INTEGRAL COACH FACTORY, CHENNAI – 600 038

ELECTRICAL DEPARTMENT

TENDER DOCUMENT

2026-27

TENDER NO: 2026245212360

Ref No : EL-W-942

Name of the Work

"Provision of Battery Energy Storage System (BESS) for Power back up for Climatic Chamber"

Signature Not Verified
Digitally signed by IRANIYAN THIRUMALAI RAVANAN
Date: 2026.10.09 17:53:26 IST
Reason: IREIS-CRIS
Location: New Delhi

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CHAPTER - 1

SALIENT FEATURES OF THE TENDER

a. The tender document is uploaded with further condition that bidder agree to abide by the conditions laid down hereinafter in the tender document before submitting tender.

b. The Railway, before the due date of opening, may of its own or in response to any clarification requested or suggested by any person including that of the Tenderer, may modify the tender document at its sole discretion.

c. The tender document includes many chapters as enclosed, which are integral parts of the tender documents.

d. All the above-mentioned chapter and above-named documents, taken together including NIT and tender schedule, if not scored off, shall constitute the complete tender document hereinafter referred to as "tender document" and have to be read together and acted upon accordingly. No part of the tender document can be relied upon or acted upon in isolation.

e. In the event of any conflict between the Books of reference and contents of various chapters of these documents, the latter shall prevail.

f. Scope of the Work: Scope of works as mentioned in Notice for Inviting Tender (NIT) and schedule of works.

CHAPTER-2

OVERVIEW OF PROPOSED BESS PROJECT

2.1.1 ICF invites bids for the complete design, engineering, supply, installation, testing, commissioning, operation support, warranty and maintenance of a Grid-Connected Battery Energy Storage System (BESS) of Class B as defined in Clause 4.2 & 4.4 of IEC 62933-2-1:2017 and integration with existing 11 kV power supply system: -

The BESS shall be a complete turnkey solution including Batteries, PCS, BMS, EMS, Inverter duty Transformer, Fire protection, Cooling System, Communication system, protection system and all associated electrical works.

Item	Requirement
Rated Power	2.0 MW
Energy Storage Capacity	4.0 MWh
Technology	$LiFePO_4$ Based BESS
Installation Type	Containerized Outdoor System
Grid Connections	11 kV Grid Integration
Operation	Bi-directional Charge/Discharge
Application	Excess Solar Energy Storage, Load Management, Grid Support
Battery System	
Battery Management System (BMS)	
Power Conditioning System (PCS)	
Energy Management System (EMS) & Remote monitoring via SCADA	
DC Cables, Instrumentation and Communication Cables	
Transformers, Circuit Breakers, Switch Gears and associated Power& control Panels	

2.1 PROJECT LOCATION AND ACCESSIBILITY:

a. The project site is situated within the premises of Design & Development building (D&D), ICF, Chennai, Tamilnadu, Pin code: 600038.

b. Access to site by Train: The nearest railway station is Perambur, located approximately 3 kms from the site.

CHAPTER - 3

SCOPE OF WORK

3.0 SCOPE: Design, Engineering, Supply, Packaging and Forwarding, Transportation, Unloading, Storage, Installation, Testing and Commissioning of **Grid Connected Dispatchable Battery Energy Storage System (BESS) of Capacity 2MW/ 4MWh** at D&D Building Premises of ICF, Perambur, Chennai, Tamilnadu including comprehensive Operation & Maintenance (O&M) for a period of 5 (Five) years after warranty period with ensuring Metering dispatchable energy performance throughout the warranty period.

a. PCS (with total capacity of 2 MW with continuous overload capacity of 10%) with black start facility for bidirectional inversion/charging of Batteries and providing voltage reference of 11 kV AC. Coupling at AC output bus bar (Main Receiving Sub Station at ICF premises). BESS must possess standalone Black Start capabilities. The system must automatically sense a dead- bus, energize its step-up transformer, stabilize voltage, and pick up critical auxiliary control equipment lines sequentially.

b. Containerized storage for BESS for protection of equipment from environmental factors.

c. Battery Management System (BMS) for monitoring healthiness and optimized charging of batteries.

d. Energy Management System (EMS) for Load management and Control of PCS.

e. Associated Electrical system, AC and DC Wiring, Switch gear, control panel, Transformer, Vacuum Circuit Breaker (VCB), earthing, lightning protection for BESS up to ICF 11 kV AC bus bar.

f. Comprehensive Operation & Maintenance of Battery Energy Storage System (BESS) for a period of Five (5) years from the date of expiry of warranty period of Five years from operational acceptance of full Project capacity.

3.1 The brief scope includes the following:

a. The BESS system shall include an Energy Management System (EMS), a Battery Management System (BMS), and a dashboard to display key operational parameters such as voltage, current, battery state of Charge (SOC), frequency etc.

b. The EMS shall interlink between the ICF grid demand and the BMS. It shall continuously monitor the ICF grid requirements and perform peak shaving of the ICF load.

c. The BESS shall include a Battery Management System, Health Monitoring, and Internal protections for Overcharge, Temperature, Current, Voltage, and a Dashboard for displaying parameters and provisions for remote access and control (for scheduling charging and discharging) as per ICF grid load conditions and requirements.

d. **It is a turnkey BESS project with the given standards**. The BESS shall be configured to perform multiple charge discharge cycles. However, for design purpose, the maximum number of rated energy discharge cycles per day may be considered as 2 (Two).

e. **DC and AC Isolation Switches:** These are critical safety devices. DC side isolation switches are used to manually disconnect the battery racks from the system for maintenance. Similarly, AC side isolation switches allow the Power Conversion System (PCS) modules to be isolated from the AC grid or load.

f. **Power Conversion System (PCS):** The PCS is the "heart" of the BESS, performing bidirectional conversion. It converts DC power from batteries to AC for the grid (discharging) and AC power from the grid to DC to store in batteries (charging).

g. **Auxiliary Power System with UPS:** This system provides reliable power to the BESS control circuits, sensors, and management units. The UPS backup ensures that even during a main power failure, the control supply remains uninterrupted for safe system shutdowns or monitoring.

h. **Earthing System:** A dedicated grounding system designed to protect personnel and equipment from electrical faults and lightning strikes by providing a low-impedance path to the ground.

i. **Surge Protection System (SPD):** These devices protect sensitive electronic components, such as the BMS and PCS, from transient voltage surges caused by lightning or grid switching events.

j. **Thermal Management System (HVAC):** To maintain the lifespan and safety of Lithium- ion batteries, this system uses heating, ventilation, and air conditioning to keep the container modules within an optimal temperature range (typically around 25°C). Thermal management loops must be rated for peak environmental ambient up to 50°C, incorporating an autonomous N+1 active unit redundancy layout per enclosure zone.

k. **Commissioning and Acceptance:** After installation, the system undergoes rigorous Performance Guarantee Tests. The PG test typically spans 3 to 7 continuous days to verify the round-trip efficiency (RTE) and deep discharge capacity as guaranteed in the bid. Upon successful completion, a certificate is issued confirming the system meets all functional and efficiency requirements.

l. **Comprehensive AMC Testing:** During the Annual Maintenance Contract (AMC) period, periodic tests are conducted to ensure the battery degradation and system efficiency remain within specified limits over time.

m. **Dashboard and MIS:** A Management Information System (MIS) provides a visual dashboard for operators to monitor real-time KPIs (Key Performance Indicators), system health, and historical performance data.

n. **Automatic Fire Safety System:** Containers must be equipped with specialized fire suppression systems (like water-based or chemical agents) that automatically activate upon detecting smoke or abnormal temperature rises to prevent thermal runaway.

3.2 Purpose of BESS in ICF: -

Proposal to install a 2 MW/ 4MWh Battery Energy Storage System (BESS) at ICF will store it to supply power to its own facility during peak load hours.

3.3 ENGINEERING AND DESIGN: -

For the engineering and design of the equipment, the Contractor shall

a. Design, fabricate, and assemble a fully functional, transportable BESS that meets the requirements delineated herein. This shall include a control system that provides standard input/output channels and appropriate control actions for all required operational and protective features.

b. Fully document the design and expected performance of the BESS by means of documents, drawings, reports, data, and other submittals, as required herein.

c. Perform factory acceptance testing of the BESS.

d. Conduct design review meetings during initial design and fabrication, in Consultation with the ICF with special reference to the geographical/climatic conditions of the Project site.

e. Obtain site-specific data in preparation for developing, installation & implementation plans.

f. Develop site installation/construction drawings, specifications, and calculations.

g. Supply any special equipment and tools required for maintenance of the BESS.

h. Supply an initial complement of spare parts (as per OEM recommendations and to meet the BESS Availability Guarantee).

i. Provide warranty for the entire BESS and its constituent equipment.

3.4 **SUPPLY OF MATERIAL**: - The bidder must procure and deliver all hardware and software necessary for a functional BESS system.

a. **Core Battery Components:** These Include the Battery Modules (cells) and the Battery Management System (BMS) for monitoring battery health. It is strictly mandated that the supplies of Batteries for this Railway project must only be executed after obtaining formal authorization from their competent Railway Authority before 4 months from the date of issuance.

b. **Power Conversion System (PCS) & Energy Management System (EMS):** Supplying the Power Conversion System (PCS) for AC/DC conversion and the Energy Management System (EMS) for load control and monitoring.

c. **Infrastructure:** Provide outdoor type containerized enclosures to protect equipment from environmental factors.

d. **Electrical & Control Gear:** This category includes inverter duty transformer, UPS systems, SCADA for remote monitoring, LT panels, and all necessary communication equipment.

e. **Fire detection & Suppression system: -** The bidder must supply comprehensive safety system designed specifically for high-energy battery environments.

f. **Cables & Accessories: -** The bidder is responsible for all "balance of system" interconnectivity materials such as DC cabling, AC cabling, Communication cables and all hardware.

3.5 INSTALLATION & COMMISSIONING / INTERCONNECTION:

For installation/interconnection, the Contractor shall execute the following:

a. **Civil and Structural Works**: - The bidder is responsible for the specific design of the site preparation to support heavy containerized equipment. This includes:

b. **Foundation Construction:** Designing and casting reinforced concrete pads or plinths capable of supporting the weight of BESS containers and transformers.

c. **Site Preparation:** Grading, leveling, and soil compaction to ensure long-term stability.

d. Required shed structural drawings, foundation drawing shall be submitted by the tenderer for approval by ICF.

e. **Containment & Drainage:** Implementing secondary containment (if required for hazardous materials) and adequate site drainage systems.

f. **Access Requirements**: Ensuring clear pathways for heavy cranes and transport vehicles to reach the installation pads.

g. Inspection of civil and structural work will be conducted by an authorized representative of the ICF. All final reports must be jointly signed and submitted to the administration. This documentation must include a jointly inspected draft checklist for civil and structural requirements, alongside key ICF compliance standards.

h. **Electrical Installation**: - This covers all high and low-voltage electrical work after the equipment is placed:

i. **Cable Laying:** Professional routing of power (AC/DC), control, and communication cables through trenches, conduits, or cable trays.

j. **Terminations:** High-quality cable terminations and glanding at the BESS containers, Inverter duty transformers, and Switchgear.

k. **Earthing/Grounding:** Installation of the site-wide earthing grid and lightning protection to ensure personnel and equipment safety.

l. Study of Workshop/ICF grid system and Integration with BESS to be submitted to ICF before commencement of work.

m. The bidder must strictly ensure that in the event of a Battery Energy Storage System (BESS) trip due to any electrical fault or operational reason, it shall not result in any disruption, degradation, or tripping which adversely affect the stability and continuity of the ICF power supply network.

n. **Equipment Mounting and Interconnection**: - This involves the physical assembly and "handshaking" of the different systems:

o. **Physical Integration:** Securely bolting containers, transformers, and auxiliary systems to their foundations.

p. **System Interlink:** Connecting the Battery Management System (BMS) with the Power Conversion System (PCS) and Energy Management System (EMS).

q. **HVAC & Fire Systems:** Final assembly and connection of cooling pipes and fire suppression plumbing between units.

r. **Testing and commissioning**: -The final phase to prove the system meets performance specifications before hand-over:

s. **Pre-Commissioning:** Visual inspections, continuity tests, and insulation resistance (megger) testing.

t. **Cold/Hot Commissioning:** Energizing the system in stages, verifying communication protocols (SCADA/EMS) and checking protection relay settings.

u. **Performance Testing:** Conducting "State of Charge" (SoC) calibration, round-trip efficiency tests, and confirming response times for grid services.

v. **Documentation:** Providing final "As-Built" drawings, operation manuals, and signed test reports each to be used for this project, and commissioning of the BESS.

w. **Initial Requirements Performance Verification:** The bidder is responsible for proving that the installed system meets all technical specifications (such as the 4-MWh capacity). This typically involves a formal commissioning process, site acceptance tests (SAT), and efficiency measurements to verify the system performs as guaranteed in the contract.

x. **Synchronization with ICF Power Network:** The contractor must ensure the Battery Energy Storage System (BESS) or equipment integrates seamlessly with the existing ICF electrical grid. This involves matching voltage, frequency, and phase angles, as well as installing the necessary protective relays to prevent grid instability during connection.

y. **Training & Documentation Deliverables**: To fulfill the "Training & Documentation" section, the bidder must prepare and hand over the following:

z. **Comprehensive Manuals:** Three distinct sets of documentation covering day-to- day Operations, long-term Maintenance schedules, and Safety protocols (including emergency shutdown procedures).

aa. **Personnel Training:** A structured training program for ICF staff. This ensures they are self-sufficient in monitoring and basic troubleshooting of the system once the contractor leaves the site.

bb. **As-Built Drawings:** Final, "as-installed" technical diagrams and schematics. These are critical for any future repairs or system expansions, as they reflect the actual physical layout rather than the initial design.

cc. **Software & Configuration Files**: Provision of all necessary Software Licenses to operate the system, along with the specific Configuration Files (set points, logic parameters) used during commissioning.

CHAPTER - 4

DEFINITIONS AND ABBREVIATIONS

4.0 Definitions and Abbreviations:

4.1 **PCC** (Point of Common Coupling): - The electrical boundary line and connection point between the ICF 11 kV Grid at MRS/ICF and the Battery Energy Storage System (BESS).

4.2 **Unit Battery**: - The smallest, field-replaceable energy storage component or assembly. It consists of one or more electrochemical cells connected in series, parallel, or a combination of both. Each unit battery features exactly one set of positive and negative terminals to connect with the rest of the storage system.

4.3 **FAT** (Factory Acceptance Test) - The quality and performance inspection conducted at the manufacturing facility before dispatch. The bidder must possess an in-house testing facility for power converters. This testing facility must be NABL-approved (National Accreditation Board for Testing and Calibration Laboratories). The bidder must offer either the complete BESS capacity or a mutually agreed partial capacity for FAT before shipping. Detailed testing protocols are listed under the relevant clause of this document.

4.4 **SAT** (Site Acceptance Test): - The final operational and performance test conducted on- site after the installation and integration of the complete BESS.

4.5 BESS (Battery Energy Storage System) an AC-coupled, containerized energy storage system using commercially available electrochemical batteries. It must be capable of receiving, storing, and delivering electrical energy at the rates specified in this document. Components: The BESS must include unit batteries, a Battery Management System (BMS), a bi-directional Power Conditioning System (PCS), transformers, communication sub-systems, and auxiliary units (such as HVAC and fire suppression systems). Operation: The system must be a "plug-and-play" type, allowing easy connection to or disconnection as required.

4.6 **BMS** (Battery Management System): The electronic control system responsible for managing the rechargeable battery cells or packs. Functions: It must protect the battery from operating outside its Safe Operating Area (SOA), monitor its state of health and charge, calculate operational data, report real-time metrics, control the thermal environment, handle authentication, and balance cell voltages.

4.7 **EMS** (Energy Management System): The combined hardware and software suite responsible for controlling and optimizing the power and energy flow through the BESS based on specific application demands.

4.8 **SoC:** State of Charge

4.9 **SoH:** State of Health

4.10 **BOL / EOL:** Beginning of Life / End of Life

4.11 **Dispatchable / Throughput Energy**: - The total net electrical energy (measured in kWh) delivered by the BESS, measured precisely at the point of interconnection.

4.12 **BATTERY:** The Battery should be having Primary cells only and no second life

batteries are allowed. If any defect is noticed in the battery during the O&M period, it must be replaced on free of cost. It is in the scope of contractor only.

4.13 **BATTERY SUB-SYSTEM:** The cells shall be supplied as group of cells combined into modules and inter- connection of cells; modules should be designed properly to prevent the damage during transportation. The cells & modules should be able to absorb the anticipated vibration/shock associated with the transportation.

4.14 **BATTERY TECHNOLOGY:** Definitions of various terminologies related to battery energy storage system should comply with IEC 60050-482 (International electro-technical vocabulary for cells/ batteries).

CHAPTER - 5

GENERAL INFORMATION TO THE BIDDERS

5.0 **General information to the bidders**

5.1 The installation location of BESS is within workshop premises. Tenderer are free to inspect the locations before bidding the tender. The locations are liable to be changed as per site feasibility.

5.2 Completion period shall be **as per NIT** from the date of issue of the Letter of Acceptance.

5.3 Conditional tender will not be accepted and will be summarily rejected

5.4 The quantities shown in the schedule are on approximate basis. However, the payment shall be made on actual quantity executed.

5.5 The tenderer shall comply with the provision of all laws including labour laws, rules, regulations and notifications issued there under from time to time by statutory agency and Railways and shall abide by these laws, strictly. The tenderer shall take necessary measures to protect the personnel, work and facilities and shall observe all reasonable safety rules and instructions.

5.6 This is a complete turnkey job as such any item, Civil/Fabrication work or any other work required to be carried out for commissioning of the work should also be considered within the contractor's scope of work for which no extra payment would be admissible. The price quoted shall be firm and inclusive of all taxes, labour, transportation charges and any other contingency charges that may be necessary to complete the work satisfactorily.

5.7 Work shall be carried out as per specification and IEC shall be followed. All the spare parts to be used shall be genuine and of good quality and reputed make and the same shall be got approved from Site Engineer before replacing the same.

5.8 Error/omission and discrepancies – The tenderer shall not take advantage of any error due to typing or otherwise. If there is any doubt it shall be brought to the notice of Dy.CEE/M without delay and same shall be dealt as per Railway's requirement and to Railway's advantage only.

5.9 The contractor has to supply and provide ancillary materials such as nuts, bolts, clamps, brackets etc. that are required for the work even if they are not mentioned in the tender schedule.

5.10 The work to be governed by this contract shall cover designing, manufacturing, transporting till site, safe custody at site, insurance, erection, and commissioning of equipment as detailed in technical specifications and in the scope of Work of tender documents. All the materials and workmanship shall strictly conform to the provision of this specification primarily and to the related Indian Standard Specification and code of practice mentioned in the specifications.

5.11 All the materials brought to site for construction of BESS shall be of latest technology of the best quality of approved makes/manufacture conforming to the relevant applicable international standards like IEC/IEEE/UL and CEA (Indian grid code) and to BIS wherever applicable.

5.12 All the cable routes, locations of relevant items of work shall be first shown in drawing and marked at site and approval of the Engineer-in-charge obtained for the same before starting the work. Such drawings shall be based on the drawings issued and further based on the changes made at site by the Engineer-in-charge through instructions to the site representative of the contractor.

5.13 The rates quoted for the relevant items of work shall include the cost of materials and equipment, their accessories, fixing labour, together with the cost of providing the necessary tools and tackles etc., so as to ensure that the work carried out forms a complete installation to the satisfaction of the Engineer-in-charge.

5.14 Any deviation from the specifications shall be clearly brought out in the offer along with the reasons for such deviations. If, no such deviations are brought out in the offer, it will be deemed that the tenderer has fully understood the requirements of the tender and no extra cost will be paid under any circumstances for carrying out the works under this tender in accordance with the interpretations of the Engineer-in-charge.

5.15 The rates quoted shall also provide for handing over the necessary completion drawings together with the test results of commissioning tests carried out by the contractor, in accordance with BIS before the installation and handed over to the Railways.

5.16 The contractor is bound by the opinion of the Engineer-in-charge in accepting whether the work is carried out in accordance with the provisions of these specifications or not and shall take steps to rectify or replace such parts of the materials and installations as in the opinion of the Engineer-in- charge which are unsatisfactory in relation to these specifications

5.17 The contractor shall ensure proper liaison with ICF authorities for obtaining all statutory approvals and to co- ordinate with them for timely inspections/quality control inspections. ***Payments for all inspection charges shall be borne by the contractor***. ***Inspection of BESS, PECS and associated items shall be inspected by ICF representative/ RITES/ Railway Agency in the OEM premises***.

5.18 All Drawings, tests and measurements, readings and documentation required for EIG approval shall be arranged and prepared by the contractor without any extra cost.

5.19 All the materials and equipment shall conform to the Standards not less than those stipulated under the current Indian Standard Specifications or international Standard Specifications.

5.20 In addition to the above, the equipment and workmanship shall satisfy the requirements of the following –

a. Method of construction approved by the Electrical Inspectorate
b. Indian Electricity Acts and Rules
c. Fire Insurance Regulations

d. I.E.E. wiring regulations
e. Instructions of the Engineer-in-charge based on the site conditions and revised requirements, if any.

5.24 STANDARDS FOR EQUIPMENTS AND WORKMANSHIP –

a. The materials and equipment to be supplied and installed under this contract shall conform to the requirements of these specifications.

b. In further support of what is contained in this specification, the materials and equipment as well as workmanship shall satisfy the requirements

5.25 Electrical Safety –

a. The work is to be done in compliance with the National Electrical Code-2011 or the latest issued by BIS.

b. The work done shall comply with the provisions of CEA (Measures related to safety and electric supply) Regulations, 2023.

c. Only items confirming relevant international standards (like IEC, IEEE, UL) shall be used. Refer to the technical specifications applicable for the components used in BESS In case no specification is mentioned then the contractor is to obtain approval of Dy.CEE/M in advance.

d. Contractor is advised to train/counsel or use only trained workers having the competency to work in the LV/HV system and are aware of electrical safety. All safety precautions are to be ensured by the contractor while execution of work and no work shall be carried out without permission of Engineer in charge.

5.26 The following Statutory Clearances shall be obtained by the contractor wherever applicable –

a. Electrical System approval (Electrical Inspector) if required.

b. All equipment, accessories, materials, civil construction and erection works should comply with the statutory requirements and IS standards.

c. All statutory requirements for working at the Project Site like Labour Registration, Workman Compensation Policy, ESIC etc., shall be complied with by the vendor before deployment of resources at the Project Site. Any other statutory clearances required during commencement of work.

5.27 Obligations of the Contractor –

a. The contractor shall design, engineer, procure and undertake civil and electrical works including Erection, Testing and Commissioning of the BESS project.

b. Bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the CONTRACTOR under this document.

c. The contractor shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules and regulations applicable as per Electricity Act 2003, CEA guidelines etc.

d. Procure all the Approvals specified in this document and also from other agencies unconditionally or if subject to conditions, then all such conditions required to be fulfilled by the date specified therein shall have been satisfied in full and such Approvals are in full force and effect;

e. Acquire and maintain in effect all approvals and clearances in order to enable it to perform its obligations under this document.

f. Governmental Approvals – While providing the Installation Work, the BESS and System Operations, the contractor will obtain and maintain and secure all Governmental Approvals required to be obtained and maintained and secured by the contractor and to enable the contractor to perform such obligations.

g. Interconnection Requirements – The interconnection of the BESS with the network of the Railways will be made.

h. Subject to and on the terms and conditions of this document, the contractor shall, at its own cost and expense, procure finance for and undertake the design, engineering, procurement, construction and commissioning of the BESS project and observe, fulfill, comply with and perform all its obligations set out in this document.

i. The contractor shall comply with all Applicable Laws and obtain Approvals (including renewals as required) in the performance of its obligations under this document.

j. Undertake Interconnection Facilities as per the specifications and requirements laid down by the Central Electricity Authority and respective State ERCS.

k. The contractor shall ensure efficient operation of the Project and the associated facilities to achieve the maximum energy storage in BESS as specified for the Project. For this purpose, the contractor shall engage the services of adequate number of Graduate Engineers and Technicians for successful completion of project with in prescribed time limit. Daily Management Information System through BMS & SCADA for all BESS installations for reporting and down time analysis. These data shall be made available to Railways office by E-mail on daily basis.

l. All minor items viz., hardware items, foundation bolts, termination lugs for electrical connections etc. as required and necessary for proper working of the equipment shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

m. **Contractor will provide and lay down the dedicated electrical cables** for transmission of energy through transformer, PECS, BESS installations etc. to the nearest Panels of Railways available. The cable laying shall be done on wall or through trench/HDD (as per site requirement), and its cost is inclusive in the scope of work defined. No separate cost shall be payable.

n. **Contractor shall ensure all the energy data, working parameters like I,V,PF, Temp. KW, KVA, ratio of parameter etc. as required for system prescribed in this project as per satisfaction of Railways.**

5.27 Obligations during Construction and Commissioning –

a. The contractor shall be responsible for the design, implementation and commissioning of the project. The contractor will Design, Engineer, Procure, Undertake Civil and Electrical work including Erection, Testing and Commissioning of the BESS project.

b. Testing Procedures – The contractor and Railways or its representative(s) shall implement the testing procedures.

CHAPTER - 6

TECHNICAL SPECIFICATION OF BESS

Note:

i. Tenderer shall furnish clause wise comments on the technical requirements specified, hereunder. Deviations, if any shall be brought out very clearly duly furnishing the techno economical merits, thereof.

ii. Tenderer shall offer components and sub-assemblies of specified makes only, wherever specifically called for. (However, alternative make(s) may be considered, for which complete technical details for the same duly indicating the techno economical merits and demerits, as compared to the make specified shall be furnished in the offer).

iii Technical details, wherever called for shall be furnished.

iv The successful tenderer shall purchase branded items from original manufacturer or authorized dealer only and the proof of purchase shall be produced along with the supply.

v. All electrical installations, equipment's and erection practices shall comply with latest Indian Electricity Rules.

6.0 TECHNICAL SPECIFICATION

6.1 Battery Energy Storage System (BESS): The Battery Energy Storage System (BESS) shall strictly comply with the definitive technical parameter detailed in the specification schedule as mentioned in below Table: -

Sl. No	Parameters	Value
1	System Capacity & Rating	2.0 MW/4.0 MWH
2	Power rating	2 MW continuous dispatchable output at PCC with 10% continuous overload capability.
3	Guaranteed Energy Capacity	Net dispatchable AC useful capacity at PCC shall be minimum 4,000 kWh (4 MWh) at the end of each year throughout the complete 2-year warranty period. The capacity refers to 2 MW (AC Continuous Rated Power) and 4 MWh (Net Usable AC Energy) discharge capability measured at the 11kV Point of Common Coupling (PCC) after all auxiliary, transformation, and round-trip performance losses.
4	Beginning of Life (BOL) Sizing	System shall be sized to ensure 4 MWh net output at 05 Year. Sizing calculation shall account for auxiliary consumption, system losses, battery degradation and PCS efficiencies etc. Auxiliary consumption (HVAC, lighting, control power) must be accounted for by the bidder. The final system delivery must guarantee 4 MWh net at the PCC irrespective of auxiliary load drawn.

5	Battery Cell Chemistry	Lithium Iron Phosphate (LFP) technology. Battery system shall be maintenance-free and should be able to work for site-specific climatic conditions. Any secondary, rechargeable Lithium-Iron Phosphate (LFP) or equivalent advanced chemistry is acceptable. Cells must be Prismatic or Cylindrical, certified under IEC 62619, UL 1973 (module level), and UN 38.3
6	Depth of Discharge	>90%
7	Rated Cycle Life	Minimum 10,000 cycles at rated energy capacity with minimum 80% DoD. BESS lifecycle performance validation must conform to IEC 61427-2 / IEC 62933-2-1 criteria, based on standard 0.5C/0.5C charging-discharging rates at a nominal cell temperature of 25°C ± 3°C.
8	End of Life (EOL) Threshold	Capacity below 65% of initial installed capacity or 25 years of operational life, whichever occurs earlier.
9	System Round-Trip Efficiency (AC/AC)	Not less than 85%, measured at the Point of Common Coupling (PCC).
10	Post-O&M capacity and efficiency Degradation	Maximum 2.5% annual degradation on the remaining energy capacity from the 6th year onwards. The system must deliver the full 4 MWh net AC energy output once a daily (or as scheduled). Bidders must detail their augmentation schedule or deploy an initial overbuild layout to cover annual capacity degradation over the operational timeline.
11	Round-Trip Efficiency (DC/DC)	Bidder shall explicitly state and guarantee the DC-to-DC round-trip efficiency of the proposed system.
12	System Response Time	≤ 1 second full-scale operational response time.
13	Minimum Annual BESS Availability	95% guaranteed annual availability.
14	Charging Window & Power Source.	The BESS shall be primarily configured to grid-transmitted Power. The Maximum Charging Window shall be defined as a continuous 5 hour period.
15	Operational Duty Cycle	2 complete charge/discharge cycle per day (baseline operating profile).
16	Power Factor Control & Range	Four-quadrant operation at PCC with dynamic reactive power injection and absorption capability to meet real-time load requirements.
17	System Automation & Scheduling	Charge/discharge operations shall be programmable and schedulable through EMS based on solar generation and real-time tariff structures.
18	Black Start Capability	Comprehensive black-start functionality shall be provided and integrated.

19	Container Enclosure Ventilation	Integrated HVAC/ thermal management system shall continuously maintain manufacturer-recommended temperature conditions inside the container.
20	Point of Common Coupling (PCC)	The exact location and configuration of the PCC shall be mutually finalized between ICF and the selected contractor.
21	Power factor (Measure at PCC)	Four quadrant capabilities is required. Reactive power injection/ absorption shall be as per requirement of load.

The location and configuration of the Point of Common Coupling (PCC) for the BESS shall be mutually finalized between ICF and contractor.

Note: - The basic cell and battery module to be used in energy storage shall be primary / virgin/ first time use that is one which have been never used earlier. Cell / Battery module shall be Grade- A, Grade- B or Grade- C type or Recycled battery module /battery cell / chip is not acceptable for this contract.

6.2 Battery Management System (BMS) Specification

The Battery Management System (BMS) shall be designed, engineered, supplied, integrated, tested and commissioned in accordance with the battery OEM recommendations, applicable standards and project-specific operational requirements. The BMS shall provide continuous monitoring, protection, control, balancing, diagnostics, communication and data logging functions to ensure safe, reliable and efficient operation of the battery system throughout its service life.

a. **Charging Control**

The BMS shall control and supervise battery charging and discharging operations in accordance with the battery manufacturer's recommended operating limits, as per daily load forecast by EMS and charging profiles. Battery charging shall be performed using a Constant Current–Constant Voltage (CCCV) charging methodology, and the BMS shall automatically manage the transition from Constant Current (CC) mode to Constant Voltage (CV) mode to optimize battery performance, maximize battery life and ensure operational safety. The BMS shall continuously regulate charging and discharging parameters to prevent operation beyond permissible limits and to maintain the battery system within safe operating conditions.

NOTE: - Battery shall be charged during excess solar generation.

b. **Monitoring Functions**

The BMS shall continuously monitor, measure, record and display all critical battery operating parameters including individual cell voltages, module voltages, battery string and rack voltages, charging and discharging currents, cell and module temperatures, State of Charge (SOC), State of Health (SOH), Depth of Discharge (DoD), cumulative charge- discharge cycles, utility-side voltage and current, protection system status, ground fault indications and internal battery fault conditions.

All monitored parameters shall be made available for local and remote monitoring, diagnostics, alarm generation and performance evaluation.

c. **Protection Functions**

The BMS shall provide comprehensive protection functions to safeguard the battery system against abnormal operating conditions including over-voltage, under-voltage,

over-charge, over-discharge, charge over-current, discharge over-current, over-temperature, under- temperature, ground faults, internal battery faults, communication failures and any other abnormal operating conditions that may adversely affect battery performance, safety or service life. The BMS shall automatically initiate appropriate protective actions, alarms and shutdown functions whenever predefined protection thresholds are exceeded.

d. **State of Charge (SOC) Estimation**

The BMS shall automatically calculate, determine and continuously update the State of Charge (SOC) of individual cells, battery modules, battery racks and the complete battery system using appropriate estimation algorithms recommended by the battery OEM. The SOC calculation shall be continuously available for monitoring, control and operational decision-making purposes, and its accuracy shall be maintained in accordance with the battery manufacturer's specified performance requirements.

e. **State of Health (SOH) Estimation**

The BMS shall automatically determine, monitor and record the State of Health (SOH) of individual cells, battery modules, battery racks and the overall battery system. The SOH calculation shall be based on battery operating parameters, cycle history, charge-discharge performance, internal resistance characteristics, capacity degradation trends and other relevant battery health indicators as recommended by the battery OEM. The calculated SOH values shall be used to assess battery condition, predict remaining useful life and support maintenance planning activities.

f. **Cell Balancing**

The BMS shall provide automatic cell and module balancing functionality to maintain uniform voltage distribution across all battery cells and modules. The balancing function shall continuously minimize voltage variations between cells and modules and shall optimize battery capacity utilization, energy efficiency, operational performance, reliability and service life. The balancing strategy and operating limits shall be implemented in accordance with battery OEM recommendations.

g. **Data Logging and History Storage**

The BMS shall provide comprehensive data logging and historical storage facilities and shall maintain a historical database or logbook containing voltage measurements, current measurements, temperature records, State of Charge (SOC) data, State of Health (SOH) data, charge-discharge cycle counts, alarm history, fault records, event logs and operational records. Historical data shall be securely stored and made available for diagnostics, troubleshooting, performance analysis, condition monitoring, warranty evaluation and long- term operational assessment of the battery system.

h. **Alarm and Fault Management**

The BMS shall continuously monitor battery operating conditions and shall generate alarms, warnings and fault indications for abnormal conditions including over-voltage, under- voltage, over-current, over-temperature, under-temperature, cell imbalance, ground faults, communication failures, internal battery faults and other critical operating conditions. All alarms and fault events shall be time-stamped, recorded and made available through local and remote monitoring systems for operational awareness and fault investigation.

i. **Emergency Isolation and Safety**

The BMS shall provide automatic emergency isolation and shutdown functions to protect personnel, battery assets and connected equipment during emergency or fault conditions. Upon detection of critical operating conditions, the BMS shall automatically initiate appropriate safety actions including battery isolation, emergency shutdown, safe battery disconnection and alarm generation. The emergency isolation and protection philosophy shall be implemented in accordance with battery OEM recommendations, applicable safety standards and project requirements.

j. **Communication and Integration**

The BMS shall communicate continuously with higher-level control systems, Energy Management System (EMS), Power Conversion System (PCS), protection systems and SCADA systems for monitoring, control, alarm management, diagnostics and operational coordination. The communication architecture, interfaces and protocols shall be compatible with the project control system architecture and shall conform to the battery OEM recommendations. The BMS shall support reliable exchange of operational data, alarms, events, status information and control commands required for coordinated system operation. Fiber optic cables (OFC) must be used for all outdoor plant networks, utilizing standard industrial Ethernet/Modbus/IEC 61850 protocols.

k. **Compliance**

The BMS shall be fully compatible with the supplied battery technology and shall incorporate all monitoring, protection, balancing, control, communication, diagnostics and safety functions necessary for safe and reliable battery operation. The complete BMS design, functionality and performance shall comply with battery OEM recommendations, applicable national and international standards, project technical specifications and operational requirements.

6.3 ENERGY MANAGEMENT SYSTEM (EMS), SCADA AND CONTROL SYSTEM REQUIREMENTS

a. General Requirements

The Contractor shall design, engineer, supply, install, test and commission a complete Energy Management System (EMS) for the Battery Energy Storage System (BESS). The EMS shall provide supervisory monitoring, control, optimization, protection coordination, data acquisition, reporting and communication functions necessary for safe, reliable and efficient operation of the BESS.

The EMS architecture shall be scalable, modular and suitable for future expansion without major hardware or software modifications. The Energy Management System (EMS) scope includes local active/reactive power scheduling, SOC state tracking, frequency regulation response (droop control), and direct interface coordination with the central load dispatch center.

The EMS shall comprise all necessary hardware, software, communication interfaces, servers, workstations, networking equipment, licenses and accessories required for complete functionality.

b. Monitoring, Measurement and Control Requirements

i. The Energy Management System (EMS) shall continuously acquire, monitor, record, display and control all operational, electrical, protection, environmental and auxiliary

parameters associated with the Battery Energy Storage System (BESS). The EMS shall provide real-time visualization, historical trending, alarm generation, event logging and reporting facilities for all monitored parameters.

ii. The EMS shall monitor and display all Grid and Point of Common Coupling (PCC) parameters including three-phase grid voltage, three-phase grid current, active power, reactive power, apparent power, frequency, power factor, imported energy, exported energy, voltage unbalance, current unbalance, grid availability status and PCC breaker status.

iii. The EMS shall continuously monitor and record battery system parameters including battery bank voltage, battery bank current, State of Charge (SOC), State of Health (SOH), battery charge rate, battery discharge rate, available battery energy, cumulative charged energy, cumulative discharged energy, battery capacity utilization, battery string status, battery rack status, battery system availability, battery operating mode and battery protection status.

iv. The EMS shall interface with the Battery Management System (BMS) and shall acquire, display and record cell-level parameters including individual cell voltage, maximum cell voltage, minimum cell voltage, cell voltage deviation, individual cell temperature, maximum cell temperature, minimum cell temperature, cell temperature deviation, cell balancing status, string State of Charge (SOC), string State of Health (SOH), BMS alarm status, BMS fault status and BMS communication health status.

v. The EMS shall monitor and display all Power Conversion System (PCS) parameters including PCS operating status, PCS availability status, active power output, reactive power output, apparent power output, power factor, DC input voltage, DC input current, AC output voltage, AC output current, AC frequency, converter efficiency, PCS internal temperature, PCS alarm status, PCS fault status and PCS mode of operation.

vi. The EMS shall continuously monitor all thermal management system parameters including liquid cooling system status, coolant temperature, coolant flow status, cooling pump status, cooling unit running status and cooling system alarm status.

vii. The EMS shall monitor and display the status of the fire detection and fire suppression systems including fire detection system status, fire suppression system status, fire alarm status, smoke alarm status, gas detection status, where applicable, and emergency shutdown status.

viii. The EMS shall monitor environmental conditions within the BESS installation including container internal temperature, container internal humidity, ambient temperature, ventilation system status and HVAC system status.

ix. The EMS shall monitor security-related parameters including container door open/close status, unauthorized access alarms, intrusion alarms and the health status of the CCTV system, wherever applicable.

x. The EMS shall continuously monitor and display all switchgear and protection system parameters including circuit breaker open/close status, breaker healthy status, spring charged status, trip circuit healthy status, isolator open/close status, earthing switch status, protection relay healthy status, protection relay operation status, protection relay alarm status, protection relay trip status, lockout relay status, interlock status, synchronization status, fault indications, fault records and disturbance records. The winning EPC contractor must submit a formalized protection relay coordination matrix, interlocking internal BESS circuit breakers with the main step-up grid isolators.

xi. The EMS shall monitor and display operational and control parameters including grid-connected mode, islanded/standalone mode, automatic mode, manual mode, charge mode, discharge mode, application mode selection, active power setpoint, reactive

power setpoint, ramp rate settings, system availability status, system efficiency, energy throughput and operator command status.

xii. All monitored parameters shall be available for real-time display at the local Human Machine Interface (HMI), operator workstation and centralized control station. The EMS shall provide secure remote monitoring, control, data logging and reporting facilities through the specified communication interfaces and protocols. Remote access and control functions shall be subject to user authentication, authorization, cyber security requirements and control hierarchy interlocks. The entire industrial control, EMS, and firewall network framework must hold validated compliance certificates under the industrial cyber security IEC 62443 standard series.

c. Analog Data Recording

The EMS shall continuously record analog parameters including grid voltage, grid current, active power, reactive power, frequency, battery voltage, battery current, state of charge (SOC), battery temperature and energy import/export at a sampling interval not exceeding ten (10) seconds.

d. Digital Data Recording

The EMS shall continuously record and time-stamp all digital signals and operational events including alarms, events, protection trips, breaker operations, operating mode changes, operator commands and interlock operations for monitoring, diagnostics and performance analysis.

e. Data Retention Requirements

The EMS shall store high-resolution operational data online for a minimum period of thirty (30) days, provide historical trend visualization for at least one (1) week at the operator workstation, archive all operational, alarm and event data for a minimum period of ten (10) years in non-volatile memory, ensure data integrity and retention during power interruptions and system restarts, and make all monitored data, alarms and events available through DNP3 communication interfaces.

f. Human Machine Interface (HMI)

The EMS shall include a graphical Human Machine Interface (HMI) with colour display facilities for monitoring, control and diagnostics of the Battery Energy Storage System (BESS). The HMI shall provide real-time system monitoring, Single Line Diagram (SLD) display, equipment status indication, alarm and event displays, historical trend displays, diagnostic information, user-configurable screens and multi-level user access management. All alarms and events shall be displayed in chronological sequence with date and time stamping for effective fault analysis and operational review. The HMI shall be user-friendly, intuitive in operation and suitable for continuous 24×7 operation.

g. Operating Modes

The EMS shall support Grid Connected Mode and Standalone/Islanded Mode for system operation and shall provide both Automatic and Manual control modes. The EMS shall also support functional operating modes including charging, discharging, peak shaving, load levelling, energy time-shifting, renewable energy integration and other grid support functions as required by the application. Authorized operators shall be able to define, modify and manage operating set points, charge and discharge limits, power references and ramp rate settings through the HMI or authorized remote interfaces.

h. Battery Management System (BMS)

A cell-level Battery Management System (BMS) shall be provided and fully integrated with the EMS for continuous monitoring, control and protection of the battery system. The BMS shall continuously monitor individual cell voltages, cell temperatures, cell State of Charge (SOC), cell balancing status and battery protection functions. The BMS shall communicate with the EMS in real time and shall provide all alarms, events, warnings, fault indications, diagnostics and operational information necessary for safe and reliable operation of the battery system.

i. SCADA Integration Requirements

The EMS shall be fully compatible with the centralized SCADA system provided by ICF and shall include all necessary hardware, software, gateways, communication modules, protocol converters and interfaces required for seamless integration. The EMS shall transmit all operational, electrical, alarm and event data to the centralized control station and shall receive supervisory control commands from the centralized control station. The system shall support remote monitoring and control functions, real-time status updates, alarm annunciation and event reporting while maintaining synchronization between local and remote control systems. The EMS shall periodically perform integrity scans and shall generate alarms whenever discrepancies are detected between field status and command status.

j. Control Hierarchy and Interlocking

The EMS shall ensure that only one operator has operational control authority at any given time. The control hierarchy shall be configured such that local control has the highest priority, followed by remote SCADA control. Software and hardware interlocking functions shall be provided to prevent unsafe operating sequences, unauthorized switching operations, simultaneous contradictory commands, equipment damage and personnel hazards. All interlock operations, violations and bypass conditions shall be alarmed, recorded and stored in the event database for future analysis.

k. Control Centre Display Requirements

The EMS shall provide comprehensive monitoring information at both local and remote control centers. The displayed information shall include operating status such as Grid Connected or Standalone mode, Automatic or Manual mode, Charge or Discharge status and selected application mode. The EMS shall display electrical measurements including voltage, current, active power, reactive power, frequency, power factor, State of Charge (SOC), energy import/export and charge/discharge rates. The EMS shall further display equipment status information including breaker positions, PCS operating parameters, battery parameters, cooling system status and fire protection system status. Alarm and event information including alarm summaries, event summaries, fault information, smoke alarms, fire alarms and container door alarms shall also be continuously displayed and updated.

l. Communication Protocol Requirements

The EMS shall support, as a minimum, communication through Modbus TCP/IP, Modbus RTU, Modbus ASCII, DNP3, IEC 61850, IEC 60870-5-101 and IEC 60870-5-104 protocols to facilitate interoperability with all plant subsystems and external control systems. The Contractor shall provide all necessary protocol licenses, communication drivers, engineering tools, configuration software and communication gateways required for complete and reliable integration of the EMS with associated equipment and external systems.

m. Cyber security Requirements

The EMS shall incorporate comprehensive cyber security measures including hardware firewalls, user authentication mechanisms, role-based access control, password protection, audit trail logging, secure remote access facilities and event logging and monitoring functions. Access to operational data, configuration settings and control functions shall be restricted exclusively to authorized personnel. The system shall maintain detailed records of user activities and security-related events to ensure traceability and compliance with cyber security requirements.

n. Reporting Requirements

The EMS shall automatically generate, store, retrieve and archive operational and performance reports including daily operational reports, monthly performance reports, system availability reports, charge/discharge reports, load profile reports, voltage and frequency reports, Sequence of Events (SOE) reports, alarm reports and BESS performance evaluation reports. The system shall provide flexible reporting facilities with user-selectable periods and shall support export of reports in Microsoft Excel (.xlsx), CSV and PDF formats for operational analysis, regulatory compliance and performance assessment.

6.3.1 SYSTEM HARDWARE REQUIREMENTS

6.3.1.1 Control and Monitoring Equipment

The Contractor shall supply, install, configure and commission a complete monitoring and centralized control system consisting of operator workstations, keyboards, mouse devices, industrial networking equipment, LAN cabling, communication accessories, software licenses and engineering tools required for operation and maintenance of the EMS and SCADA systems. The workstation shall be based on current industrial personal computer technology and shall support Microsoft Windows 11 or the latest available version. Alternative operating systems may be proposed, provided all specified functional, performance and interoperability requirements are fully satisfied.

6.3.1.2 Local Display System

The Contractor shall provide a local HMI display and one wall-mounted LED monitor of minimum 55-inch screen size for continuous display of BESS operating parameters, alarms, events, trends and system status information. The wall-mounted display shall replicate all information available on the operator workstation and shall be suitable for continuous operation within the control room environment. Control room shall be provided by ICF.

6.3.1.3 Printer

The Contractor shall provide one network-connected printer for generation and printing of operational reports, alarm logs, event records and historical data reports. The printer shall support output of reports generated in CSV, Microsoft Excel and PDF formats and shall be fully integrated with the EMS and SCADA reporting system.

6.3.1.4 Server Requirements

The Contractor shall provide one Local Server at MRS and one Remote Server at MRS/Shell Control Room. Plant SCADA data, alarms, events and historical records shall be replicated between both servers in real time using industry- standard interfaces such as OPC-UA, Web Services, database replication mechanisms and secure data file

transfer methods. Both servers shall have adequate processing capability, redundancy and storage capacity to retain all operational, alarm, event and historical data generated by the BESS for a minimum period of ten (10) years.

6.3.1.5 System Performance Requirements

The EMS and SCADA hardware platform shall be sized such that average processor, memory and storage utilization does not exceed fifty percent (50%) under normal operating conditions, thereby ensuring adequate reserve capacity for future expansion and reliable operation. The system shall support unsolicited transmission of critical alarms and events to the SCADA system and shall achieve a minimum overall availability of 99.5%. The system architecture shall be designed to eliminate single points of failure affecting monitoring, control and data acquisition functions. All operational, alarm and historical data shall be automatically preserved and protected during power interruptions, communication failures and system restart conditions. Hot-standby redundancy is mandatory for the main SCADA servers and critical communication links to avoid any single point of failure.

6.4 Power Conversion System (PCS) technical specification

a. The Power Conversion System (PCS) shall be designed, manufactured, supplied, tested and commissioned as an integral part of the Battery Energy Storage System (BESS). The PCS shall be a bi-directional, four-quadrant converter capable of converting DC power from the battery system into AC power for export to the grid and AC power from the grid into DC power for charging the battery system.

b. Power Conversion System (PCS) and Battery Management System (BMS) must be fully rated to safely absorb the total required energy throughput within specified charging window without triggering thermal de-rating, in compliance with IEC 62933-3-1.

c. The PCS shall provide active and reactive power control, grid support functions, power quality management, protection, monitoring and communication facilities required for reliable operation of the BESS under grid-connected and standalone operating conditions.

d. The PCS shall be suitable for continuous operation under the environmental and electrical conditions specified for the project site and shall comply with the latest applicable IEC, IEEE, UL and Indian Standards etc.

e. <u>Detailed Description of Power Conversion System (PCS):</u>

Parameters	Value
Maximum	3300 KW
Power rating	3,000 kW (3 MW) AC at 50°C ambient temperature with a transient overload rating of 110% for 10 minutes.
Power factor	0.95 (Leading to Lagging)
Power converter technology	The solid-state devices used in bi-directional PCS / Four Quadrant Inverter shall be IGBT or better solid-state device. Semiconductor devices to be used shall be of Industrial Grade/ military grade and from either M/s Infineon Technologies or M/s Mitsubishi Electric Corporation or M/s Toshiba or M/s Semikron make
Efficiency	> 98%

Voltage withstand capabilities	± 15/20% of rated voltage on both AC & DC Side
Rated voltage	690V AC / Suitable for 11kV Grid Integration through Transformer
Frequency	50 ± 2.5%
Power quality parameters	As per latest IEC/IEEE standards including IEEE 519
Communication Interface with SCADA System	Appropriate communication system with IEC 60870-5- 104 protocol

6.4.1 Charge Control

The Power Conversion System (PCS) shall continuously monitor battery operating parameters and control the charging process of the Battery Energy Storage System (BESS) in accordance with the requirements of the battery subsystem and Energy Management System (EMS). The PCS shall be capable of operating in Float Charge Mode, Boost Charge Mode and Constant Current–Constant Voltage (CC-CV) charging mode, as applicable to the selected battery technology. The charging algorithm shall be designed to optimize battery performance, maximize battery life and ensure safe operation under all operating conditions. The PCS shall continuously regulate charging voltage and current to maintain battery temperature within the limits specified by the battery manufacturer and shall prevent excessive temperature rise, overcharging and other abnormal operating conditions.

6.4.2 Power Control

The PCS shall be capable of delivering and absorbing the rated active power of the BESS for the specified duration without exceeding the permissible temperature rise limits of the power electronic components, battery system and associated equipment. The PCS must dynamically supply a power factor range from 0.95 lagging to 0.95 leading over full active power output, meeting localized grid code compliance limits. However, the PCS shall also be capable of supplying or absorbing reactive power as required for grid support, voltage regulation and future operational requirements. The PCS shall maintain compliance with all applicable power quality requirements, including harmonic distortion limits, voltage fluctuations, frequency variations and other performance parameters in accordance with the latest applicable IEC, IEEE and utility standards etc.

6.4.3 Operation Mode

The PCS shall operate in synchronization with the ICF 11 kV electrical network and shall continuously maintain synchronization of voltage magnitude, frequency and phase angle during all operating conditions. During battery discharge operation, the PCS shall function in inverter mode and convert DC power from the battery system into AC power for supply to the grid or connected loads. During battery charging operation, the PCS shall function in rectifier mode and convert AC power from the grid for charging the battery system. The transition between charging and discharging modes shall be automatic, seamless and controlled by the EMS without causing any disturbance in ICF existing power supply system.

6.5 AUXILIARY POWER SUPPLY:

6.5.1 All auxiliary systems associated with the BESS, including but not limited to SCADA, BMS, EMS, liquid cooling thermal management system, ventilation system, fire protection system, communication equipment, and other critical auxiliary loads requiring uninterrupted power supply, shall be powered through an Uninterruptible Power Supply (UPS) system. The UPS input supply shall preferably be derived from the BESS PCS output through a suitable switching device such as an MCCB, along with an energy meter for recording auxiliary power consumption. Each auxiliary subsystem shall be supplied from the UPS through dedicated MCBs/MCCBs. The useful capacity available at the Point of Connection (PCC), as specified in the relevant schedules/tables, shall be net of all auxiliary power consumption of the BESS.

6.5.2 For the auxiliary system UPS shall be capable of delivering an overload capacity of 125% of its rated load for 10 minutes and 150% of its rated load for 10 seconds. The overall efficiency of the UPS system shall be not less than 80% at full load. The UPS shall provide a minimum battery backup duration of 30 minutes at full rated load.

6.5.3 For the auxiliary system UPS system shall be capable of operating without the DC battery connected in the circuit under all load conditions. The performance of all UPS components, including the inverter, charger, static switch, and associated equipment, shall be guaranteed with or without the battery connected. For UPS systems rated 5 kVA and above, in addition to local indications and displays on the UPS panel, all important alarms and critical analog signals shall be made available for monitoring through the SCADA system.

6.5.4 For the auxiliary system UPS systems rated 5 kVA and above, the bidder shall provide Status, Common Alarm, and Trip digital signals (hardwired or through communication interface) to the SCADA system.

6.5.5 For the auxiliary system UPS charger shall be of self-regulating, solid-state, full-wave rectifier type suitable for operation with the battery connected in parallel. The charger shall be equipped with automatic voltage regulation to maintain close voltage stability under AC supply fluctuations. The charger shall be capable of simultaneously supplying the full rated inverter load and charging the battery bank. The charger shall be capable of recharging a fully discharged battery to its rated capacity within 8 hours. The charger shall be designed to operate satisfactorily with an input voltage variation of ±10% and frequency variation of ±5%. The charger design shall ensure that no component failure occurs due to input voltage fluctuations, supply interruptions, or restoration of supply.

6.5.6 For the auxiliary system UPS inverter shall be of continuous-duty, solid-state design utilizing proven Pulse Width Modulation (PWM) technology. Ferro-resonant type inverters shall not be acceptable. The inverter output shall be 230 V AC, single phase, 50 Hz. The inverter shall include all necessary circuitry and protective features to ensure voltage regulation, current limiting, waveform shaping, transient response, and reliable operation under all specified operating conditions.

6.5.7 The total harmonic distortion (THD) of the inverter output voltage shall not exceed 5%, and the magnitude of any individual harmonic component shall not exceed 3%.

6.5.8 A static bypass switch shall be provided to enable automatic transfer of the UPS load

from the inverter to the standby AC source without interruption in the event of inverter failure or abnormal operating conditions.

6.5.9 A manual maintenance bypass switch shall also be provided to facilitate isolation of the UPS system for maintenance and servicing purposes without interruption of supply to the connected loads.

6.6 CONTAINER:

6.6.1 The Power Conversion System (PCS), containerized Battery Energy Storage System (BESS) including battery racks/modules, Battery Management System (BMS), Energy Management System (EMS), auxiliary systems, and all associated equipment shall be suitable for outdoor installation and operation under the specified site environmental conditions.

6.6.2 The battery container shall be designed and constructed to prevent ingress of moisture, dust, vermin, rodents, insects, and other environmental contaminants. Adequate provisions shall be incorporated to avoid internal condensation and ensure reliable operation of all equipment under varying ambient conditions.

6.6.3 The scope shall include all associated accessories and hardware required for complete installation and operation, including but not limited to base frames, removable gland plates, cable glands, copper lugs, earthing terminals, anchor bolts, fasteners, and mounting hardware.

6.6.4 All metallic non-current carrying parts, including container structures, doors, panels, frames, and equipment enclosures, shall be effectively bonded and connected to the station earthing system. Container and cubicle doors shall be provided with flexible earthing connections to ensure electrical continuity during operation and maintenance.

6.6.5 The BESS shall be supplied as a factory-assembled, factory-tested, modular plug-and-play solution, enabling ease of transportation, installation, commissioning, relocation, connection, and disconnection from the associated grid interconnection point as required.

6.6.6 The Battery Energy Storage System shall comprise, as a minimum, the following outdoor equipment:

- Outdoor Power Conversion System (PCS) enclosure with minimum degree of protection IP55.
- Outdoor Battery Container /Auxiliary Cabinet with minimum degree of protection IP54.
- Oil-immersed cooling type inverter duty transformer suitable for outdoor installation.
- Integrated Battery Management System (BMS), Energy Management System (EMS), thermal management system, fire detection and suppression system, SCADA interface, and all associated control and protection equipment.

6.6.7 The complete BESS solution shall be designed, manufactured, tested, transported, installed, commissioned, and operated in accordance with the applicable IEC, IS, IEEE, and tender specification requirements.

6.7 DC CABLES:

6.7.1 All DC power cables used within the Battery Energy Storage System (BESS) shall be suitable for the maximum system DC voltage and shall have a minimum voltage

grade of 1.8 kV DC or higher, as required by the system design.

6.7.2 The DC power cables shall be of stranded and compacted aluminum conductor, XLPE insulated, PVC inner sheathed (where applicable), armored, and FRLS (Flame Retardant Low Smoke) PVC outer sheathed construction, conforming to IS 7098 (Part-1) and other applicable Indian and International standards.

6.7.3 The cables shall be designed for continuous operation under the specified environmental and operating conditions and shall be suitable for installation in cable trenches, ducts, trays, conduits, and outdoor environments

6.7.4 The cable insulation, sheath, armor, and conductor sizing shall be selected to withstand the maximum operating voltage, fault current levels, temperature rise, and environmental conditions specified for the project.

6.7.5 All DC cables shall comply with the latest editions of applicable standards, codes, and regulations, including but not limited to:

- IS 7098 (Part-1) – XLPE Insulated PVC Sheathed Cables.
- IS 8130 – Conductors for Insulated Electric Cables and Flexible Cords.
- IS 10810 – Methods of Test for Cables.
- IEC 60502-1 and other relevant IEC standards, where applicable.

6.7.6 The cable manufacturer shall provide type test, routine test, and acceptance test certificates in accordance with the applicable standards. Cable sizing shall be selected such that the voltage drop and current carrying capacity remain within the limits specified in the tender document and applicable standards.

6.8 DESIGN AND CONSTRUCT ION REQUIREMENTS:

6.8.1 The Battery Energy Storage System (BESS) shall be designed, manufactured, tested, and commissioned for seamless interconnection with the existing ICF electrical network. The complete system shall comply with all applicable grid interconnection requirements, safety standards, and statutory regulations.

6.8.2 The BESS shall be provided as a containerized, factory-assembled, factory-tested, modular solution incorporating battery systems, Battery Management System (BMS), Power Conversion System (PCS), Energy Management System (EMS), thermal management system, fire detection and suppression system, and associated auxiliaries.

6.8.3 The containerized system shall be suitable for outdoor installation and shall incorporate an effective heat load management system to maintain battery operating conditions within the manufacturer's specified limits. The container shall comply with applicable safety standards and shall be fabricated from corrosion-resistant materials having adequate electrochemical compatibility with the battery technology employed.

6.8.4 The container structure shall be fire-retardant and shall be designed to withstand mechanical loads, transportation stresses, environmental conditions, and any internal pressure developed under abnormal operating conditions. The container shall be provided with suitable lifting arrangements, including a minimum of four (4) certified lifting lugs located on the top for safe handling by crane. The complete BESS shall be supplied as a plug-and-play system, enabling ease of installation, commissioning, connection, disconnection, and relocation, if required.

6.8.5 Each battery cell shall be provided with a pressure relief or pressure-regulated safety valve wherever required by the selected battery technology. Such valves shall be self-resealing, fire-resistant, and designed to operate safely under abnormal conditions.

6.8.6 Battery cell terminals and interconnections shall be manufactured from corrosion-resistant materials and shall be protected against deterioration due to exposure to electrolytes, moisture, and environmental conditions. All live terminals shall be

adequately insulated and shrouded to prevent accidental contact and ensure personnel safety.

6.8.7 All battery modules, racks, and associated equipment shall be mounted on robust metallic structures designed to withstand static and dynamic loading conditions. Structural members shall be treated and coated with corrosion-resistant paint or equivalent protective coating suitable for the installation environment. Appropriate insulation and isolation arrangements shall be provided between the metallic structures and earth to prevent unintended grounding and galvanic corrosion.

6.8.8 All sensors, transducers, communication devices, control boards, monitoring equipment, test points, and associated instrumentation shall be installed in locations that are readily accessible and safe for inspection, calibration, testing, replacement, and maintenance activities.

6.8.9 The bidder shall provide all additional equipment, accessories, and materials necessary for complete and satisfactory operation of the BESS, including but not limited to enclosures, junction boxes, cable trays, conduits, grounding and earthing systems, instrumentation, control wiring, communication wiring, hardware, supports, and mounting arrangements, whether specifically mentioned in the specification or otherwise required for proper functioning of the system.

6.8.10 All external electrical connections to battery cells and modules, including inter-cell, inter-module, and inter-rack connections, shall be designed and secured to withstand transportation, vibration, thermal expansion, fault conditions, and operational stresses without degradation of performance or reliability.

6.8.11 Battery modules may be connected in series, parallel, or a combination thereof, as required to achieve the specified system voltage, power rating, and energy storage capacity while complying with the battery manufacturer's recommendations and applicable safety requirements.

6.8.12 The BESS shall be equipped with a liquid cooling-based thermal management system designed to maintain battery temperatures within the specified operating range under all operating conditions. The cooling system capacity shall be adequately sized considering maximum heat dissipation requirements, ambient temperature conditions, and system operating profiles.

6.8.13 The liquid cooling system shall be rugged, reliable, energy-efficient, and suitable for continuous unattended operation. It shall be designed for long service life with minimum maintenance requirements and shall include all necessary controls, sensors, alarms, protections, pumps, piping, heat exchangers, and monitoring facilities.

6.8.14 An ABT energy meter of accuracy class 0.2S shall be provided at the Point of Common Coupling (PCC) or between the PCC and the PCS output, as approved by the Purchaser, for recording import and export energy to and from the BESS.

6.8.15 Metering must comply with CEA/CERC regulations using standard secure communication protocols compatible with the plant SCADA.

6.8.16 Current Transformers (CTs) used for metering shall be of accuracy class 0.2S with a minimum burden rating of 5 VA, and Potential Transformers (PTs) shall be of accuracy class 0.2 with a minimum burden rating of 10 VA.

6.9 SAFETY REQUIREMENTS:

6.9.1 The battery cells, modules, racks, and associated equipment shall comply with the applicable IEC, UL, IEEE, and other relevant international standards for safety, performance, and reliability. Battery enclosures, racks, cabinets, and containers shall have a minimum degree of protection as specified in this tender document and shall be suitable for outdoor installation under site environmental conditions.

6.9.2 Where required by the selected battery technology, each cell shall be equipped with suitable pressure relief and flame-arresting mechanisms to safely vent gases generated under abnormal operating conditions. The design shall prevent propagation of fire or thermal events from one cell to adjacent cells and shall comply with the applicable battery safety standards and manufacturer's recommendations.

6.9.3 The complete Battery Energy Storage System (BESS), including batteries, Battery Management System (BMS), Power Conversion System (PCS), Energy Management System (EMS), thermal management system, and fire protection system, shall comply with applicable safety requirements of UL 9540 and other relevant international standards governing energy storage systems. The specification of each items/equipment with OEM test certificate should be submitted before commencement of work.

6.9.4 A comprehensive fire detection, alarm, suppression, and mitigation system shall be provided for the complete BESS, including battery compartments, PCS enclosures, auxiliary equipment, cable compartments, and associated installations. The fire protection system shall be designed in accordance with applicable standards, statutory regulations, and battery manufacturer's recommendations.\

6.9.5 A complete earthing grid and bonding system including drawing and specification shall be designed, installed, and commissioned for the BESS in accordance with applicable IS, IEC, IEEE, and statutory requirements. All metallic non-current carrying parts shall be effectively connected to the station grounding system to ensure personnel and equipment safety. A dedicated, low-noise Instrument Clean Earth System must be established for SCADA/EMS electronics, isolated from the standard Structural/Equipment Safety Ground Grid.

6.9.6 The PCS shall be provided with adequate protection and control features to ensure safe isolation of the BESS from the ICF electrical network in the event of any abnormal condition, fault, malfunction, or emergency. Provision shall be made for both automatic and manual disconnection of the BESS from the distribution system through suitable protection relays, circuit breakers, and isolation devices.

6.9.7 A comprehensive temperature monitoring and protection system shall be provided for battery cells, modules, racks, liquid cooling system, PCS, transformers, and other critical equipment. The system shall generate alarms and initiate protective actions whenever predefined temperature limits are exceeded.

6.9.8 The BESS shall be equipped with comprehensive AC and DC protection schemes, including but not limited to:

- Over-voltage and under-voltage protection.
- Over-current and short-circuit protection.
- Earth fault protection.
- Reverse polarity protection (where applicable).
- Over-frequency and under-frequency protection.
- Over-temperature protection.
- Surge and transient voltage protection.
- Breaker failure protection.
- Anti-islanding protection.
- Differential protection, where applicable.
- Communication failure and control system protection functions.

6.9.9 All protection settings shall be coordinated with the ICF electrical network and approved by the Purchaser.

6.9.10 An emergency alarm and event notification system shall be integrated with the SCADA/centralized control system for continuous monitoring of BESS operation. The system shall generate alarms, warnings, event logs, and fault indications for all critical operating parameters and abnormal conditions.

6.9.11 In addition to the above safety requirements, the complete BESS and its major components shall successfully undergo all applicable type tests, routine tests, factory acceptance tests (FAT), site acceptance tests (SAT), safety validation tests, and performance verification tests specified elsewhere in this tender document and relevant standards. The required tests shall include, but not be limited to, those listed in the following table.

S. No.	Clause No IEC 62933-2-1	Name of the Tests and details
1.	6.2.1	Actual energy capacity test
2.	6.2.2.1	General
3.	6.2.2.2	Active power test
4.	6.2.2.3	Reactive power test
5.	6.2.3	Round trip efficiency test
6.	6.2.4	Expected service life test
7.	6.2.5	System response test, step response time and ramp rate
8.	6.2.6	Auxiliary power consumption test
9.	6.2.7	Self-discharge of EES system test
10.	6.2.8	Auxiliary power consumption test

6.10 DISPOSAL OF BATTERIES:

6.10.1 Upon reaching the end of their useful service life, or in the event of failure during the Operation and Maintenance (O&M) period, batteries and associated storage devices shall be removed, handled, transported, recycled, and disposed of by the Contractor in accordance with the applicable statutory regulations and environmental requirements.

6.10.2 Prior to disposal, the Contractor shall submit a detailed Battery Disposal and Recycling Plan for approval by ICF. The disposal process shall comply with the latest applicable provisions of the E- Waste (Management) Rules, Battery Waste Management Rules, and all applicable regulations issued by the Ministry of Environment, Forest and Climate Change (MoEF & CC), Government of India, as amended from time to time.

6.10.3 The Contractor shall ensure that all batteries are rendered electrically safe prior to handling, transportation, storage, recycling, or disposal. Batteries shall be discharged to a safe state of charge as recommended by the battery manufacturer and applicable standards. All exposed DC terminals, connectors, and conductors shall be adequately insulated and protected to prevent accidental contact, short circuits, arcing, or electrical hazards during handling and transportation.

6.10.4 The Contractor shall engage only authorized recyclers, dismantlers, transporters, or waste management agencies approved by the competent statutory authorities. Documentary evidence of battery collection, transportation, recycling, and disposal shall be submitted to ICF for record purposes.

6.10.5 The Contractor shall be solely responsible for ensuring compliance with all applicable environmental, health, safety, and statutory requirements related to battery waste

management throughout the contract period.

6.11 TOXIC MATERIALS:

6.11.1 If any toxic, hazardous, corrosive, flammable, or otherwise harmful substances may be released from the BESS equipment during normal operation, fault conditions, thermal runaway events, fire incidents, emergency situations, or operation of protective devices, the Contractor shall provide complete details of such substances.

6.11.2 The Operation and Maintenance (O&M) Manual shall include, as a minimum:

- Identification and description of all potentially hazardous substances.
- Material Safety Data Sheets (MSDS) / Safety Data Sheets (SDS) for all hazardous materials used in the system.
- Health hazards and exposure risks associated with such substances.
- Recommended personal protective equipment (PPE) and safety precautions.
- Emergency response procedures and first-aid measures in case of exposure.
- Procedures for containment, clean-up, handling, transportation, storage, and disposal of hazardous materials.
- Firefighting measures and precautions applicable to the battery technology employed.

6.11.3 The Contractor shall ensure that the handling, storage, transportation, treatment, recycling, and disposal of all hazardous materials, waste products, contaminated components, and by-products generated during installation, operation, maintenance, replacement, or decommissioning of the BESS are carried out in accordance with the latest applicable statutory regulations, including the Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2022, Battery Waste Management Rules, E-Waste Management Rules, and other applicable regulations issued by the Government of India, as amended from time to time.

6.12 RECYCLING AND SUSTAINABILITY

6.12.1 The Battery Energy Storage System (BESS) shall be designed, manufactured, operated, and managed in accordance with the principles of a circular economy, promoting the concepts of Reduce, Reuse, Recycle, and Resource Recovery throughout the lifecycle of the system.

6.12.2 The Bidder/Manufacturer shall submit a comprehensive End-of-Life (EOL) Management Plan during the design stage, detailing the procedures for collection, transportation, repurposing, recycling, recovery, and disposal of batteries and associated ESS components upon completion of their useful service life.

6.12.3 The BESS shall be designed with due consideration for end-of-life management, material recovery, recyclability, and environmental sustainability. The Bidder shall encourage reuse and second-life applications of batteries, wherever technically feasible and permitted by applicable regulations, through authorized agencies specializing in battery refurbishment, repurposing, and recycling.

6.12.4 The Bidder shall provide ICF with recommendations, guidelines, and maintenance practices intended to maximize battery life, optimize system performance, and minimize environmental impact throughout the operational life of the project.

6.12.5 The Manufacturer/Producer shall comply with the provisions of the Battery Waste Management Rules, 2022 and shall fulfill all obligations related to Extended Producer Responsibility (EPR), including collection, take-back, recycling, material recovery, and environmentally sound disposal of waste batteries through authorized entities.

6.12.6 The Bidder shall establish or engage authorized collection, recycling, and waste management facilities for handling battery waste, electronic waste, hazardous waste, and other end-of-life ESS components in accordance with applicable statutory requirements and environmental regulations.

CHAPTER - 7

CODE AND STANDARDS

The IEC standards to be mandatorily adhered are as given below –

Quality Certification, Standards and Testing for BESS, PCS Quality certification and standards for BESS, PCS are essential for the successful mass-scale implementation of this technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, adherence to these standards. Hence, all components of BESS, PCS must conform to the latest and updated version of relevant standards and test certifications given below with latest amendments, additions and corrections –

7.1 FOR BATTERY ENERGY STORAGE SYSTEM:

Requirements	Standards
Cell Safety requirements	IEC-62619 + IEC 63056 or UL- 1642 or UL-1973 or UL-1642 or UN-38 or UL-9540A (Cell level safety standard)
Designations, markings, dimensions and other requirements for lithium single cells and batteries	IEC 61960
Test methods and requirements to ensure safety during transport other than for recycling or disposal	IEC 62281 or, UN-38.3
Tests and requirements for verifying the mechanical behavior	IEC-62620/IEC-62817/62933
Communications network and management systems.(BESS control system communication)	IEC 61850/ DNP3
Design, Operation & Maintenance of BESS	IEEE P2030.2.1 IEEE P2030.3
Planning & Installation of Electrical Energy Storage	IEC-62933
Container	IEC60529 IP55
Battery handling rule	Battery Waste Management rule 2022
E-waste Rule	E-Waste Management rule 2022

7.2 FOR PCS:

Requirements	Standards
General and safety requirements	IEC 62040-1 or IEC 62477-1 2022
Functional Requirements and Testing, Terminology and General Requirements	IEC 62909- 1 & 2
Power conditioners – Procedure for measuring efficiency	IEC 61683 and IEC-62909

Environmental testing	IEC 60068-2-1 (1:2007, 2:2007, 14:2009, 30: 2005)
Switches/Breakers/Connectors	IEC 60947 (1, 2, 3)
Power metering & monitoring devices	IEC 61557-12
Power quality parameters	IEEE 519-2014 or IEC 61000-4 series
Interconnection and Interoperability of Distributed Energy Resources (DER) with Electric Power Systems	IEEE 1547:2018 & IEEE 1547.1:2020
Electromagnetic Compatibility (EMC) – Immunity and Emission Requirements	IEC 61000-6-2 & IEC 61000-6-4
Degrees of Protection Provided by Enclosures (IP Code)	IEC 60529

7.3 STATUTORY COMPLIANCE:

Bidder shall comply all provisions and latest amendments thereafter of

a) CEA (Technical Standards for Connectivity to Grid) Regulation, 2007, as amended from time to time.
b) CEA (Technical Standards for construction of Electrical Plants and Electrical Lines) Regulation, 2022, as amended from time to time.
c) CEA (Grid Standard) Regulation, 2010, as amended from time to time.
d) CEA (safety requirements for construction, operation and maintenance of Electrical Plants and Electrical Lines) Regulations, 2011, as amended from time to time.
e) CEA (Measures relating to Safety and Electrical Supply) Regulations, 2023, as amended from time to time.
f) CEA (Installation and Operation of Meters) Regulations 2006, as amended from time to time.
g) CERC (Indian Electricity Grid Code) Regulation, 2023, as amended from time to time.
h) CEA (Technical standards for communication system in Power system operations) Regulation 2020, as amended from time to time. and any other applicable standard/regulations

7.4 FOR CONVERTER UNIT

a. The Proposed converter unit shall conform to the all-applicable IEC / UL / IEEE standard. Where an applicable IEC /UL/ IEEE standard is not available, BIS or any applicable international standard shall be referred to as best practice.
b. Following standards have been relied upon while preparing this instant specification for converter unit. If there is any contradiction between the instant specification and IEC / UL / IEEE Standard then the latter shall prevail. Compliance of following specification is mandatory whether the instant specification mentioned the same or not. The instant specification is guidance for inspection agency, the successful bidder has to manufacture the product as per international standards and best practices applicable for the systems whether it is mentioned in this specification or not.

IEC-61683	Efficiency Measurements
IEC 61000-6-2 Ed. 2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments

IEC 61000-6-4 Ed. 2.1	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
IEEE 519	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
IEC 60068-2-1	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14:	Environmental testing - Part 2-14: Tests- Test N: Change of temperature
IEC 60068-2-30	Environmental testing - Part 2-30: Tests- Test Db: Damp heat, cyclic (12 h +12 h cycle)
IEC 62909-1	Bi-directional grid connected power converters- Part 1: General requirements
IEC 62909-2	Bi-directional grid-connected power converters - Part 2: Interface of GCPC and distributed energy resources
IEC 62116 IEEE 1547	Test procedure of islanding prevention measures
IEC 62109 IEC 62103	Safety of power converters for use in power systems
IEEE 1547	Standard for interconnecting distributed resources with electrical power systems
IEC 62933-5-2	Safety requirements for grid-integrated EES systems - Electrochemical-based systems
IEC TS 62933-5-1	Safety considerations for grid integrated EES systems – General specification.
IEC TS 62933-4-1	Electrical energy storage (EES) systems Guidance on environmental issues - General specification
IEEE 2030.2	Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure
IEC 62924	Railway applications – Fixed installations – Stationary energy storage system for DC traction systems
Grid Connectivity	Relevant CEA Regulations (including LVRT/HVRT compliance) and Grid Code as amended and revised from time to time.
IEC 61000-1-2	Electromagnetic compatibility (EMC) – Part 1-2: General – Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena
IEC 61000-6-7	Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations

IEC 62477-1	Safety requirements for power electronic converter systems and equipment. Part 1: General - For rated system voltages not exceeding 1 000 V AC or 1 500 V DC
IEC 62477-2	Safety requirements for power electronic converter systems and equipment - Part 2: Power electronic converters from 1000 V AC or 1 500 V DC up to 36 kV AC or 54 kV DC
ISO/IEC Guide 51:2014	Safety aspects – Guidelines for their inclusion in standards

c. IEC 62933-2-1 shall be used as a reference when selecting testing items and their corresponding evaluation methods as well as principal parameters. Principal terms used in this document are defined in IEC 62933-3-1. Environmental issues are covered by IEC TS 62933-4-1. The personnel safety issues are covered by IEC TS 62933-5-1

7.5 FOR ACC STORAGE UNIT / BATTERY / CELL

a. The Proposed ACC Storage unit shall conform to the all-applicable IEC / UL/ IEEE / NFPA standard. Where an applicable IEC /UL/ IEEE/NFPA standard is not available, BIS or any applicable international standard shall be referred to as best practice. Following standards have been relied upon while preparing this instant specification for converter unit. If there is any contradiction between the instant specification and IEC / UL / IEEE Std then the latter shall prevail. Compliance of following specification is mandatory whether the instant specification mentioned the same or not. The instant specification is guidance for inspection agency, the successful bidder has to select OEM of ACC storage unit whose product is as per international standards and using best practices while manufacturing ACC storage unit whether it is mentioned in this specification or not.

IEC-61427	Secondary cells and batteries for renewable energy storage for on-grid applications, non-chemistry specific (applicable to all secondary battery types)
UL 1973	Energy storage for stationary applications such as for PV. Non-chemistry specific (applicable to all secondary battery types)
UL 1642	Standard of Lithium Batteries (Safety of Lithium-Ion Batteries)
IEC 62485-2	Safety requirements for secondary batteries and battery installations - to meet requirements on safety aspects associated with the erection, use, inspection, maintenance and disposal: Non-chemistry Specific (applicable to all secondary battery types)
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport: Applicable for storage systems using Lithium Ion chemistries

UN 38.3	"Certification for Lithium Batteries" (Transportation)
IEC 62619	Secondary cells and batteries containing alkaline or other non-acid electrolytes - **Safety requirements** for secondary lithium cells and batteries, for use in **industrial applications**
IEC 63056	Secondary cells and batteries containing alkaline or other non-acid electrolytes - **Safety requirements** for secondary lithium cells and batteries for use in electrical **energy storage systems**
IEC 63370	Lithium Ion Batteries and Charging System-Safety
IEC 62485-5	Safety requirements for secondary batteries and battery installations - Part 5: Safe operation of stationary lithium ion batteries
Battery management and Handling rules, 2001 Ministry of Environment, Forests and Climate Change.	
E-waste (management) rules-2016 Ministry of Environment, Forest and Climate Change	
IEC 61508	Functional Safety of Electrical/ Electronic/ Programmable Electronic Safety-related Systems: Applicable for all Battery Energy Storage Systems
IEC 62620	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications
UNECE R10.6	UNECE (United Nations Economic Commission for Europe) Regulation 10 Revision 6 : Electromagnetic compatibility for Vehicle Use.

7.6 For BESS / EES / EPS

7.7

BESS is the complete system consists of converter unit, ACC storage unit, BMS, EMS etc. The individual system shall comply corresponding IEC / UL. But collectively overall system shall meet the requirements of the following standards and others applicable standards.

IEC 62933 -1	Electrical energy storage (EES) systems – Part 1: Vocabulary
IEC 62933-2-1	Electrical energy storage (EES) systems - Part 2-1: Unit parameters and testing methods - General specification
IEC TS 62933-2-2	Electrical energy storage (EES) systems - Part 2-2: Unit parameters and testing methods - Application and performance testing
IEC TS 62933-3-1	Electrical energy storage (EES) systems - Part 3-1: Planning and performance assessment of electrical energy storage systems - General specification

IEC TS 62933-3-3	Electrical energy storage (EES) systems - Part 3-3:Planning and performance assessment of electrical energy storage systems – Additional requirements for energy intensive and backup power applications
IEC TS 62933-4-1	Electrical energy storage (EES) systems – Part 4-1: Guidance on environmental issues - General specification
IEC TS 62933-5-1	Electrical energy storage (EES) systems - Part 5-1: Safety considerations for grid-integrated EES systems – General specification
IEC 62933-5-2	Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems-Electrochemical-based systems
IEC 61850 DNP3	Communications networks and management systems. (BEES control system communication)
UL 9540	Safety of energy storage systems and equipment
NFPA 855	Standard for the Installation of Stationary Energy Storage Systems
UL 9540A	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems
IEEE P2030.3	Standard for test procedures for electric energy storage equipment and systems for electric power systems applications

7.8 FOR BMS ELECTRONICS

List of standards which shall also be applicable for BMS Electronics for the ACC storage unit:

IEC 60068-2-1	Environmental testing- Test A: Cold
IEC 60068-2-2	Environmental testing -Test B: Dry heat
IEC 60068-2-30	Environmental testing -Test Db: Damp heat, cyclic (12 h +12h cycle)
IEC 61000-4-4	Electrical fast transient/burst immunity test
IEC 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-6	Immunity to conducted disturbances, induced by radio- frequency fields

7.9 For UPS

Though bidirectional inverter or 4 quadrant Inverter is better techno economical solution compare to grid connected UPS with 1C battery charger. In case UPS is considered offered then following standards shall apply for UPS Part

IEC 62040 -1	Uninterruptible power systems (UPS) - Part 1: Safety requirements
IEC 62040-2	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
IEC 62040-3	Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements
IEC 62040-4	Uninterruptible power systems (UPS) - Part 4: Environmental aspects - Requirements and reporting
IEC 62040-5-3	Uninterruptible power systems (UPS) - Part 5-3: DC output UPS - Performance and test requirements

CHAPTER- 8

PROTECTION SYSTEM

8.1 **Fire Detection and Fire Protection System:** The Contractor shall provide a complete fire detection, alarm and fire suppression system for the entire BESS, including battery modules, PCS, control panels and auxiliary equipment, in compliance with applicable international standards such as UL 9540, UL 9540A, NFPA 855 and IEC standards. The system shall include smoke, heat and fire detection, automatic fire suppression using suitable clean-agent extinguishing systems, emergency shutdown facilities and portable fire extinguishers. CCTV surveillance with day and night monitoring capability shall be provided for continuous monitoring of the BESS and shall be integrated with the EMS and SCADA systems.

8.2 Protection System Requirements: The BESS protection system shall continuously monitor all operating parameters and automatically detect, isolate and clear faults without affecting healthy portions of the system. The system shall distinguish between internal faults within the BESS and external faults associated with the grid or distribution network and shall provide local and remote alarms, fault indications and event recording. Protection coordination shall ensure that the protective device nearest to the fault operates first. A lightning protection system shall also be provided for the complete installation.

8.3 AC and DC Protection: The requirements of AC/DC protection system are listed below:

AC Protection	DC Protection
AC under/over voltage	DC under/over voltage
Over current protection	DC over current relay
Earth fault protection	Ground fault protection
Breaker failure protection	Breaker failure protection
Transient/surge protection	Transient/surge protection
Synchronization check for relay	Synchronization check for relay if any

8.4 Temperature Protection: A temperature monitoring and protection system shall be provided for battery cells, battery modules, PCS and all critical equipment. The system shall continuously monitor temperatures and automatically generate alarms, initiate corrective actions or safely shut down the system in the event of abnormal temperature rise, cooling system failure or thermal runaway conditions.

8.5 Electrolyte Leakage Protection: Where applicable to the selected battery technology, suitable electrolyte leak detection and containment arrangements shall be provided to prevent leakage from affecting nearby equipment, personnel or the environment.

8.6 Emergency Stop and Isolation: The BESS shall be equipped with local and remote Emergency Stop (E-Stop) facilities capable of safely isolating the battery system and PCS from the ICF electrical network. Emergency shutdown shall be automatically initiated in the event of protection system failure, breaker failure, loss of control power, fire detection, thermal runaway or any other critical fault condition. All emergency shutdown events shall be alarmed and recorded in the EMS and SCADA systems.

CHAPTER 9

ENVIORNMENTAL CONDITIONS

The Battery Energy Storage System (BESS), including battery cells/modules, Battery Management System (BMS), Power Conversion System (PCS), Energy Management System (EMS), control equipment and all associated auxiliary systems, shall be designed, manufactured and tested for reliable and continuous operation under the environmental conditions specified herein.

The Contractor may provide suitable environmental control measures such as air conditioning, liquid cooling, ventilation or other thermal management systems as required to ensure compliance with the specified operating limits. No additional consideration shall be provided for battery sizing adjustments due to temperature derating. The PCS and associated power electronic equipment shall be designed for operation at an ambient temperature of up to 50°C and may utilize cooling or ventilation systems to maintain optimum operating performance and efficiency.

9.1 Site Environmental Conditions

The BESS shall be designed to operate under the following environmental conditions:

SL. No	Description	Value
1	Ambient Temperature	As per latest ASHRAE Climatic Design Conditions applicable to the project location
2	Climatic Conditions	As per latest ASHRAE Climatic Design Conditions applicable to the project location
3	Seismic Requirement	Seismic Zone III as per applicable Indian Standards
4	Relative Humidity	67% annual average

9.2 Thermal Design Criteria

For the design of air-conditioning, ventilation and thermal management systems, an ambient temperature of **35.9°C**, corresponding to the **2% Cooling Dry Bulb (DB) / Mean Coincident Wet Bulb (MCWB)** condition as defined in the latest ASHRAE Climatic Design Conditions, may be considered as the design basis.

The Contractor shall ensure that all equipment ratings, cooling systems, battery performance guarantees and operational parameters are achieved under the specified environmental conditions throughout the project life.

CHAPTER 10

WARRANTY, COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT

11.1 Warranty

a. The Contractor shall provide a comprehensive free warranty for the complete BESS, including batteries, PCS, BMS, EMS, control systems and all associated equipment, for a period of five (05) years from the date of commissioning and taking over of BESS by Railway. An additional extended warranty of five (05) years shall be provided for all major equipment and components. Any component having a service life less than ten (10) years shall be replaced by the Contractor during the warranty period at no additional cost to ICF.

b. OEM Warranty support: - The contractor shall ensure that OEM provides a direct warranty for major components (including battery, PCS and BMS). This warranty must be explicitly issued in favour of ICF to ensure continuity of support. The OEM shall provide formal under taking to Honour the warranty term directly to ICF in the event of any default by the contractor.

11.2 Penalty

a. The Contractor shall ensure continuous availability of the BESS through timely preventive and corrective maintenance. If the BESS remains non-operational for more than ninety-six (96) hours due to reasons attributable to the Contractor, a penalty of ₹30,000 per day shall be levied.

b. If the availability falls below 98%, a penalty is levied for every 1% (or part thereof) shortfall. For every percentage point drop in annual availability below 98%, the capacity charges payable to the developer shall be reduced by a factor of 1.5 x of the present tariff rate of ICF.

c. Any penalty for non-performance, shortfall in guaranteed parameters, or delay in execution shall be mutually agreed upon between the successful tenderer and ICF and incorporated in the contract agreement.

11.3 Comprehensive Annual Maintenance Contract (CAMC)

ICF reserves the right to enter into a Comprehensive Annual Maintenance Contract (CAMC) with the Contractor after expiry of the Five (05) years free warranty period. The Contractor shall provide maintenance support for the entire operational life of the BESS. The Comprehensive Annual Maintenance Contract charges shall be payable at the rate accepted in Tender.

NOTE:- ICF reserves the right to enter into fresh agreement @ mutually agreed terms and condition for CAMC beyond 5 years of Warranty period. Successful bidder shall support till the end of life of BESS.

11.4 Scope of Comprehensive Annual Maintenance Contract (CAMC)

a. During the CAMC period, the Contractor shall be responsible for carrying out all scheduled preventive maintenance, inspections, testing, calibration, repairs and replacement of defective components necessary to maintain the BESS in safe and reliable operating condition. The Contractor shall submit a detailed preventive maintenance schedule and scope of work along with the bid.

b. The Contractor shall carry out all repairs arising during scheduled maintenance activities at no additional cost to ICF. In the event of any unscheduled failure or breakdown of BESS equipment, the Contractor may undertake necessary repairs at its own cost where the failure is attributable to equipment defects, workmanship deficiencies or inadequate maintenance.

c. Where any repair is claimed to be chargeable to ICF, the cause of failure and responsibility shall be established through a joint investigation conducted by representatives of ICF and the Contractor. The findings shall be documented in a jointly signed investigation report. In case of any dispute regarding responsibility, the decision of ICF shall be final and binding on the Contractor.

d. The Contractor shall submit an estimate for materials required for repairs that are determined to be outside the scope of CAMC and chargeable to ICF. Such repairs shall be undertaken only after approval by ICF and shall be paid separately as applicable.

e. All spare parts, assemblies and replacement components, excluding approved consumables, shall be included within the scope of CAMC. The Bidder shall submit a detailed list of consumables along with unit rates as part of the bid submission.

f. The tenderer shall provide a comprehensive list of recommended spare parts, along with quantities, required to ensure reliable operation and maintenance of the BESS after handover to ICF. The tenderer shall also certify that the recommended spares are adequate for maintaining the system in functional condition during the intended operational period.

11.5 Preventive Maintenance and Remote Monitoring

a. Preventive maintenance of the BESS shall be carried out in accordance with Clause 7.6 of IEC TS 62933-5-1 and the recommendations of the equipment manufacturers. The objective of preventive maintenance shall be to detect and rectify abnormal conditions before they result in equipment failure, safety hazards or loss of system availability.

b. The BESS shall be equipped with a remote monitoring and diagnostic system capable of continuously monitoring system performance, operational status, battery condition, State of Charge (SOC), State of Health (SOH), temperatures, efficiency, alarms and other critical operating parameters. Remote monitoring shall facilitate condition-based maintenance, fault diagnosis and assessment of remaining useful life of major system components.

c. The monitoring system shall be capable of identifying abnormal operating trends, sensor failures, communication failures and erroneous measurements. All operational data shall be transmitted, recorded and analyzed in a timely manner to support predictive maintenance and performance evaluation. The real-time data logging and monitoring sampling interval must be 1 second, with a trend storage interval of 1 minute.

d. For unattended operation, the BESS shall continuously monitor its operating condition and automatically detect abnormal situations. Upon detection of unsafe operating conditions, the system shall automatically initiate alarms, protective actions and transition to a safe operating state without requiring operator intervention.

e. All preventive maintenance activities, inspection records, alarms, fault logs, performance reports and diagnostic data shall be maintained by the Contractor and made available to ICF throughout the warranty, extended warranty and CAMC periods.

CHAPTER 11

LIST OF LIKELY SOURCES FOR ELECTRICAL & GENERAL SERVICE ITEMS / EQUIPMENTS: -

S. No.	Name of article	Specification / IS	Likely sources
1	Transformers	IS: 2026/ IEC 60076	Kirloskar, Crompton Greaves, KEL, Voltech, Voltamp, Schneider or similar reputed manufacturer / brand / make
2	VCB	IEC 62271-200 IS: 3427	Schneider, Crompton Greaves, Siemens, ABB, Lauritz Knudsen or similar reputed manufacture/brand/make
3	MCCB	IS: 13947(Part-1 & /sec or latest,	L&T, GE, Legrand, Schneider Electric, ABB, Siemens, Indoasian or similar reputed manufacture/brand/make
4	MCB	IS: 8828/96 & (IS: 13032-1991)/ or latest, IEC 60947 The breaking capacity of MCB'S should be minimum 10KA of 'C' curve with ISI mark. All DB's should be IP 43 or better Protection (Metal door) and MCB/DB'S along with cable end box.	Siemens, HagerR, LAURITZ KNUDSEN, SCHNEIDER, GE, LEGRAND, BCH, ABB or similar reputed manufacture/ brand/make
5	GI Pipe 'B'-class/ C.I pipe.	IS: 1239 (Part- 1)/ 2004 or latest/ relevant latest	Tata, Jindal, Apollo or similar reputed manufacture/brand/make
6	Cable Lugs & Gland.	IS:12943/1990 or latest	Dowell, Comet, Jainson or similar reputed manufacture/brand/make
7	FRLSH Wire	IS: 694-1990	Havel's, Finolex, Anchor, Poly Cab, RR Kabal, HPL, KEI or similar reputed manufacture/ brand/make
8	Bi-Directional Power Converters	Applicable IEC/IEEE/Grid code	Delta Electronics, Siemens, Toshiba, SMA; Fimer or similar reputed manufacture/brand/make
9	Containerized LFP Batteries	Applicable international standards	Delta Electronics, Panasonic, Samsung, LG Chem or similar reputed manufacture/brand/make
10	Energy Management System	Applicable International Standards	Delta Electronics, Siemens, ABB, Schneider or similar reputed manufacture/brand/make

CHAPTER 12

CONDITION OF TENDER AND INSTRUCTION TO TENDERER(S)

I. ICF SCOPE OF SUPPLY:

a. Electrical energy required for works / activities such as welding, drilling, grinding will be supplied by this administration at chargeable basis.

b. ICF will co-ordinate with the contractor in supplying air free of cost only if the contractor desires to use his air operated / concrete power breakers.

c. ICF will co-ordinate for availing necessary power shut downs in case of requirement. The contractor shall approach ICF site supervisor with written request well in advance for getting the shutdown.

II. INSPECTION, TESTING AND COMMISIONING OF THE INSTALLATIONS AFTER COMPLETION OF THE WORK:

a. Good engineering practices suggested by ICF site engineer shall be followed by the contractor while carrying out the erection work.

b. The contractor shall get the work inspected during the execution by AEE/M-II or his authorized representative at every stage as indicated below:

c. The contractor shall supply the sample qty. (both purchase and manufacture items) for each supply items for inspection and necessary approval by AEE/M-II before supplying the bulk qty.

d. The contractor shall offer stage inspection for completion of each work and should get clearance for every stage before proceeding to the next stage.

e. After completion of all wiring and installation the following tests are to be conducted before commissioning.

i. The insulation resistance value of the all wiring circuitry cables shall be measured and to be recorded.

ii. The earth resistance value of the individual earth pit shall be checked and to be recorded.

iii. The earth continuity up to the all Electrical installation shall be checked and to be recorded.

iii. Any other checks and tests as instructed by ICF site engineer shall be conducted and to be recorded.

III. COMPLETION TIME: The contractor shall complete the entire work in all respects as per **Notice Inviting Tender** from the date of issue of Letter of Acceptance.

Note:

a) ***However, early completion of the entire work is mostly preferred. If any unavoidable delays cause in the part of ICF and its associated departments in later stages, extension of completion time will be given subject to the advanced approval obtaining from the competent authority by appropriate written request.***

b) ***If the work is not completed within the due date, the contract will be terminated by giving 7 days and 48 hours notice as per the General Conditions of Contract.***

CHAPTER – 13

COMMERCIAL TERMS AND CONDITIONS

Note: ***The contract against this specification will be governed by the Indian Railway General Conditions of contract applicable to Works Contracts as amended and/ or corrected up to date, in addition to the special conditions set forth in this specification. Wherever these special conditions are at variance with the General Conditions of contract, the special conditions shall prevail. General Conditions of contract available may be accessed through the path*** **https://indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1,304,366,526,2624**

Although details presented in this Tender document have been compiled with all reasonable care, it is tenderer's responsibility to satisfy themselves that the information/documents are adequate and that there are no conflicts between various documents/stipulations. No dispute or claims will be entertained on this account. Offer proposal preparation is the responsibility of the tenderer and no relief or consideration can be given for errors and omissions.

1.0 INSTRUCTIONS REGARDING QUOTING OF RATES:

The tenderer has to quote the rate as collective uniform percentage `ABOVE' or `BELOW' or `AT PAR' value of SCHEDULE OF RATES. The rates mentioned in the tender schedule shall be inclusive of all cost of procurement (if any associated items applicable to this contract), applicable Taxes & duties, handling transportation to site of works, storage, wastage etc.

1.1 The quantities mentioned in the Schedule of rates are tentative and subject to variation.

2.0 PERFORMANCE GUARANTEE CERTIFICATE

a. The successful bidder shall have to submit a Performance Guarantee (PG) within 21 (Twenty-one) days from the date of issue of Letter of Acceptance (LOA). Extension of time for submission of PG beyond 21 (Twenty-one) days and upto 60 days from the date of issue of LOA may be given by the Authority who is competent to sign the contract agreement. However, a penal interest of 12% per annum shall be charged for the delay beyond 21(Twenty-one) days, i.e. from 22nd day after the date of issue of LOA. Further, if the 60th day happens to be a declared holiday in the concerned office of the Railway, submission of PG can be accepted on the next working day.

In all other cases, if the Contractor fails to submit the requisite PG even after 60 days from the date of issue of LOA, the contract will be terminated. In case contract is terminated railway is entitled to forfeit Earnest Money Deposit and other dues payable against this contract. In case a tenderer has not submitted Earnest Money Deposit on the strength of their registration as a Startup recognized by Department of Industrial Policy and Promotion (DIPP) under Ministry of Commerce and Industry, DIPP shall be informed to this effect.

The failed Contractor shall be debarred from participating in re-tender for this work.

b. The successful bidder shall submit the performance Guarantee (PG), amounting to 5% of the original contract value, along with an Additional Performance Guarantee as specified in para (h) below in any of the following forms:

1) A deposit of cash;
2) Irrevocable Bank Guarantee;
3) Insurance Surety Bond as per Annexure-XVII of IRGCC.

Note: In case of Extension of Date of Completion selected bidder needs to submit extended Insurance Surety Bond/Fresh Insurance Surety Bond/Fresh Performance Security, in any form as given above, before expiry of existing Insurance Surety Bond.

4) Government securities including State Loan Bonds at 5% below the market value;
5) Pay orders and Demand Drafts tendered by any Scheduled Commercial Bank of India.
6) Guarantee bonds executed or Deposits Receipts tendered by any Scheduled Commercial Bank of India;
7) Deposit in the Post Office Saving Bank;
8) Deposit in the National Savings Certificates;
9) Twelve years National Defense Certificates;
10) Ten years Defense Deposits;
11) National Defense Bonds and
12) Unit Trust Certificates at 5% below market value or at the face value whichever is less. Also, FDR in favour of FA&CAO / ICF, (free from any encumbrance) would be accepted.

(c) The Performance Guarantee shall be submitted by the successful bidder after the Letter of Acceptance (LOA) has been issued, but before signing of the contract agreement. This P.G. shall be initially valid upto the stipulated date of completion plus 60 days beyond that. In case, the time for completion of work gets extended, the Contractor shall get the validity of P.G. extended to cover such extended time for completion of work plus 60 days.

(d) The value of PG to be submitted by the Contractor is based on original contract value and shall not change due to subsequent variation(s) in the original contract value.

(e) The Performance Guarantee (PG) shall be released after physical completion of the work based on 'Completion Certificate' issued by the competent authority stating that the Contractor has completed the work in all respects satisfactorily.

(f) Whenever the contract is rescinded, the Performance Guarantee already submitted for the contract shall be encashed.

(g) The Engineer shall not make a claim under the Performance Guarantee except for amounts to which the President of India is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

(i) Failure by the Contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer may claim the full amount of the Performance Guarantee.

(ii) Failure by the Contractor to pay President of India any amount due, either as agreed by the Contractor or determined under any of the Clauses/Conditions of the Agreement, within 30 days of the service of notice to this effect by Engineer.

(iii) The Contract being determined or rescinded under clause 62 of IRGCC conditions.

(h) If the tender is accepted on the quoted rates of bidder which is below the advertised tender value, an additional performance security shall be submitted by the bidder as tabulated below: -

Bid Quoted in % of the Advertised Cost	Additional Performance Guarantee (%)
Below 0- 5 % (inclusive)	Nil
Below 5%	5%

3.0. SECURITY DEPOSIT

3.1 The Security Deposit shall be 5% of the contract value. The Bid Security (EMD) submitted by the Contractor with his tender will be retained/encashed by the Railways as part of security for the due and faithful fulfillment of the contract by the Contractor. Provided further that, if Contractor submits the Cash or Term Deposit Receipt issued from a Scheduled commercial bank of India or irrevocable Bank Guarantee Bond from a Scheduled commercial bank of India, either towards the Full Security Depositor the Part Security Deposit equal to or more than Bid Security, the Railway shall return the Bid Security, to the Contractor.

3.2 Balance of Security Deposit may be deposited by the Contractor in cash or Term Deposit Receipt issued from Scheduled commercial bank of India or irrevocable Bank Guarantee bond issued from Scheduled commercial bank of India, or may be recovered at the rate of 6% of the bill amount till the full Security Deposit is recovered. Provided also that in case of defaulting Contractor, the Railway may retain any amount due for payment to the Contractor on the pending "on account bills" so that the amounts so retained (including amount guaranteed through Performance Guarantee) may not exceed 10% of the total value of the contract.

3.3 The Irrevocable Bank Guarantee submitted towards Security deposit shall be initially valid up to the stipulated date of Maintenance period plus 60 days and shall be extended from time to time, depending upon extension of contract granted in terms of Clause 17A and 17B of the Standard General Conditions of Contract.

Note: Security Deposit deposited in cash by the Contractor or recovered from the running bills of a Contractor or submitted by contractor as Term Deposit Receipt(s) can be refunded/returned to the contractor, in lieu of irrevocable Bank Guarantee bond issued from scheduled commercial bank of India, to be submitted by him, for an amount equal to or more than the already available Security Deposit, provided however that, in a contract of value less than Rs. 50 Crore, such refund/ return of the already available Security Deposit is permitted up to two times and in a contract of value equal to or more than Rs. 50 Crore, such refund / return of the already available Security Deposit is permitted up to three times.

3.2 (i) Refund of Security Deposit:

Security Deposit mentioned in sub clause **(3.1)** above shall be returned to the Contractor after, the following:

i. Final Payment of the Contract (as per clause 51.(1) of IRGCC) and
ii. Signature of Final Supplementary Agreement or Certification by Engineer that Railway has No Claim on Contractor and
iii. Maintenance Certificate issued, on expiry of the maintenance period (as per clause 50.(1) of IRGCC), in case applicable.

3.2 (ii) ***Forfeiture of Security Deposit:*** Whenever the contract is rescinded as a whole under clause 62 (1) of IRGCC, the Security Deposit already with railways under the contract shall be forfeited. However, in case the contract is rescinded in part or parts under clause 62 (1) of IRGCC, the Security Deposit shall not be forfeited.

3.3 No interest shall be payable upon the Earnest Money and Security Deposit or amounts payable to the Contractor under the Contract, but Government Securities deposited in terms of Sub-Clause 16.(4)(b) of IRGCC) this clause will be payable with interest accrued thereon.

4.0 ACTIVITY CHART: You shall submit the 'Activity Chart' detailing from starting of the work till completion, within 7 days from the date of issue of LOA. The layout plan / drawing of proposed Schematics, Guaranteed technical particulars (GTP), wiring, general electrical installation arrangement etc. shall be submitted to Dy. CEE/M or his representative for prior approval within 15 days from the date of issue of LOA.

5.0 COMPLETION REPORT: On completion of entire work, the contractor shall submit a completion certificate countersigned by the supervisor under whose direct inspection the work has been carried out.

6.0 TERMS OF PAYMENT: No advance payment will be made against this contract. However Contractor may claim for progressive payment for the Items specified in the schedule of Rates as follows:

a. Supply of Materials for **"Supply Items"** - 80% of Schedule of Rates
b. Supply of Materials for **"Supply & Erection Items"** - 65% of Schedule of Rates
c. On completion of works to the extent completed for "**Individual schedule items**" for each bill – 100% of Schedule of Rates
d. The balance will be paid only on successful completion and commissioning of the respective works and after issue of completion report by SSE & AEE/M for that work.

7.0 PAYMENT OF CONTRACTORS BILLS THROUGH ELECTRONIC FUND TRANSFER (EFT)

a. The tenderer should submit the consent in a mandate form of **Enclosure-1** for receipt of payment through NEFT and provide the details of bank A/c in line with RBI guidelines for the same. These details will include bank name, branch name & address, A/c type, bank A/c no. and bank and branch code as appearing on MICR cheque issued by bank. Further, the tenderer should also submit certificate from their bank certifying the correctness of all above mentioned information in the mandate form.
b. The Tenderer / contractor should indicate their NEFT (Electronic Fund Transfer) contractor code number (allotted, if any) for payment

8.0 DEDUCTION OF INCOME TAX & WORKS CONTRACT TAX AT SOURCE:

a. Being a indivisible works contract, Sales Tax, Excise Duty etc., are not payable separately.
b. Income Tax and any other Government levies, shall be recovered at source at the rates prevailing at the time of passing the bill.
c. Present rate of **Income Tax** is 2%. Necessary certificate will be issued to the Contractor for Deduction of Income Tax at source.

9.0 GUARANTEE:

The materials supplied and the works carried out against this contract shall be guaranteed for **FIVE YEARS** from the date of completion of the work. The materials becoming defective during the guarantee period shall be replaced free of cost and the defects arising out of the works shall be rectified free of charge without delay.

10.0 VARIATION IN EXTENT OF CONTRACT:

10.1 Modification to Contract to be in Writing: In the event of any of the provisions of the contract required to be modified after the contract documents have been signed, the modifications shall be made in writing and signed by the Railway and the Contractor and no work shall proceed under such modifications until this has been done. Any verbal or written arrangement abandoning, modifying, extending, reducing or supplementing the contract or any of the terms thereof shall be deemed conditional and shall not be binding on the Railway unless and until the same is incorporated in a formal instrument and signed by the Railway and the Contractor, and till then the Railway shall have the right to repudiate such arrangements.

10.2(1) Powers of Modification to Contract: The Engineer on behalf of the Railway shall be entitled by order in writing to enlarge or extend, diminish or reduce the works or make any alterations in their design, character position, site, quantities, dimensions or in the method of their execution or in the combination and use of materials for the execution thereof or to order any additional work to be done or any works not to be done and the Contractor will not be entitled, to any compensation for any increase/reduction in the quantities of work but will be paid only for the actual amount of work done and for approved materials supplied against a specific order.

10.2(2)(i) Unless otherwise specified in the special conditions of the contract, the accepted variation in quantity of each individual item of the contract would be upto 25% of the quantity originally contracted, except in case of foundation work (in which no variation limit shall apply). However, the rates for the increased quantities shall be as per sub-para (iii) below.

(ii) The Contractor shall be bound to carry out the work at the agreed rates and shall not be entitled to any claim or any compensation whatsoever upto the limit of 25% variation in quantity of individual item of works.

(iii) In case an increase in quantity of an individual item by more than 25% of the agreement quantity is considered unavoidable, the same shall be executed at the following rates.

a). Quantities operated in excess of 125% but upto 140% of the agreement quantity of the concerned item, shall be paid at 98% of the rate awarded for that item in that particular tender;

b). Quantities operated in excess of 140% but upto 150% of the agreement quantity of the concerned item shall be paid at 96% of the rate awarded for that item in that particular tender;

c). Variation in quantities of individual items beyond 150% will be avoided and would be permitted only in exceptional unavoidable circumstances and shall be paid at 96% of the rate awarded for that item in that particular tender.

d) Variation to quantities of minor value items:.

The limit for varying quantities for minor value items shall be 100% (as against 25% prescribed for other items). A minor value item for this purpose is defined as an item whose original agreement value is less than 1% of the total original agreement value

i). Quantities operated upto and including 100% of the agreement quantity of the concerned minor value item, shall be paid at the rate awarded for that item in that particular tender.

ii) Quantities operated in excess of 100% but upto 200% of the agreement quantity of the concerned minor value item, shall be paid at 98% of the rate awarded for that item in that particular tender.

iii) Variation in Quantities of individual minor value items beyond 200% will be avoided and would be permitted only in exceptional unavoidable circumstances and shall be paid at 96% of the rate awarded for that item in that particular tender.

11.0 INDEMNITY BOND

i) PART PAYMENT

a. An Indemnity Bond to Indemnity this Administration against loss or damage of all the materials for which part payment is effected shall have to be executed by contractor in the manner specified by this Administration.

b. When as the said contractor is entitled for PART PAYMENT for items in Schedule of Rate as per payment clause 5.0 of Annex-B as per conditions of contract on executing an Indemnity Bond against loss or damage for all the material for which part payment has been arranged.

c. The said contractor hereby agreed to hold the materials for which part payment is payable as per condition of the agreement, entrusted to him and his possession in trust for the ICF Administration as their property until such time as the works entrusted to him are completed and handed over back to the representatives of the ICF Administration as per the terms of the Agreement.

d. The said contractor further agrees to hold the ICF – Administration harm less and free from all liabilities for all losses, damages, etc., arising from any cause, whatsoever to the material while in his possession, and further under takes to indemnify and reimburse the ICF Administration to the extent of loss or damage caused to the materials or any loss or any claims to the ICF – Administration in respect of the said material while in possession of the contractor.

ii) GST

Contractor hereby agrees to indemnify and hold harmless the Indian Railways from and against any and all losses, including loss on account of Input Tax Credit and all losses incurred by the Indian Railways relating to or arising out of or in connection with any actual or threatened claim, legal action, proceedings, prosecution or inquiry by or against the Indian Railways arising out, directly or indirectly, of failure by the contractor to comply with the provisions of GST and related laws, or based upon or arising from any failure by the Contractor

12.0 EXTENSION OF TIME WITH LIQUIDATED DAMAGE (LD) FOR DELAY DUE TO CONTRACTOR (17-B of IRGCC):

a. With liquidated Damage (LD): The time for the execution of the work or part of the works specified in the contract documents shall be deemed to be the essence of the contract and the works must be completed not later than the date(s) as specified in the contract. If the Contractor fails to complete the works within the time as specified in the contract for the reasons other than the reasons specified in Clause 17 and 17-A of IRGCC, the Railway may, if satisfied that the works can be completed by the Contractor within reasonable short time thereafter, allow the Contractor for further extension of time (Proforma at Annexure-VII) as the Engineer may decide. On such extension the Railway will be entitled without prejudice to any other right and remedy available on that behalf, to recover from the Contractor as agreed damages and not by way of penalty for each week or part of the week, a sum calculated at the rate of Liquidated Damages as decided by Engineer, between 0.05% to 0.30 % of contract value of the works for each week or part of the week.

b. For the purpose of this Clause, the contract value of the works shall be taken as value of work as per contract agreement including any supplementary work order/contract agreement issued. Provided also, that the total amount of liquidated damages under this condition shall not exceed 5% of the contract value or of the total value of the item or groups of items of work for which a separate distinct completion period is specified in the contract.

c. Provided further, that if the Railway is not satisfied that the works can be completed by the Contractor and in the event of failure on the part of the contractor to complete the work within further extension of time allowed as aforesaid, the Railway shall be entitled without prejudice to any other right or remedy available in that behalf, to appropriate the contractor's Security Deposit and rescind the contract under Clause 62 of these Conditions, whether or not actual damage is caused by such default.

II. INSTRUCTIONS TO CONTRACTORS

1.0. PROGRAMME OF WORK

a. Immediately on issue of letter of acceptance of this tender, the contractor should submit a programme of work showing the activities work wise for completing the whole work within the stipulated period of completion, in consultation with the Dy. CEE/M. If so desired by the Dy. CEE/M., the contractor shall submit further programme from time to time taking into consideration the latest progress achieved till then.

b. This is to reiterate that the Railway reserves the right of terminating the contract at any stage of review of the progress under (a) above, if the above agreed programme (s) are not adhered to within the margin of 10 % as envisaged in Clause 62 (I) (viii) of the General Conditions of Contract.

c. Non submission of the programme as envisaged in (a) above shall entitle Railway to terminate the contract under clause 62 of the General Conditions of Contract.

d. The Contractor shall start the work within 15 days from the date of issue of letter of Acceptance.

e. It is the responsibility of the contractor to get all his doubts clarified about all the points mentioned in this specification. If required he may visit the site duly fixing a prior appointment with Dy. CEE/M

2.0. EMPLOYMENT OF QUALIFIED SUPERVISOR FOR THE EXECUTION OF WORK:

2.1 In terms of provisions of new Clause 26A.1 to the General Conditions of Contract (GCC), contractor shall also employ following Qualified Engineers during execution of the allotted work:

a). One Qualified Graduate Engineer when cost of work to be executed is Rs.200 lakh and above, and

b). One Qualified Diploma Holder Engineer when cost of work to be executed is more than Rs. 25 lakh, but less than Rs. 200 lakh.

2.2 Further, in case the contractor fails to employ the Qualified Engineer, as aforesaid in clause 2.1 above, he, in terms of provisions of Clause 26A.2 to the General Conditions of Contract, shall be liable to pay an amount of Rs. 40,000 and Rs. 25,000 for each month or part thereof for the default period for the provisions, as contained in Para 2.1(a) and 2.1(b) above respectively.

3.0 CONTRACT LABOUR

The contractor's attention is drawn to Clause 55A of the General conditions of contract regarding provision of contract labour (Regulation and abolition Act 1970) and the contractor shall comply with the provision in all respects to the extent applicable under this contract and shall face consequences at his risk and responsibilities for any lapses on his part.

4.0 SHRAMIK KALYAN PORTAL: The following instructions given for Updating of **"ShramikKalyan Portal"** vide clause 55-C of IRGCC for all the tenders irrespective of tender value:

(i) Contractor is to abide by the provisions of Payment of Wages act & Minimum Wages act in terms of clause 54 and 55 of Indian Railways General Condition of Contract. In order to ensure the same, an application has been developed and hosted on website **'www.shramikkalyan.indianrailways.gov.in'**. Contractor shall register his firm/company etc. and upload requisite details of labour and their payment in this portal. These details shall be available in public domain. The Registration/ updation of Portal shall be done as under:

(a) Contractor shall apply for onetime registration of his company/firm etc. in the Shramikkalyan portal with requisite details subsequent to issue of Letter of Acceptance. Engineer shall approve the contractor's registration in the portal within 7 days of receipt of such request.

(b) Contractor once approved by any Engineer, can create password with login ID (PAN No.) for subsequent use of portal for all LoAs issued in his favour.

(c) The contractor once registered on the portal, shall provide details of his Letter of Acceptances (LoA) / Contract Agreements on shramikkalyan portal within 15 days of issue of any LoA for approval of concerned engineer. Engineer shall update (if required) and approve the details of LoA filled by contractor within 7 days of receipt of such request.

(d) After approval of LoA by Engineer, contractor shall fill the salient details of contract labours engaged in the contract and ensure updating of each wage payment to them on shramikkalyan portal on monthly basis.

(e) It shall be mandatory upon the contractor to ensure correct and prompt uploading of all salient details of engaged contractual labour & payments made thereof after each wage period.

(ii) While processing payment of any 'On Account bill' or 'Final bill' or release of 'Advances' or 'Performance Guarantee / Security deposit', contractor shall submit a certificate to the Engineer or Engineer's representatives that "I have uploaded the correct details of contract labours engaged in connection with this contract and payments made to them during the wage period in Railway's Shramikkalyan portal at 'www.shramikkalyan.indianrailways.gov.in' till ____Month, ____Year."

5.0 ISSUE OF I.D CARD FOR CONTRACT LABOUR:

Contractor has to engage only Police verified Pvt. Labour / Pvt Employee. If any new person (other than already verified) to be engaged by contractor he has to submit proof of police verification application for issuing a "Temporary permission" like present permit system. However contractor has to arrange PV report within permissible period i.e. one month for person from Tamilnadu and three months for persons from other states.

6.0 Provisions of "The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996" and "The Building and Other Construction Workers' Welfare Cess Act, 1996":

(vide clause 55-D of IRGCC) The tenderers, for carrying out any construction work, shall get themselves registered with the Registering Officer under Section-7 of the Building and Other Construction Workers Act, 1996 and rules made thereto by the concerned State Govt., and submit certificate of Registration issued from the Registering Officer of the concerned State Govt. (Labour Dept.). The Cess shall be deducted from contractor's bills as per provisions of the Act.

7.0 ENTRY PERMITS

a. The contractor shall obtain revised Entry Permit and following work Permits as required, introduced with effect from 15.6.09, vide CWE/Shell/ICF Procedure Order No. 03 dt.6.6.2009.

Revised Entry Permit

Permit to work at Height to avoid fall of person or tools (Only to approach to the work area at height above 2 M)

Hot work permit for Welding Gas Cutting, use of open flames Etc.,

Excavation Permit.

b. The above permits shall be available with the contractor or his supervisor of the work site and shall be produced on demand by the site supervisor and any other authority of this Administration.

8.0 INSTRUCTIONS FOR EXECUTION OF WORK

a. The Contractor shall ensure that their work shall not affect the regular coach production of the factory.

b. The Contractor shall make his own transport arrangements for drawing any materials from construction Stores to site, and for moving the items if any from site to Construction stores situated inside Shell Factory.

c. The Contractor shall be solely responsible for the orderly conduct of his authorized persons as well as labourers within ICF premises and at work place.

d. The contractor shall be responsible to see that the work executed by him does not if any way infringe or damage the existing structures or other works in the area. The contractor is liable to take responsibility and rectify for the damage if any caused to the ICF property during the execution of their work.

e. The contractor shall be responsible for any damage to all materials in his custody till the work is completed and finally handed over to this administration.

f. Safety accessories like helmets, belts, safety boots, Hand Glouses, Goggles and other safety items shall be used by the contractor while executing the work.

g. All the tools and plants such as welding sets, crimping tools, ladders, safety equipments and other electrical tools required for this work shall be arranged by the contractor at their own expense including the cost of conveyance to adhere to the target date of completion. The administration will not be responsible for inadequacy of tools and plants brought by the contractor and no claim on this ground is admissible.

h. Departmental supply of materials shall be transported by the contractor at his own expense. Necessary fabricating, cutting, welding, bending of structural steel to required size shall be done by the contractor at his expense.

i. Railway administration shall not be responsible for safety of the staff of the contractor and hence the personnel shall not be liable for any compensation arising out of accidents while executing the work.

j. Power shut down required by the contractor, shall be intimated to the SSE concerned in writing at least one week in advance and plan for executing the work. This administration is not responsible for delay in the execution of the work due to the delay in taking power shut down.

k. The contractor shall clear the work spot free from all unwanted materials like debris, scrap etc., when the work is completed in all respects.

III. SAFETY NORMS & EMS REQUIREMENTS:

1.0 SAFETY NORMS TO BE FOLLOWED BY THE CONTRACTOR

Safety clause as per CWE/Shell's letter No.MS.231/ACC/10 dt.23.02.2000.

a. The contractor should take all precautionary measures in order to ensure the protection of his own personnel moving about or working on the railway premises, and should conform to the rules and regulations of the Railway.

b. The Contractor should abide by all railway regulations in force from time to time and ensure that the same are followed by his representatives, agents or sub-contractors or workmen.

c. The contractor should ensure that unauthorized, careless or inadvertent operation of installed equipment which may result in accident to staff and / or damage to equipment does not occur.

d. The Contractor should indemnify and keep the purchaser indemnified and harmless against all actions, suits, claims, demands costs charges or expenses arising in connection with any accident, death or injury, sustained by any person or persons within the railway premises and any loss or damage to railway property sustained due to the acts or omissions of the contractor irrespective of whether such liability arises under the workmen's compensation act or the fatal accidents act or any other statute in force from time to time.

2.0 EMS REQUIREMENTS

a. The contractor shall ensure that all his workmen wear PPEs commensurate with the severity of work.
b. The contractor shall ensure industrial safety methods in executing his work at ICF.
c. The contractor shall ensure that all wastes generated by his activities / work are moved to the respective dump sites or taken for re-cycling at ICF.
d. The contractor has to give prior information whether any hazardous chemical is used in his work and if so, the operational control to be exercised.
e. The contractor has to ensure that all his material handling equipments / transport vehicles are emission tested.
f. The contractor has to ensure that his activities are in tune with the ICF EMS Policy (to be incorporated as part of Contract)
g. The contractors' staff must be aware of contents of MSDS in respect of chemicals / materials (if any).
h. The contractors' staff shall be competent to operate emergency appliances like fire extinguishers.
i. The contractors' staff shall be competent in the areas wherein the contract is awarded eg. to operate ETPs at ICF by evaluating through skill matrix by concerned official

3.0 SAFETY, HEALTH AND ENVIRONMENTAL INSTRUCTIONS (REF: CWE's Letter No. Safety Cell/RCW/02 dt.30.06.2008.)

3.1 SAFETY & HEALTH

1. The Factories Act – 1948 and Tamil Nadu Factories Rules - 1950 & Contract Labour (Regulation & Abolition) Act, 1970 are to be followed.
2. Adequate and appropriate tools shall be issued.
3. All instrument used for the work is to be complied with Indian Electricity rules.
4. The instruments are used to be conformed to Indian Standards.
5. Staffs under your control should wear the personal protective equipments as per working condition to prevent injuries.
6. Suitable ladders/scaffoldings are to be used for climb up and working at height.
7. Ensure adequate lighting at work place.
8. Contractor should follow the terms and conditions/instructions of ICF from time to time.
9. Activities other than the specified activities as per the contract clauses, which are assigned to you, are not permitted at our premises.
10. Ensure the Suitable guards are provided to the hand operating machine.
11. Suitable lifting machineries and tackles are to be used to handle the materials.
12. Any loss incurred to ICF because of your activities shall be charged on your account.
13. The equipments& materials stored at our premises are on your own risk.
14. Before start of work, proper shut down (if necessary) is to be undertaken for safety.
15. Before start of any work, appropriate Work Permits shall be obtained.
16. Off cuts and wastes generated during the course of your work, must be suitably disposed identified areas.
17. The renewal of permit will be issued only on the basis of performance of compliance of the said rules, regulations, conditions and safety norms.
18. The contractor shall engage qualified supervisors at the work site whenever men are engaged for work.
19. First aid box with adequate medicine are to be provided in the work area.
20. In case of any accident to the contract staff, the contractor should inform to the CSO/Shell & CSO/Fur. through department concerned within one hour.

21. Disobeying or not following the conditions / precautions / procedures shall result in penalty. In serious cases, stoppage of work or cancellation of permits may be done. Stopping of the work are empowered by the Safety Officer, Chief Safety Officer, Factory manager and Occupier.
22. For accidents involving to your staff inside Shell & Fur factory, necessary compensation to the dependents of the staff and legal expenditure cost shall be borne on your account.
23. The display board containing the details of nature of work, maximum number of staff working per shift, period of work, site in charge name and phone number and main office phone numbers is to be placed at prominent place.
24. If total staff engaged by you on any day of the contract period is 20 or more, you have to register with Central Labour Commissioner at Shastri Bhavan and obtain license.
25. Staffs under your control are to be insured during the work period.
26. Registers in Form XIII, XVI, XIX, and XVII as per contract labour act shall be maintained.
27. Employment card in Form XIV should be issued to all work men by the contractor.
28. The payment of wages shall be made as per Minimum wages Act, and shall be witnessed by ICF nominated Supervisors.
29. Usage of LPG cylinder in the factories (both Shell & Fur) is prohibited for industrial activities. Industrial LPG cylinders shall only be allowed if accompanied by a certificate from gas companies about the end use for which it is issued.

3.2 ENVIRONMENT

a. ICF is an ISO 14001/2004 certified Factory. All activities shall be carried out as per the Environment Protection Act & Rules.
b. Handling, storage & use of any chemicals and Haz. waste shall be carried out as per conditions laid down by TNPCB (Tamil Nadu Pollution control Board). Any clarification shall be made with contract executing officer & Safety Cell.
c. Spillage of Hazardous materials, chemicals and oil shall be strictly avoided; in case of any leakage /spillage, it should be cleaned immediately.
d. Any waste materials should not be burnt inside the Factory.
e. Any open fire or smoke noticed by the contractor or his men, should be informed immediately to the Fire Fighting crew through telephone numbers FIRE Fighting CREW: 46565 (Railway phone) Firefighting Contractor: 9841098419, 9841269727 (cell).

3.3 PENALTY FOR NON-COMPLIANCE OF SAFETY, HEALTH AND ENVIRONMENTAL INSTRUCTIONS

a. In case any Unsafe conditions noticed that could have led to grievous injury to the contract labour, a minimum penalty of Rs 5,000/- per person shall be imposed by ICF administration to the contractor. However, if multiple violation of Safety instructions is noticed, the amount could be higher
b. Recurrence on third occasion for the same contract would result in penalty of Rs.50,000/-(Fifty thousand) and termination of contract.

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