ **IP20 or better**.
- 5.8.3 Each distribution board shall be arranged for top and bottom cable entry and shall be provided with ample cable termination plates and chambers to enable cables to be neatly glanded with tails grouped and terminated on to appropriate internal terminations.
- 5.8.4 Distribution boards shall not be wall mounted and shall, where specified, incorporate double pole or triple pole or four pole all insulated switches as appropriate, which shall be front of panel operated with an "ON/OFF" indicator and capable of being padlocked in the "OFF" position. Distribution boards shall incorporate combinations of single pole, double pole, triple pole and four pole miniature circuit-breakers (MCBs)/ (MCCBs) as specified.
- 5.8.5 Each bank of MCBs shall be clearly identified with its appropriate phase colours/code, and the mounting frame work for the banks of MCBs shall be easily removable to simplify installation. Adequate phase barriers and shields shall be fitted to ensure that after installation and wiring, all bare terminals and wires are covered to prevent accidental contact with live conductors during the normal procedure of resetting MCBs.
- 5.8.6 Each distribution board shall be supplied complete with a permanent circuit identification chart, preferably mounted with in the front door. This chart shall be permanently and legibly filled in as circuits are completed, including the circuit

description, the MCB rating and the identification of upstream source of the distribution board.

- 5.8.7 Each distribution board shall be clearly labelled indicating its service and all 3- phase distribution boards shall be fitted with white labels red engraved "DANGER-415 VOLTS"
- 5.8.8 In the top and bottom, of each distribution board a 32 mm clear hole in addition to other requirements shall be provided. These spare holes shall be fitted with 32mm stopping plugs and locknuts.
- 5.8.9 Spare MCBs shall be provided on the basis of one per four ways or part there off or every distribution board ensuring that spares are provided in numbers and ratings proportional to the numbers and ratings in the installation.
- 5.8.10 All bus bars shall be of hard drawn copper having ratings as specified complying to relevant clauses given in section1.3, and shall be electro-tinned. Neutral bus bars shall be of the same cross-sectional area as the phase bus bars and shall have adequate number of terminals for all outgoing circuits including spare ways.
- 5.8.11 The configuration of the bus bars, bus bars supports and bus bar mounting arrangement shall be rated at 415V.It shall be type tested and certified to a short-time withstanding current, which is not less than10 kA for 1 second at voltage of 415 V.
- 5.8.12 Multi-terminal connectors shall be provided with in the distribution board for connection of protective conductors of all out going circuits including spare ways.

5.9 Moulded Case Circuit Breakers Boards (MCCB Boards)

- 5.9.1 MCCB boards shall be factory-built assemblies for indoor use and fully comply with all the requirements of IEC61439 and IEC 60947. All MCCB boards shall be capable of withstanding through fault of not less than the MCCB rated fault-breaking capacity as specified without sustaining permanent damage.
- 5.9.2 MCCB boards shall be totally enclosed type and suitable for floor/surface mounting. The cases and doors shall be manufactured from CRCA sheet steel finished with high quality powder coated with colour to be decided. The doors shall be casketed and fitted with ball catch lock or equal and approved, and the complete enclosure shall be in accordance with IP54 **IP20 or better** to IEC60529 or EN60529.
- 5.9.3 The factory-built assemblies shall comprise tinned copper bus bar(s) as specified in clause 46-5.8.10 with rating as specified, multi-terminal neutral, neutral link and earth bars of adequate sizes.
- 5.9.4 All wirings, bus bars, etc, within the board shall be adequately shrouded and a flame-retardant insulating shield of 2.0 mm thickness shall be provided to completely screen the live parts and wiring when the front panel is opened. Only the MCCB operating toggle and insulated surround shall project through the shield and the front panel. Insulating barriers shall be fixed between phases and between phase and neutral.
- 5.9.5 The sequence of terminals shall be such that the neutral terminals for the connection of each outgoing circuit are arranged in the same order as that of the phase terminals.
- 5.9.6 A multi-terminal protective conductor shall be provided, with one terminal for each MCCB way.
- 5.9.7 An earthing terminal shall be provided to enable the enclosure to be earthed. The earthing terminal shall be suitable for internal or external connection.

- 5.9.8 MCCB boards shall be provided with vertical triple-pole and neutral copper bus bar of rating not less than that of the supply side of protective device subject to a minimum of 250A. The configuration of the bus bars, bus bar supports and bus bar mounting arrangement shall be type tested to a short-time withstanding current of not less than 50kA for 1 second at a voltage of 415 V.
- 5.9.9 All MCCB boards shall be clearly labelled, and marked with phase identification. Inside each board door, a circuit record card shall be provided. The card shall be renewable and protected by transparent material for recording the title, cable size and actual current rating of each outgoing circuit, the rated current of the MCCB board, the identification of the upstream source, the total number of points served by each MCCB circuit and the area served.
- 5.9.10 Spare MCCBs shall be provided on the basis of one per four ways or part thereof for every distribution board ensuring that spares are provided in numbers and ratings proportional to the numbers and ratings in the installation.

5.10 Not Used

5.10.1 Not used

5.11 Servo Controlled Voltage Stabilizers

5.11.1 Not used

5.11.2 Three phase 60KVA SCVS as per IS spec.No. IS: 9815-1994 or the latest shall be provided along with all the 60 KVA UPS for bypass modes.

5.11.3 Three phase 45KVA SCVS as per IS spec.No.IS:9815-1994 or the latest shall be provided along with all the 45 KVA UPS for bypass modes.

5.11.4 Three phase 160 KVA SCVS as per IS spec.No.IS:9815-1994 or the latest shall be provided along with all the 160 KVA UPS for bypass modes.

5.11.5 Three phase 80KVA SCVS as per IS spec.No.IS:9815-1994 or the latest shall be provided along with all the 80 KVA UPS for bypass modes.

5.12 Electrical Distribution

5.12.1 UPS shall work on 3-phase AC 415 V input supply source. The input source shall be from two different source feeders supported with a Diesel Generator to take full load of the UPS. Two-feeder lines one normal and the other stand by shall be terminated in the UPS room and contractor shall provide the automatic changeover switches. Distribution from this changeover switch shall be the responsibility of the **S&T UPS(PS-05)** contractor.

5.12.2 The output of the UPS system shall be terminated in Distribution Boards. The arrangement MCCB/MCB in ACDB (AC distribution board) should be as follows:

S. No	Systems	Types	Details	Remarks
1.	Signalling	MCCB	63A,4P,10KA, ~~Type-G~~	
2.	Telecom	MCCB	63A, 4P,25KA, ~~Type-G~~	
3.	AFC	MCCB	63A,4P,10KA, ~~Type-D~~	
4.	PSD/PSG	MCCB	63A,4P,10KA, ~~Type-D~~	

5.	E&M Emergency supply	MCCB	32A, 4P, 10KA, ~~Type-G~~	
6.	Spare-1	MCCB	63A,4P,10KA, ~~Type-G~~	For Signalling System.
7.	Spare-2	MCCB	63A, 4P,25KA, ~~Type-G~~	For Telecom System.
8.	Spare-3	MCCB	63A,4P,10KA, ~~Type-D~~	For AFC & PSD System.
9.	Spare-4	MCCB	32A, 4P, 10KA, ~~Type-G~~	For E&M System.
The above indicative arrangement would be uniform at all stations.				

S. No	Systems	Types	Details	Remarks
1.	Signalling Depot	MCCB	200A,4P,50KA, ~~Type-G~~	
2.	Signalling OCC	MCCB	200A,4P,50KA, ~~Type-G~~	
3.	Telecom Depot	MCCB	200A,4P,50KA, ~~Type-G~~	
4.	Telecom OCC	MCCB	200A,4P,50KA, ~~Type-G~~	
5.	110V DC Rectifier	MCCB	32A, 4P,10KA, ~~Type-G~~	For IRS Point Machine (if used)
6..	AFC System	MCCB	63A,4P,50KA, ~~Type-D~~	
7.	Signalling Lab	MCCB	63A,4P,10KA, ~~Type-G~~	
8.	Telecom Lab	MCCB	63A, 4P,25KA, ~~Type-G~~	
9.	E&M	MCCB	63A, 4P,10KA, ~~Type-G~~	
10.	Spare-1	MCCB	200A,4P,50KA, ~~Type-G~~	For Signalling System.
11.	Spare-2	MCCB	200A,4P,50KA, ~~Type-G~~	For Telecom System.
12.	Spare-3	MCCB	32A, 4P,10KA, ~~Type-G~~	110V DC Rectifier (IRS point Machine).
13.	Spare-4	MCCB	63A,4P,50KA, ~~Type-D~~	For AFC System.
14.	Spare-5	MCCB	63A, 4P,10KA, ~~Type-G~~	For E&M System
The above indicative arrangement would be for Depot.				

A separate Isolation Transformer of 25/52 KVA, 3 Phase input and 3 Phase output shall also be provided on the output feeder of MCB (for emergency load of Electrical department) of the UPS ACDB in a separate cubicle in the UPS room itself. The cable connectivity of this Isolation Transformer will be part of this contract.

6. MATERIALS AND EQUIPMENT

6.1 Materials

- 6.1.1 Materials for inclusion in the Permanent Works shall be new unless ~~so the wise~~ **otherwise** stated in the Contractor **Contract** having been reviewed without objection by the Employer's Engineer.
- 6.1.2 Certificate softest by manufacturers, which are submitted to the Employer's Engineer, shall relate to the material delivered to the Site. Certified true copies of certificates may be submitted if the original certificates cannot be obtained from the manufacturer. A letter from the supplier stating that the certificates relate to the material delivered to the Site shall be submitted with the certificates.
- 6.1.3 The Employer's Engineer may reject any materials and goods, which in his opinion are inferior to the samples previously reviewed, and the Contractor shall promptly remove such materials and goods from the Site.
- 6.1.4 The Contractor shall obtain certificates for each batch of goods and materials incorporated into the Permanent Works. Each certificate shall certify that the materials comply with the requirements of the Contract and shall include all reports of inspections and /or tests carried out at the place of manufacture.

6.2 Mounting and Enclosure

- 6.2.1 UPS and other cabinets shall be free standing; floor mounted and has a minimum degree of protection of IP-20 in accordance with BS EN IEC 60947-1 and BS EN 60529/IEC60529 and conforming to the international standards of ISO9001. The control panels and switch gear cubicles shall generally comply with IEC61439& IEC 60947for standards of construction, safety and technical characteristics/tests.
- 6.2.2 All parts used in mounting and enclosure shall be standard manufactured models.
- 6.2.3 Cabinets shall be constructed with material of thickness as per manufactures standard design and suitably braced to form a rigid structure. Full substantiation of mechanical strength shall be provided for approval to demonstrate that the cabinet is free from distortion when equipment is mounted and support on floor. All metallic cabinets shall have treatment for corrosion protection.
- 6.2.4 The dimensions of all cabinets shall be standardized as far as possible and without occupying excessive floor spacing.
- 6.2.5 The equipment shall be constructed in modular units, which shall be installed in metal enclosures designed for floor mounting. Each module shall be constructed on a rigid base frame. Sub- assemblies and components shall be mounted on pull out and/or swing out trays. Cable connections to the cable ladder and trays shall be of sufficient length to allow for easy access to all components.
- 6.2.6 Cabinets shall be of the free-standing floor mounting cubicle type. They shall provide easy access to all components for maintenance and replacement.
- 6.2.7 The UPS and other cabinets shall have a clear area of at least 900mm in front to allow the doors to be opened fully and maintenance to take place. Doors shall be fitted with lockable handles or other approved means ~~off a stening~~ **of fastening** and shall be provided with locking bars and guides to prevent distortion. Cabinet shall be arranged so that access doors or panels into compartment can only be opened when the locking device is in the unlocked position. Two sets of keys shall be provided for each lock.
- 6.2.8 Means shall be provided for isolating individual units of equipment. Monitoring terminals or test jack points shall be provided for maintenance and testing.

7. CABLES

7.1 General

- 7.1.1 The specifications mentioned in paragraph 7.1 to 7.3 shall apply to all cables supplied or used under this contract, except those used within the equipment.
- 7.1.2 All cables shall comply with the latest version of the relevant requirements of IEC standard, ASTM standards, ITU recommendations or equivalent international standards.
- 7.1.3 The Employer's Engineer shall have free access to the works of the manufacturer and to be present at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacturing of the cables at any stage of manufacture. He shall have the right to reject in whole or part of any work or material that does not conform to the terms of this specification or and may order the same to be removed/ replaced or altered at the expense of the manufacturer.
- 7.1.4 The Contractor shall satisfy the Employer's Engineer by producing certificate from a recognized testing laboratory or otherwise that the materials used and the cable itself is of the highest possible standards and complies with all relevant specifications. In case of no relevant test certificates being available tests shall be carried out by the Contractor (manufacturer) as those laid down with relevant specification but this shall not preclude any test desired by the Employer's Engineer to determine the quality of the cable.
- 7.1.5 Test results and certificates shall be submitted for review by the Employer's Engineer.
- 7.1.6 Spare cables shall be provided, wherever there is no redundancy. All cable cores shall be terminated including all spare conductors. Each cable core shall be uniquely numbered and identified with a label giving details of the circuit carried.

7.2 Fire and Smoke Performance Requirements

- 7.2.1 The external cables shall be manufactured from fire retardant/ resistant low smoke, zero halogen materials.

7.2.2 Flammability

- 7.2.2.1 The bedding and over sheath of the cable shall have a minimum oxygen index of 29 when tested in accordance with ASTM D2863/BS 2782: Part 1: Method 141.
- 7.2.2.2 The temperature index of the bedding and over sheath of the cable shall not be less than 2350C **235 °C** when tested in accordance with ASTM D2863/ BS 2782: Pat 1: Method 143.

7.2.3 Fire Resistance

- 7.2.3.1 All cables shall be flame retardant and shall comply with the requirements of IEC 60331- 1 and for bunched cables of IEC 60332-3-21 and for flame propagating criteria of US IEEE-383 with a minimum test short circuit time of five minutes.

7.2.4 Smoke Emission

- 7.2.4.1 The value of the smoke generated (Ao) of the low voltage power cables shall meet the requirements of IEC 61034-2.
- 7.2.4.2 All cable materials shall meet requirements of the US National Bureau of Standard Smoke Chamber Test, used to evaluate plaque materials of constant thickness. (E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials).

8. INTERFACE

The requirements specified here in a herein are by no means exhaustive main and it remains the responsibility of Interfacing Contractors to develop and execute interface plans during execution of the work to ensure that:

- a) All interface issues between the two contracts are satisfactorily resolved.
- b) Supply, installation and testing of equipment and software are fully coordinated.
- c) All equipment supplied in the contracts are fully compatible with each other.

8.1 Interfaces with Station Detail Design Consultants

- 8.1.1 Contractor shall interface with Station detail design consultants to confirm basic room sizes; floor load bearing capacity and room finishes; air conditioning requirements, heat load of equipment's, trench, duct and cut-out requirement, lighting and ventilation requirements and power socket requirements of UPS room.
- 8.1.2 Contractor shall interface with Station detail design contractors and/or E&M contractors to get furnished normal and standby power supply changeover installations.
- 8.1.3 All necessary drawings and data as required shall be uploaded by the contractor on BIM 360 construction management software of DMRC (Please refer Appendix A20 of this PS).

8.2 Interface with Civil

- 8.2.1 The Power Supply Contractor shall co-ordinate with the Designated Contractors for the access of UPS room with suitable conditions to install the Power supply equipment's and clearance of path in station building for carrying the material.
- 8.2.2 The Power Supply Contractor shall review the Combined Services Drawings (CSD) and ensure that all information required by him is incorporated in these drawings. The Contractor shall review the details of these works and notify the designated contractors and Employer of any amendments required or omissions their in.
- 8.2.3 Contractor shall interface and Coordinate with Civil contractor in accordance with detailed Requirement given in Appendix A1 of this PS.

8.3 Interface with Telecommunication contractors

- 8.3.1 The power supply contractor shall interface with Telecommunication contractors for their requirements of power supply and communication channel from TERs to OCC and BCC.
- 8.3.2 The power supply contractor shall interface with Designated Telecommunication contractors for implementing centralized clock synchronization. Each station shall have processing unit to run NTP/other protocol.
- 8.3.3 Contractor shall interface and Coordinate with Telecommunication system contractors in Accordance with detailed requirement given in Appendix A4, A8 & A9 of this PS.

8.4 Interface with Signalling & Train Control Contractors

- 8.4.1 The power supply contractor shall interface with Signalling & Train Control contractors for his requirements of power supply and for providing connections (potential free contacts) for power supply alarms.
- 8.4.2 Contractor shall interface and Coordinate with Signalling system contractor in accordance with detailed requirement given in Appendix A4 of this PS.

8.5 Interfaces with Automatic Fare Collection Contractors

- 8.5.1 The power supply contractor shall interface with AFC contractors for his requirements of power supply and for providing connections for power supply alarms. Contractor shall interface and Coordinate with AFC system contractor in accordance with detailed requirement given in Appendix A4 of this PS.

8.6 Interface with Station E&M Contractors

- 8.6.1 The Contractor shall interface with Electrical Contractors for three-phase AC input feeder supply from two sources and Earth bus bar in UPS room. The contractor shall coordinate that feeder supply is terminated in a junction box in UPS room.
- 8.6.2 The Contractor shall ensure that UPS is synchronized with Diesel Generator supply.
- 8.6.3 The contractor shall interface with E&M contractors for joint earth resistance test at main earth terminal installed in UPS Room.
- 8.6.4 The contractor shall interface with E&M contractors for providing the Electrical Power to E&M deptt. Through 25/52 KVA output Isolation Transformer (downstream) at all elevated stations. The installation, testing and commissioning of 25/52 KVA output isolation transformer (downstream) will be under the scope of S&T **UPS(PS-05)** Contractor. The interconnection cabling from E&M MCB in AC distribution board (as per clause 5.12.2) to input feeder of 25/52 KVA Isolation Transformer (downstream) shall be under the scope of S&T **UPS(PS-05)** contractor. E&M Contractor will further lay cables from output terminal of Isolation Transformer (downstream) as per their requirement.
- 8.6.5 The contractor shall interface and Coordinate with E&M system contractor in accordance with detailed requirement given in Appendix A2 of this PS.

8.7 Interface with PSD Contractor

- 8.7.1 The power supply contractor shall interface with PSD contractors for their requirements of power supply and for providing connections for power supply alarms. Contractor shall interface and Coordinate with PSD system contractor in accordance with requirement given in Appendix A4 of this PS.

8.8 Interface with Central Telecommunication Fault reporting system (CTFRS).

- 8.8.1 The contractor shall interface and Coordinate with CTFRS system contractor in accordance with requirement given in Appendix A6 of this PS.

8.9 Integrated Project Monitoring System[System for Tracking and Monitoring Projects (STAMP)]

- 8.9.1 The Project Monitoring of various corridors of ~~DMRC~~ **PMRC** consisting of multiple contract packages pertaining to Civil, Track, E&M, Traction, S&T and Rolling Stock shall be done through Integrated Project Monitoring software (STAMP). For more details, contractor may refer Appendix A20 of this PS.

8.10 Interface Standards

- 8.10.1** For detailed information, contractor may refer Appendix A18 of this PS.

10.3 Installation Programme

10.3.1 The Contractor shall submit Installation Programme for review by the Employer's Engineer.

10.3.2 The Contractor shall co-ordinate with relevant Project Contractors s storage **to agree** the date of access to the physical are as to carry out installation activities.

Employer's Engineer, and a programme showing the dates for testing and for submission of each test procedure.

- 11.4.4 Test procedures shall be carefully planned to ensure that the work can be executed in the time available. If the available time is restricted, this planning shall include contingency plans to be implemented if testing proceeds slower than anticipated or if defects are discovered that necessitate rectification and subsequent repeat testing, etc.
- 11.4.5 The Contractor shall submit to the Employer's Engineer no later than one months before the commencement of the commissioning work, 3 copies of its proposed Partial Acceptance Test check list. The check list shall be appropriately sub-divided to make provision for the various parts of the systems and equipment covered by the Contract and shall cover all tests (mechanical, electrical or otherwise), positive identification of equipment, assemblies and sub-assemblies by serial number, drawing and specification reference numbers (and issue reference) and any other data to be certified by the Employer's Engineer during the course of commissioning.
- 11.4.6 The Site Acceptance Tests shall include but not be limited to the following tests:
- a) UPS energizing one by one
 - i) Soft start features of charger/ rectifier, if applicable
 - ii) AC input failure and return test
 - iii) Parallel Redundancy test
 - iv) Current sharing test Paralleling of UPS-1 & UPS-2 inverter
 - b) Powering up of SCVS
 - c) Connections of battery bank
 - d) Switch over between SCVS, Inverter and Battery
 - e) Tests of Automatic Transfer Switch
 - f) Testing of Bypass and Maintenance Bypass
 - g) Time and synchronisation with master clock
 - h) Battery Capacity Tests
 - i) Battery Bank cross redundancy test
 - j) Synchronization with Diesel Generator
 - k) Display of alarms and indications
 - l) Tests of voltage free contracts
 - m) Remote monitoring at respective OCC/BCC
 - n) Joint tests with Signalling & Train Control, Telecommunication, AFC, PSD/PG contractor and E&M contractor.
 - o) **Paralleling of UPS-1 & UPS-2 inverter.**
 - p) **Loading of system.**
- 11.4.7 Where performance across interfaces to Project Contractors or to other parties is required to be verified during the Partial Acceptance Tests, the Contractor shall include a list of Project Contractors and the interface test procedures agreed with the relevant Project Contractors in the Partial Acceptance Tests procedures for the relevant Subsystem.
- 11.4.8 The functional, electrical and timing performances of the system shall be verified against the requirements and relevant international standards.

11.6.1.1 In relation to all Quality Control Points and Quality Hold Points involving inspection and/or testing by the Contractor, the Contractor shall give the Employer's Engineer notice of when the relevant work will be inspected and/or tested. The period of notice shall be such period as in the opinion of the Employer's Engineer is reasonable and notified to the Contractor. In the absence of any such statement or notice, a reasonable period of notice shall be given by the Contractor provided that:

- a) In the case of on-Site work, such notice shall be given not less than 72 hours of normal working time before the work is to be inspected and/or tested;
- b) In the case of work carried out off-Site in Patna, such notice shall be given not less than 5 days before the work is to be inspected and/or tested; and
- c) In the case of work carried out outside Patna, such notice shall be given not less than 14 working days before the work is to be inspected and/or tested.

11.6.1.2 In relation to all inspection and/or testing notified by the Contractor, the Employer's Engineer may elect to witness such inspections and/or tests but the Contractor may proceed with the inspections and/or tests notwithstanding the absence of the Employer's Engineer or of any response to the said notice.

11.6.1.3 If the Contractor is in any doubt whether inspection and/or testing by the Employer's Engineer is required as a Quality Hold Point, the Contractor shall request that the Employer's Engineer clarifies his requirements prior to submitting the relevant inspection and testing plan for review, and in any event not later than 30 days.

11.6.2 Timing for Inspection and/or Test by the Employer's Engineer.

11.6.2.1 The Contractor shall allow the Employer's Engineer as much time as is able to carry out any inspection and/or testing and to assess the result of any inspection and/or test before proceeding with the Works.

11.6.2.2 Unless the Employer's Engineer's prior review without objection has been obtained, all inspections and/or tests to be carried out or witnessed by the Employer's Engineer shall be carried out between 0800 and 1800 hours.

11.6.3 Failure to Notify the Employer's Engineer.

11.6.4 Employer's Engineer may reject the test and test results in question, and require the test to be repeated in the event of any failure by the Contractor to notify the Employer's Engineer in accordance with clause 46-11.8.

11.7 Failures

11.7.1 The Contractor shall correct all faults found during testing, and shall arrange for the relevant tests to be repeated. The relevant tests shall only be repeated when the fault has been remedied and the equipment demonstrated to function correctly.

11.7.2 Where remedial measures involve significant modifications that might, in the Employer's Engineer's opinion, affect the validity of earlier tests, the Contractor shall repeat the earlier tests and obtain results satisfactory to the Employer's Engineer before repeating the test in which the fault was first identified.

11.7.3 The Employer's Engineer shall have the right to order the repeat or abandonment of any test in the event that results demonstrate that the equipment is significantly non-compliant with the Contract.

11.7.4 The Employer's Engineer shall have the right to suspend any test in the event that errors or failures have become unacceptable. The Employer's Engineer shall also have the right to suspend any test if a fault was detected by the Contractor but not reported

to the Employer's Engineer within 24 hours of the detection. In this event, the suspension shall remain in effect until reporting has been brought up to date to the satisfaction of the Employer's Engineer.

- 11.7.5 The Contractor shall conduct preventive maintenance periodically till DLP **ROD** and shall be responsible for proper maintenance and functioning of complete UPS system.

11.8 Repeat Tests

- 11.8.1 The Contractor shall correct and re-test every fault detected during the tests.
- 11.8.2 If the test results in a failure of the item under test the provisions of GCC shall apply.
- 11.8.3 For each hardware failure that occurs at any stage of testing, the Contractor shall investigate the failure and prepare a report on its cause(s) and design implications, if any, resulting from such failure.

11.9 Software Support

11.9.1 General

- 11.9.1.1 The Contractor shall provide full support to the Employer or Engineer for all programs provided by the contractor under the Contract.
- 11.9.1.2 All changes, bug fixes, updates, modifications, amendments, new versions shall not result in any non-conformance with the specification.
- 11.9.1.3 The Contractor shall submit all new versions to the Employer's Engineer for review.
- 11.9.1.4 The new versions of software shall not degrade the operation of the system.
- 11.9.1.5 The Contractor shall provide all tools equipment, manuals and training necessary for the Employer / Engineer to maintain and reconfigure all the software provided under the Contract.

13. CONTRACT SPARES

13.1 Unit Spares

- 13.1.1 The Contractor shall submit a list of Contractual Spares and supply unit spares listed in items B1 to B31 of Annexure 4 I - Schedule Supply & Services'.
- 13.1.2 Apart from the unit spares mentioned in clause 13.1 above, the Contractor shall submit detailed list of spares, together with the price for each item of spares. This list shall exclude unit spares listed in items B1 to B31 but include all other spares including cubicles, racks, modules, mother boards, cards, cables, connectors etc, to the smallest Line Replacement Unit for each unit.
- 13.1.3 Contractor shall mention the Part number, Drawing number, Source of Supply Second Source of Supply, price at Patna to the Employer and the probable delivery period.
- 13.1.4 The Spare Parts to be supplied under the Contract shall be manufactured at the same time as the Permanent Works. All Spare Parts shall be manufactured, works tested and inspected in accordance with the relevant quality system, suitably packed and labelled.
- 13.1.5 Spare Parts shall be fully interchangeable with their corresponding part. All Spare Parts shall be configured to the latest revision during the Defects Liability Period.
- 13.1.6 An adequate supply of Spare Parts shall be available throughout the design/service life of the Works, from the date of the Employer's Taking Over of the Works. The Contractor shall notify the Employer at least 6 months prior to deleting any item used in the Works from general availability.
- 13.1.7 The Contractor shall supply and deliver the Contractual Spares six months before completion of Defects Liability Period of first section.
- 13.1.8 The Contractor shall ensure that all spares are correctly calibrated, tested and labelled prior to their delivery. Test certificates for each equipment shall be submitted to the Employer's Engineer.

14. DEFECT LIABILITY PERIOD (DLP)

14.1 Support during Defects Liability Period (DLP)

- 14.1.1 Contractor shall provide comprehensive DLP support for items supplied by him. Please refer Schedule- E of Annexure-I for DLP support.
- 14.1.2 DLP shall be on section-by-section basis, which shall start from date of Commissioning of the UPS system for a section and shall continue for Three years beyond the Revenue Operation Date of each section.
- 14.1.3 During the Defects Liability Period, the Contractor shall provide all maintenance support to the Employer as per system requirement. For this purpose, the contractor will provide competent staff during the complete DLP period. CVs of all the staff shall be submitted to Employer's Engineer for prior approval before deployment for DLP. In case Engineer notifies the contractor for replacement of any staff before or during the DLP, suitable replacement for the same is to be provided by the contractor. Normal day-to-day maintenance will be carried out by Employer's personnel.
- 14.1.4 The contractor shall provide the DLP support either through OEM or OEM certified vendors only. In case the contractor is not the OEM, contractor shall submit the credentials of OEM certified vendors to Employer's Engineer for approval at least three months before expected ROD of first section.
- 14.1.5 The contractor shall submit to the Engineer for review, the details of manpower proposed to be deployed by him during DLP at least 3 months before expected ROD. Engineer at his discretion may instruct the contractor for any change in terms of the personnel deployed, in terms of number, experience, expertise etc which shall be binding on the contractor to comply. Nothing extra shall be paid on this account.
- 14.1.6 Deployment of minimum manpower by the contractor shall in no way absolve the contractor from fulfilling any obligations under the contract. Any additional manpower required shall be deployed by the contractor without any extra cost to DMRC.
- 14.1.7 Contractor shall be provided with a reasonable office/space within PMRC premises during DLP as far as possible. Such space is to be furnished by the contractor at his own cost. However, if DMRC fails to provide such office then contractor has to arrange for office at his own cost. Nothing shall be payable on this account.
- 14.1.8 All contractor staff shall report to ~~DMRC~~ **PMRC** O&M department on daily basis. An attendance register shall be kept in the custody of O&M department as per format provided in Annexure-IX of PS.
- 14.1.9 The contractor shall get all attendance register printed in hard bound booklets with self-inking sheets in Triplicate copies.
- 14.1.10 Original copy shall be retained by O&M department, one copy shall be submitted to Project department at the time of half yearly billing and one copy shall be retained by the contractor for his record.
- 14.1.11 No half yearly payment shall be made to the contractor until jointly signed attendance register by O&M department are submitted. In addition, jointly signed certificate with O&M department for the successful completion/resolution of all DLP issues are also required to be submitted by the contractor for raising invoices.
- 14.1.12 In case the contractor fails to deploy DLP manpower as approved by the Engineer on a certain number of days during the DLP Period, such days would not be counted for ascertaining the DLP Period and DLP man-days shall get extended by

double the number of such man- days. For Example: If 5 nos out of 10 nos of contractor's approved DLP manpower is not deployed for 30 days, then, DLP shall be extended by 300 (5*30*2) man-days i.e 30 (300/10) days.

- 14.1.13 Not Used.
- 14.1.14 The Contractor shall thoroughly investigate all the defects during DLP and take proper steps to avoid their occurrence.
- 14.1.15 List of all the Contractor's staff responsible for attending the failure during DLP shall be displayed at all the stations with their address and contact numbers. A copy of which shall also be submitted to the Employer.
- 14.1.16 Contractor shall maintain a round the clock centralized location where all the failures shall be reported including on Holidays/ Sundays. A complaint number shall be given as soon as the failure is reported
- 14.1.17 The contractor shall not be permitted to remove any working/healthy equipment/component/sub-systems/systems from any station/depot etc for any reason whatsoever without specific approval in writing from DMRC's **PMRCs** O&M Department or Engineer's authorized representative.
- 14.1.18 The Contractor shall attend to the failures reported by the Employer or his representative. In case a failure cannot be attended at site, the Contractor shall arrange to remove the equipment from site and restore later upon rectification of the failure. In the meanwhile, the Contractor shall arrange temporary replacement before removing the defective equipment.
- 14.1.19 The Contractor shall replace the components which may be necessary as a result of removal of the wear and tear during the period of DLP.
- 14.1.20 The Contractor's Engineer shall check all the system once a month for its perfect working and record the observations in the log book maintained by the Employer with his signature in addition to day to day attending of faults when reported by Employer's Representative.
- 14.1.21 RAM demonstration testing shall be done by the contractor as stated in clause 4.1.5 of PS.

ANNEXURE-I - SCHEDULE OF SUPPLY & SERVICES

Schedule of Supply & Services of UPS System for Patna Metro Stations/Depots in accordance with the specifications:

SCHEDULE-A (SUPPLY)						
Sr. No.	Description	Quantity		Unit	Unit Rate (In INR)	Total Price (In INR)
		Non-JICA	JICA			
1.	160 KVA UPS for Depots complete in online redundant configuration <u>along</u> with isolation transformer and ATS cubicle, Battery Sharing cubicle/Battery circuit breaker, SCVS. <u>Remote Monitoring equipment with accessories.</u>	1	0	Nos.		
2.	80 KVA UPS for Khemnichak IXL Station complete in online redundant configuration <u>along</u> with Isolation transformer and ATS cubicle, Battery Sharing cubicle/Battery circuit breaker, SCVS. <u>Remote Monitoring equipment with accessories.</u>	1	0	Nos.		
3.	60 KVA UPS for Interlocking station complete in online redundant configuration along with Isolation transformer and ATS cubicle, Battery Sharing cubicle/Battery circuit breaker, SCVS. <u>Remote Monitoring equipment with accessories.</u>	2	0	Nos.		
4.	45 KVA UPS for Secondary station complete in online redundant configuration along with Isolation transformer and ATS cubicle, Battery Sharing cubicle/Battery circuit breaker, SCVS. <u>Remote Monitoring equipment with accessories</u>	2	0	Nos.		
5.	Supply of VRLA maintenance free Battery Banks (Set of two banks at each site) for 160 KVA UPS systems each having 1 hour back up time at full load with interconnecting cables (FS), racks, battery breaker and standard accessories Battery. <u>With the facility of battery bank cross redundancy through manually operated Battery breakers/Isolators &</u> Provision of six (6) No. of spares cells along with separate charger, cabinet etc to be done for each battery bank.	1	0	Sets		
6.	Supply of VRLA maintenance free	1	0	Sets		

	Battery Banks (Set of two banks at each site) for 80 KVA UPS systems each having 1 hour back up time at full load with interconnecting cables (FS), racks, battery breaker and standard accessories Battery. <u>With the facility of battery bank cross redundancy through manually operated Battery breakers/Isolators &</u> Provision of six (6) No. of spares cells along with separate charger, cabinet etc to be done for each battery bank.					
7.	Supply of VRLA maintenance free Battery Banks (Set of two banks at each site) for 60 KVA UPS systems each having 1 hour back up time at full load with interconnecting cables (FS), racks, battery breaker and standard accessories Battery. <u>With the facility of battery bank cross redundancy through manually operated Battery breakers/Isolators &</u> Provision of six (6) No. of spares cells along with separate charger, cabinet etc to be done for each battery bank.	2	0	Sets		
8.	Supply VRLA maintenance free Battery Banks (Set of two banks at each site) for 45 KVA UPS systems each having 1 hour back up time at full load with interconnecting cables (FS), racks, battery breaker and standard accessories Battery. <u>With the facility of battery bank cross redundancy through manually operated Battery breakers/Isolators &</u> Provision of six (6) No. of spares cells along with separate charger, cabinet etc to be done for each battery bank.	2	0	Sets		
9.	UPS AC Distribution Boxes in UPS room for Interlocking station & Depot	4	0	Nos.		
10.	UPS AC Distribution Boxes in UPS room for Secondary station	2	0	Nos.		
11.	25 KVA Isolation Transformer at downstream for E&M	5	0	Nos.		
12.	52 KVA Isolation transformer at downstream for E&M	1	0	Nos.		
13.	Supply and Delivery of Site Material (Racks, Distribution Boards, Connectors, connecting cables, Power cables, data cables etc.) for complete Installation/ Testing/ Commissioning of Power Supply System at Interlocking	4	0	One set for each station/ depot		

	Station/Depot.					
14.	Supply and Delivery of Site Material (Racks, Distribution Boards, Connectors, connecting cables, Power cables, data cables etc.) for complete Installation/ Testing/ Commissioning of Power Supply System at Secondary station.	2	0	One set for each station		
15.	Supply of Software kit having user licenses to monitor all UPSs plus supply of workstations of reputed make having 32" LED monitor for OCC & BCC including (not below i7 processor).	1	0	One set for each OCC & BCC		
16.	Supply of Industrial grade laptop (laptop configuration shall be minimum but not be limited to 15.6 inch, core i7, 8th generation, 16GB RAM, Window 10 and 500GB SSD) with preloaded application configuration software to diagnose & rectification of faults, configuration of UPS and electronic cards/boards/modules, drives etc.	1	0	Nos.		
17.	Supply of various tools (properly insulated/Sleeved) for maintenance activities as detailed below: i) Spanner 10x11: 1 no. ii) Spanner 12x13: 1 no. iii) Spanner 16x17: 1 no. iv) Plies Venus 8 inch: 1 nos. v) Allen Key Set: 1 no. vi) Screw Driver set : 1 set vii) Safety Hand Gloves: 1 set. viii) Battery Cell Opener: 1 no. ix) Battery Cell Puller: 1no. x) Console cable: 1 no. (For entire network) xi) Operating system for UPS NMS server and workstation: 1 no. (For entire network) xii) UPS NMS Software for server and workstation: 1 no. (For entire network) xiii) Network management card utility CD: 2no. (For entire network). xiv) Torque wrench set (8nm to 80nm) Switchable 3" to 8": 1 no. xv) Tubular wrench set: 1 no. xvi) Vent cap opener (6/150mm, 6/165mm): 1 no.	6	0	One set for each station/depot		

	xvii) Digital Multimeter: 1 no. xviii) Clamp Meter: 1 no. xix) Any other tools required for maintenance activities					
18.	<u>Spare cell charger</u>	-	-			
(A)	<u>Appropriate capacity for Depot Interlocking.</u>	<u>1</u>	<u>Nos.</u>			
(B)	<u>Appropriate capacity for Khemni Chak Interlocking Station.</u>	<u>1</u>	<u>Nos.</u>			
(C)	<u>Appropriate capacity for Malahi Parkri & ISBT Interlocking Station.</u>	<u>2</u>	<u>Nos.</u>			
(D)	<u>Appropriate capacity for Zero Mile & Bhoothnath Secondary station.</u>	<u>2</u>	<u>Nos.</u>			

SCHEDULE- B (CONTRACTUAL SPARES)

Sr. No.	Description	Quantity		Unit	Unit Rate (In INR)	Total Price (In INR)
		Non-JICA	JICA			
1	SCVS (for 160 KVA UPS)	1	0	Nos. of each type		
2	SCVS (for 80 KVA UPS)	1	0	Nos. of each type		
3	SCVS (for 60 KVA UPS)	1	0	Nos. of each type		
4	SCVS (for 45 KVA UPS)	1	0	Nos. of each type		
5	Input Isolation transformer and ATS cubicle with complete equipment (for 160 KVA UPS)	1	0	Nos.		
6	Input Isolation transformer and ATS cubicle with complete equipment (for 80 KVA UPS)	1	0	Nos.		
7	Input Isolation transformer and ATS cubicle with complete equipment (for 60 KVA UPS)	1	0	Nos.		
8	Input Isolation transformer and ATS cubicle with complete equipment (for 45 KVA UPS)	1	0	Nos.		
9	Battery Sharing Cubicle/Battery circuit breakers with complete equipment (for 160 KVA UPS).	1	0	<u>Nos.</u> Set of each type		
10	Battery Sharing Cubicle/Battery circuit breakers with complete equipment (for 80 KVA UPS).	1	0	<u>Nos.</u> Set of each type		

11	Battery Sharing Cubicle/Battery circuit breakers with complete equipment (for 60 KVA UPS).	1	0	<u>Nos.</u> Set of each type		
12	Battery Sharing Cubicle/Battery circuit breakers with complete equipment (for 45 KVA UPS).	1	0	<u>Nos.</u> Set of each type		
13	AC Distribution Box with complete equipment for Depot & Stations.	2	0	<u>Nos.</u> of each type		
14	Control Cards of UPS (160KVA)	1	0	No. of each type		
15	Control Cards of UPS (80KVA)	1	0	No. of each type		
16	Control Cards of UPS (60 KVA)	2	0	No. of each type		
17	Control Cards of UPS (45 KVA)	2	0	Nos. of each type		
18	Inverter module of UPS (160 KVA)	1	0	Nos. of each type		
19	Inverter module of UPS (80 KVA)	1	0	Nos. of each type		
20	Inverter module of UPS (60 KVA)	2	0	Nos. of each type		
21	Inverter module of UPS (45 KVA)	2	0	Nos. of each type		
22	Rectifier module of UPS (160KVA)	1	0	Nos. of each type		
23	Rectifier module of UPS (80KVA)	1	0	Nos. of each type		
24	Rectifier module of UPS (60KVA)	2	0	Nos. of each type		
25	Rectifier module of UPS (45KVA)	2	0	Nos. of each type		
26	MCB and MCCB of each type	2	0	Nos. of each type		
27	Fuses of different ratings for UPS, SCVS, Rectifier, inverter & ACDB.	20	0	Nos. of each rating		
28	All type of electronic boards/Cards/Modules of UPS (excluding items mentioned at Sr. no 18-29).	2	0	Nos. of each type		
29	Spare cell charger					
A)	appropriate capacity (for 160KVA	1	0	Nos.		

	UPS at Depot)					
B)	appropriate capacity (for 80KVA UPS at Khemnichak Ixl station)	1	0	Nos.		
C)	appropriate capacity (for 60KVA UPS at IXL Stations)	1	0	Nos.		
D)	appropriate capacity (for 45KVA UPS at Secondary Stations)	1	0	Nos.		
30	Cables (power cables, data cables etc.)	230 <u>105</u>	0	Meters of each type		
31	Communication card (NIC)	2	0	Nos		

SCHEDULE- C (DOCUMENTATION, INSTALLATION, TESTING AND COMMISSIONING)

Sr. No.	Description	Quantity		Unit	Unit Rate (In INR)	Total Price (In INR)
		Non-JICA	JICA			
1	Documentation, Installation, Testing & Commissioning of complete system including demonstration of full load test at interlocking stations/ depot with earthing.	4	0	Per station/ Depot		
2	Documentation, Installation, Testing & Commissioning of complete system including demonstration of full load test at secondary stations with earthing.	2	0	Per station		

SCHEDULE- D (TRAINING AND MISCELLANEOUS ITEMS)

Sr. No.	Description	Quantity		Unit	Unit Rate (In INR)	Total Price (In INR)
		Non-JICA	JICA			
1	Submission of Training Manuals (Original plus two hard copies) and in electronic format	4	0	Set		
2	Submission of Operating Manuals (Original plus two hard copies) and	6	0	Set		

PRE-BID QUERIES : TENDER PS-05 : SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF UNINTERRUPTED POWER SUPPLY SYSTEM FOR SIGNALLING, TELECOMMUNICATION, AUTOMATIC FARE COLLECTION, PLATFORM SCREEN DOOR/GATE SYSTEM & EMERGENCY POWER SUPPLY TO E&M AT ALL ELEVATED STATIONS OF PRIORITY CORRIDOR (ISBT DEPOT, ISBT STATION, ZERO MILE, BHOOTNATH, KHEMNI CHAK & MALAHI PAKRI) OF PATNA METRO RAIL PROJECT.

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Sought	DMRC's Clarification
1	Volume-3 Particular Specification (PS)	3.2.1 (f)	Inverter Output Isolation Transformer (transformer shall be placed between inverter output and static bypass switch)	There is no benefit of transformer if the same is placed between inverter output and static bypass switch. Hence, please amend the clause confirming the location of transformer after static switch. It'll ensure isolation even in bypass path. The same is implemented by electrical department too.	Please refer addendum-1
2	Volume-3 Particular Specification (PS)	3.2.1 (q)	Supply of Industrial grade laptop (laptop configuration shall be minimum but not be limited to 15.6-inch, Core i7, 8th generation, 16 GB RAM, windows 10 and 500 GB SSD) with preloaded application/configuration software to diagnose & rectification of faults, configuration of UPS and its electronic cards/Boards/modules, drives etc.	Please delete this requirement as such software is not meant for customer use.	No change in tender requirements.
3	Volume-3 Particular Specification (PS)	4.1.3	Equipment shall be designed and manufactured in modular manner to facilitate the fault diagnosis and replacement of each modular part. Each module shall be capable of being interchanged with other modules of the same type without affecting the rest of modules in place.	Please confirm that UPS System is modular UPS System which will ensure the less MTTR and better maintainability in remote location like Patna.	Tender clause is self explanatory, wherein, it is advised to design the system in such a way, that helps in easy maintenance and fault diagnosis.
4	Volume-3 Particular Specification (PS)	4.6.1	The Contractor shall ensure and demonstrate that the System is adequately protected against electromagnetic interference (EMI) among the systems of the PMRC. All equipment shall comply with. a) For EMC- immunity standards should be BS EN IEC 62040-2, EN 61000-4-3 or latest. b) For EMC- Emission standard should be VDE 0857, BS EN IEC 62040-2 IEC 61000-3-2/ 61000-3-3, EN 61000-3-2/ 61000-3-3 or latest.	Applicable standard for UPS System is IEC 62040 - 2 for EMC. Please remove all other standard not related to UPS System.	Please refer addendum-1

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Sought	DMRC's Clarification
5	Volume-3 Particular Specification (PS)	5.2.5.3	The battery bank shall be protected from internal fault by a circuit breaker. The UPS shall be automatically disconnected from the battery bank when the discharge limits of volts per cell are reached, or when signalled by other control functions. The battery circuit breaker installed at the UPS room should be complete with a metal enclosure conforming to an Ingress Protection Classification of IP 54	5 - isolator assembly is asked in SLD. Please confirm that the same will be required in IP 54 enclosure putting all 5 isolators / BCB together in floor standing panel.	Yes, Bidder understanding is correct. Please also refer addendum-1
6	Volume-3 Particular Specification (PS)	5.2.5.10 (b)	The banks for depot and interlocked stations shall be formed of cell blocks of similar capacity and voltage ratings.	Battery bank for depot and interlocking station could not be same as UPS ratings are different. Hence, please delete this clause.	Please refer PS clause 5.2.5.10((d), wherein, the minimum VAH is defined. Also, if higher VAH is required to meet the requirements mentioned in clause 5.2.5.10 (e) then bidder has to provide higher VAH capacity of battery banks accordingly. Hence, No change in tender requirements.
7	Volume-3 Particular Specification (PS)	5.2.5.10 (e)	Battery Back-up time is shall be minimum One hour (1-Hr) by each battery Bank at full rated load of associated UPS set with above minimum rating of Battery Capacity as defined in clause 5.2.5.10(d).	Please share full rated load in kW to do the battery sizing.	Please refer PS Clause 5.2.7.3 for rated load power factor, for further calculation of battery sizing.
8	Volume-3 Particular Specification (PS)	5.2.9	Total Voltage Harmonic distortion of each UPS output <3% for 100% linear load <5% for 100% non-linear load	It shall be as under for better protections Total Voltage Harmonic distortion of each UPS output <1% for 100% linear load <5% for 100% non-linear load	No change in tender requirements.
9	Volume-3 Particular Specification (PS)	5.2.12	m)Status of various MCCBs of Input panel and ACDB at remote location. n)Status of localised all battery circuit breakers (BCB-1 & BCB-2) at Central Monitoring Systems.	Please share the details of monitoring is required. Whether you need below : Line voltage, phase voltage, current, frequency, power factor, THDi, THDv, Active power, Apparent power, Each voltage & current harmonic percentage (up to 31st harmonics), unbalance factor, leakage current, and neutral current.	The clause is self explanatory.
10	Volume-3 Particular Specification (PS)	5.2.15.2	Remote monitoring system at OCC & BCC	Remote monitoring from the same UPS System OEM for batter intergration. Please include it.	No change in tender requirements.

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Saught	DMRC's Clarification
11	Volume-3 Particular Specification (PS)	Schedule B (Contractual Spares)	SCHEDULE- B (CONTRACTUAL SPARES)	Card for each rating are asked separately. Please include it to avoid identical cards repetition.	The clause is self explanatory.
12	Volume-3 Particular Specification (PS)	3.2.1 (i)	Extension of Cable trays/Trenches/ Supports / Foundations;	Do we need to consideredd this in UPS vendor scope?	1. Please refer Appendix-A1 of Particular Specifications (PS) regarding interface requirements with Civil Contractor, which are self explanatory, wherein; -- <i>Support/Foundation for UPS equipments & battery banks shall be in scope of System (PS-05) Contractor except any Civil constrction work like trenches, cut-out etc.</i> 2. Please refer Appendix-A2 of Particular Specifications (PS) of Volume_3 regarding interface requirements with E&M, which are self explanatory, wherein; -- <i>Major Cable tray works i.e. cable tray upto isolator panel of Electrical supply is in scope of E&M Contractor. However, minor work of cable tray for UPS equipments (if required) shall be in scope of System (PS-05) Contractor.</i>
13	Volume-3 Particular Specification (PS)	3.3.1.1 (s)	All necessary drawings and data as required shall be uploaded by the contractor on BIM 360 construction management software of DMRC.	UPS Drawing will be submitted in CAD Format	The clause is self explanatory.
14	Volume-3 Particular Specification (PS)	4.6.2	All equipment shall confirm with the objective of the European Directives on EMC (89 / 336 / EEC) and where appropriate shall be fixed with the CE mark.	Offered UPS are complying with IEC standards.	No change in tender requirements.
15	Volume-3 Particular Specification (PS)	7.2.1	The external cables shall be manufactured from fire retardant/ resistant low smoke, zero halogen materials.	BOQ ask for Fire servival cable where as in the specification FRLS cable is mentiined. Confirm the cable type.	Please refer addendum-1 in BoQ & Schedule-A of PS

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Saught	DMRC's Clarification
16	Volume-3 Particular Specification (PS)	7.2.2.1	Core identification shall be as follows:	We will be using black colour for all phase. Kindly approve the same.	No change in tender requirements.
17	Volume-3 Particular Specification (PS)	8.6.4	The contractor shall interface with E&M contractors for providing the Electrical Power to E&M deptt. Through 25/52 KVA	We will be considering separate cubical for both rating(25kVA/52kVA). Approve the same.	Tender clause is self explanatory. Although, PS-05 Contractor shall submit the same for approval during Design stage for review & approval to DMRC.
18	Volume-3 Particular Specification (PS)	Schedule B (Contractual Spares) (5)	Input Isolation transformer and ATS cubicle with complete equipment (for 160 KVA UPS)	Do we need to consider complete ATS panel as spare which included transformer, ATS, incomer MCCB, Outgoing MCCB, SPD, Metering)?	Yes, Bidder understanding is correct.
19	Volume-1 Notice Inviting Tender (NIT)	1.1.3.2.B(iv)	The average annual turnover from works of last three financial years should be > INR 7.89 Crores.	The Average annual turnover of works should be >500 Crores, To restrict the participation of local vendors in the tender and prioritize reputed brands for consideration. please consider the same	No change in tender requirements.
20	General	General	-	Ingress protection need to specify for ATS Panel	Please refer PS Clause 6.2.1. for details.
21	General	General	-	False Flooring details to be shared	No provision of False floor in UPS Room instead trenches in the periphery of UPS room is considered. Please refer the Appendix A-1 & A-2 of Particular Specifications of Volume_3 for details.
22	General	General	-	Availability of Material Storage & shifting/movement facility to be specify	PS-05 Contractor shall be responsible for constructing /arranging and maintaining his own site offices/ stores. Please refer PS Clause 9.1 to 9.5 for details.
23	General	General	-	UPS/Battery Room layout & Cable tray Layout to be shared to estimate the Battery Cable Length	Please refer the Annexure-IV of the PS for details.
24	General	General	-	Make list to be shared.	No Specified make are defined, However, reputed make shall be preferred as per Tender. Although, PS-05 Contractor shall submit the same for approval during Design stage for review & approval to DMRC as per PS Clause 5.15.

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Sought	DMRC's Clarification
25	General	General	-	NMS Software/monitoring scope need to be confirmed	Please refer PS clause 5.2.12 to 5.2.16 for details pertaining to Remote Monitoring.
26	General	General	-	UPS & Battery Will be Standard 2 Years Warranty. UPS DLP will be 3 Years. Confirm the same	Yes, Bidder understanding is correct.
27	General	General	-	Requirement is for Non Hotswappable UPS modular UPS. Please confirm the same	PS-05 contractor shall provide "UPS complete in Online Redundant Configuration along with Input Isolation transformer & ATS cubicle, Battery Sharing cubicle/Battery circuit breaker, SCVS, Remote Monitoring equipment with accessories." Please refer PS clause 3.2 & 3.3 for detailed Scope of Work.
28	General	General	-	All transformer will be aluminum wound. Please accept the same.	Please refer PS Clause 5.4.7. for detailed specification of Transformer.
29	General	General	-	Input transformer will be k1 Rated. Confirm the same	Yes, Bidder understanding is correct.
30	Volume-3 Particular Specification (PS)	1.3 (Relevant Standards)	Protection Class for distribution box- IP54	We request that the specified IP rating be changed from IP54 to IP20/21, as IP20/21 aligns with industry standards and is commonly available from all UPS OEMs. In contrast, IP54 is a specialized specification offered by only a few UPS OEMs, which could impact pricing and potentially lead to a monopoly among certain OEMs. Notably, Kolkata Metro Signaling recently issued a tender in the S&T Department specifying IP20/21.	Please refer addendum-1
31	Volume-3 Particular Specification (PS)	1.3 (Relevant Standards)	- Rectifier RDSO Spec. IRS: S91-93 - SCVS IRS Spec. 9815-1994 - Valve Regulated Sealed Lead Acid (VRLA) Rechargeable Single Cell/Battery specifications RDSO specification No. IRS S93 – 96 with Amendment 1 or latest, TEC specification No. TQ 510G 92 or latest, IEC 60896 21 & 22, BS EN 60896 21 & 22	Govt. of India has already withdrawn RDSO approved for online UPS/Battery/SCVC vide Govt. Letter Ref. No. RDSO/PE/SPEC/PS/0023-2001 dated 16/03/2020. (Letter attached)	Please refer addendum-1
32	Volume-3 Particular Specification (PS)	1.3 (Relevant Standards)	Transient Protection : MIL-STD-7041A/Equivalent International standards	We kindly request you to modify transient Protection MIL-STD-7041A with Indian Std.	Please refer addendum-1

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Saught	DMRC's Clarification
33	Volume-3 Particular Specification (PS)	4.1.3	Equipment shall be designed and manufactured in modular manner to facilitate the fault diagnosis and replacement of each modular part. Each module shall be capable of being interchanged with other modules of the same type without affecting the rest of modules in place.	Request you to clarify, whether modular system is required or monolithic.	Tender clause is self explanatory, wherein, it is advised to design the system in such a way, that helps in easy maintenance and fault diagnosis.
34	Volume-3 Particular Specification (PS)	4.8.1(a)	Operating ambient temperature: 0°C to 50°C	Request you to change this with 0 C to 40 C otherwise UPS needs to derate. For each degree rise of temperature 1.5% deration is required.	No change in tender requirements. Please refer clause 4.8.2 of Particular Specifications for details.
35	Volume-3 Particular Specification (PS)	5.2.5.10(d)	Any combination of UPS battery bank may be acceptable provided the minimum AH capacity of both battery banks put together at a station/Depot is 384x800VAH or Appropriate higher capacity for depot, interlocking stations; and 384x600VAH or Appropriate higher capacity for secondary stations. Two separate battery banks shall be provided at all stations and depots	Request you to change it as per OEM standard.	No change in tender requirements.
36	Volume-3 Particular Specification (PS)	5.2.5.3	The battery bank shall be protected from internal fault by a circuit breaker. The UPS shall be automatically disconnected from the battery bank when the discharge limits of volts per cell are reached, or when signalled by other control functions. The battery circuit breaker installed at the UPS room should be complete with a metal enclosure conforming to an Ingress Protection Classification of IP 54. The battery shall be supplied with	We request you to kindly modify IP20 instead IP54.	Please refer addendum-1

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Saught	DMRC's Clarification
37	Volume-3 Particular Specification (PS)	5.2.5.9	Unless otherwise specified, all stationary batteries shall be of the Sealed Maintenance Free, Valve Regulated, Lead Acid type conforming to IEC 60896- 21 & 22, BS EN 60896 - 21 & 22, RDSO specification No. IRS S93 – 96 with Amendment 1 or latest for battery capacities up to and including 500AH and to IEC 60896- 21 & 22, BS EN 60896- 21 & 22, TEC specification No. TQ 510G 92 or latest for capacities above 500AH, if required. The capacity in ampere - hour (AH) shall be at 10-hour rate.	Unless otherwise specified, all stationary batteries shall be of the Sealed Maintenance Free, Value Regulated. Lead Acid type conforming to IEC 60896- 21 & 22, BS EN 60896-21 & 22, OR RDSO specification No. IRS 593 – 96 with Amendment 1 or latest for battery capacities up to and including 500AH and to IEC 60896 – 21 & 22, BS EN 60896 – 21 & 22, TEC specification No. TQ 510G 92 or latest for capacities above 500AH, if required. The capacity in ampere – hour (AH) shall be at 10-hour rate.	No change in tender requirements.
38	Volume-3 Particular Specification (PS)	5.2.5.10	Any combination of UPS battery bank may be acceptable provided the minimum AH capacity of both battery banks put together at a station/Depot is 384x800VAH or Appropriate higher capacity for depot, interlocking stations: and 384x600VAH or Appropriate higher capacity for secondary stations. Two separate battery banks shall be provided at all stations and depots.	VAH is not mentioned for 160KVA and 80KVA UPS systems.	Please refer PS clause 5.2.5.10((d), wherein, the minimum VAH is defined. Also, if higher VAH is required to meet the requirements mentioned in clause 5.2.5.10 (e) then bidder has to provide higher VAH capacity of battery banks accordingly. Hence, No change in tender requirements.
39	Volume-3 Particular Specification (PS)	5.5.2	The automatic transfer switch shall be rated in utilization category AC-33A in accordance with IEC60947-6-1 or EN60947-6-1 and capable of making, breaking and carrying continuously the rated current and making on fault without overheating, damage and deterioration.	Suggested to change utilization category AC-32 in accordance IEC 60947-6-1 as it is suitable in proposed application and has harmony with other switches used downstream.	No change in tender requirements.
40	Volume-3 Particular Specification (PS)	5.6.8	MCCBs shall have an electrical endurance of the order of 10,000 operation cycles.	As per standard, min 8000 operation cycles required.	No change in tender requirements.
41	Volume-3 Particular Specification (PS)	5.8.2	IP ratings for distribution boards shall be IP54.	IP ratings for distribution boards should be IP20 as other panels are also IP20 and will be installed in same premises.	Please refer addendum-1
42	Volume-3 Particular Specification (PS)	5.12.2	The output of the UPS system shall be terminated in Distribution Boards. The arrangement MCCB/MCB in ACDB (AC distribution board) should be as follows:	Type C and D may be deleted as not applicable for MCCB.	Please refer addendum-1

S. No	Volume/ Document Name	Tender Clause No.	Tender Clause Description	Tenderer's Query/Clarification Saught	DMRC's Clarification
43	Volume-3 Particular Specification (PS)	7.2.3.1	All cables shall be flame retardant and shall comply with the requirements of IEC 60331 – 1 and for bunched cables of IEC 60332-3-21 and for flame propagating criteria of US IEEE-383 with a minimum test short circuit time of five minutes.	Suggested as – All cables shall be flame retardant and shall comply with the requirements of IEC 60332-1 and for bunched cables of IEC 60332-3-21 and for flame propagating criteria of US IEEE – 383 with a minimum test short circuit time of five minutes. (IEC 60331 – 1 is circuit integrity test of cables)	No change in tender requirements.
44	Volume-1 Instructions to Tenderers (ITT)	C2.6.2(a)	Tenderers are advised to quote the price exclusive of GST.	As per current GST rule, GST will be applicable for UPS is 18% and for batteries is 28% kindly confirm.	This is works contract and GST will be reimbursed as per extant GST rules.