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TECHNICAL SPECIFICATION FOR
STATIONARY VALVE REGULATED LEAD-ACID (VRLA)
BATTERIES

Revisions:
Refer to record of revisions

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PROJECT ENGINEERING & SYSTEMS DIVISION
[TECHNICAL SPECIFICATION FOR STATIONARY
VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

CONTENETS

1.0	SCOPE.....	3
2.0	CODES & STANDARDS	3
3.0	GENERAL REQUIREMENTS	4
4.0	SITE CONDITIONS	5
5.0	TECHNICAL REQUIREMENTS ACCESSORIES.....	5
6.0	PERFORMANCE GUARANTEE.....	11
7.0	INSPECTION, TESTING & ACCEPTANCE.....	12
8.0	PACKING AND DISPATCH.....	13
9.0	RECORD OF REVISIONS.....	14
10.0	ANNEXURE- 1 (PROJECT SPECIFIC DATA SHEET)	
11.0	ANNEXURE-2 (UNPRICED PRICE FORMAT)	
12.0	ANNEXURE- 3 (QUALITY RELATED DOCUMENTS)	



PROJECT ENGINEERING & SYSTEMS DIVISION

[TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet 3 of 13

1.0 SCOPE

1.1 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport of Valve Regulated Lead Acid (VRLA) batteries complete with all accessories and materials for efficient and trouble-free operation, supervision of erection and commissioning.

1.2 **Scope of supply** shall include the following:-

- Design, Manufacture, Assembly, Testing, Packing and Delivery of batteries with accessories including battery racks and necessary tools & tackles to site.
- Supply of Commissioning spares as required for successful commissioning of batteries at site.

1.3 **Scope of services** shall include the following:-

- Supervision of Erection, Testing and Commissioning at site
- Touch up painting at site.

2.0 CODES AND STANDARDS

2.1 The equipment shall comply with the requirements of latest revision of following applicable standards.

<u>Sl. No.</u>	<u>International standards</u>	<u>National standards</u>	<u>Description</u>
1.	IEC 60896-21 Ed. 1.0 b	IS-15549 :2005 (Amendment-1&2)	Specification for Stationary valve regulated lead acid batteries
2.	IEC 60896-22 Ed. 1.0 b	IS-8320 : 2000	Stationary lead-acid batteries - Part 22: Valve regulated types - Requirements
3.	IEC	IS-266 : 1977	Specification for Sulphuric acid
4.	IEC	IS-1069 (1993)	Specification for water for storage batteries
5.	IEC	IS-1146: 1981	Specification for rubber and plastics container for lead acid storage batteries
6.	IEC 60050 (Part-482)	IS-1885 (Part 8): 1986	Electro technical vocabulary: Part 8 Secondary cells and batteries
7.	IEC-60410	IS-4905:1968	Sampling plans and procedures for inspection by attributes
8.	IEC-60051 (all parts)	IS-1248 (Part 2) : 2003	Direct acting indicating analogue electrical measuring instruments and their accessories
9.	IEC-60485		Digital electronic d.c. voltmeters and d.c. electronic analogue-to-digital converters

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION [TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]	Std. / Doc. Number	
			PY55434	
			Rev. No.	00
			Sheet 4 of 13	

10.	ASTM D-2863		Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
11.	ANSI T1 330		Valve regulated lead acid batteries used in the telecommunication environment
12.	IEEE: 485		Recommended practice for sizing large lead acid storage batteries for generating stations and substations
13.	IEEE-484		Recommended practice for design and installation of Storage batteries.

- 2.2 In case Indian Standards are not available for any equipment to be installed indigenously, the standards issued by IEC/BS/VDE/IEEE/NEMA/JIS C8707/DIN or equivalent agency shall be applicable.
- 2.3 The equipment installed in India shall confirm to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country. In case the equipment is installed abroad, the statutory regulations of the respective country shall be followed.
- 2.4 In case of imported equipment, standards of the country of origin shall be applicable if these standards are equivalent or more stringent than the applicable IEC/BS/VDE/IEEE/NEMA standards.

3.0 GENERAL REQUIREMENTS

- 3.1 The offered equipment shall be brand new with state of the art technology and proven field track record. No prototype equipment shall be offered.
- 3.2 Manufacturer shall ensure availability of spare parts and maintenance support for the offered equipment for at least 10 years from the date of supply. However before phasing out the product/spares, manufacturer shall give a notice of at least one year to the end user so as to enable the end user to place order for spares and services.
- 3.3 Bidder shall submit the prices ONLY in the price format indicated by BHEL. Prices furnished in any other format will not be accepted.

4.0 SITE CONDITIONS

- 4.1 Valve Regulated lead acid batteries shall be suitable for operating satisfactorily in humid and corrosive environment found in refineries, petrochemical and gas processing plants and other industrial plants. Service conditions shall be as specified in project specific data (i.e. ANNEXURE-1). If not specifically mentioned therein, design ambient temperature of 40°C and altitude not exceeding 1000m above MSL shall be considered.



PROJECT ENGINEERING & SYSTEMS DIVISION
[TECHNICAL SPECIFICATION FOR STATIONARY
VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet 5 of 13

5.0 TECHNICAL REQUIREMENTS

<u>Sl. No.</u>	<u>Description</u>	<u>Requirements</u>
1.	Battery general requirements	
a)	Type	Valve Regulated type Lead acid Battery with pasted positive plates.
b)	Design Criteria	1. The batteries shall meet the duty cycle requirements under all site and operating conditions as specified in the project specific data sheet. 2. The sizing of batteries shall be strictly as per IEEE guidelines. Any deviation in this regard is not acceptable.
c)	Type of Discharge	Heavy Duty
d)	Capacity in Ah of the Battery at specified End Cell Voltage	As per enquiry/project specific data sheet.
e)	Proposed Method of working :	
f)	Single Cell Nominal Voltage	2 V
g)	Float Cell Voltage	2.25 V/cell at limit current of 10% of total Ah of the Battery at 27°C
h)	Boost cell Voltage	As per OEM recommendations. Bidder to furnish the detail along with offer
i)	Nominal System voltage	As per project specific data.
j)	No. of cells/set of battery bank	55 cells for 110V and 110 cells for 220V unless otherwise specified project specific data
k)	Requirement of Tap Cell	Yes. At 80% of Total No. of cells.
l)	Temperature for continuous operation of VRLA battery	The temperature of the valve regulated lead acid cells shall be sufficiently low to prevent thermal runaway (critical condition arising due to constant voltage charging).
m)	Application	- Battery shall be suitable for long life under continuous float condition. (Permanently connected in parallel with charger and load). - On loss of main supply, Battery is intended to feed Reliable D.C. power to essential emergency loads such as DC Motors, Protection Relays, Breaker controls, indication, DC critical lighting and annunciation of power plant equipment unless otherwise specified in project specific data sheet.
n)	Delivery condition to site:	Factory Charged condition as per IS-15549



PROJECT ENGINEERING & SYSTEMS DIVISION
[TECHNICAL SPECIFICATION FOR STATIONARY
VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet **6** of **13**

o)	Time duration to put the battery in fully charged condition from fully discharged state at 27°C.	- On float, the cell/battery shall be suitable for being recharged to 90% of ampere hours removed within 24 hours and to 100% within 4 days. 8 hours for 90% of State of Charge (SOC) in Boost mode and 24 hours for 100% of SOC.
p)	Information to be permanently marked on each cell.	- Nominal voltage. - Name of manufacturer/model reference. - Rated capacity in ampere hours (Ah) with end cell voltage. - Voltage for float operation of 27°C with tolerance of $\pm 1\%$ - Month and year of manufacture. - Cell Number. - Type of Positive plate. - Type of Container. - Polarity marking. - Country of origin
q)	Information to be given on the instruction cards	- Manufacturer's instructions for filling and initial charging of the battery together - with starting and finishing charging rate - Maintenance instructions - Designation of cell in accordance with IS/IEC standards - Storing conditions of electrolyte.
r)	AH efficiency	Better than 90%
s)	Self-discharge / week.	0.5 to 1% of rated capacity.
2.	Electrodes/Plate Assembly	
a)	Positive Electrode Material:	Flat pasted type with Lead Calcium/Antimony High Tin/Cadmium alloy grid.
b)	Negative Electrode Material:	Flat pasted type with Lead-calcium alloy grid
c)	Electrode Structure:	Elastic enough to absorb mechanical stresses & volume changes during charge/discharge cycles
d)	Plate design	Pasted plate construction as per IS-15549/IEC.
3.	Separators	
a)	Purpose	Glass mat having high acid absorption capability, resistance to Sulphuric acid and good insulating properties. The separator shall meet the test requirements as given in IS-15549/IEC standard.



PROJECT ENGINEERING & SYSTEMS DIVISION
[TECHNICAL SPECIFICATION FOR STATIONARY
VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet 7 of 13

b)	Material	Low resistance, high porosity and highly absorbent type glass mat.
4.	Electrolyte	
a)	Content	Sulphuric acid and water shall conform to IS 266: 1993/IEC and IS 1069: 1993/IEC respectively as per IS-15549/IEC. Sulphuric acid specific gravity shall be 1.160 / 1.180.
5.	Cell Terminals & Connectors	
a)	Material	Cast of lead alloy or Nickel plated steel with brass insert for enhancement of conductivity unless otherwise specified in project specific data.
b)	End Cell connections	- Each battery set shall consist of a group of cells, electrically connected in series to attain the specified voltage level. Separate terminals with connectors shall be provided on the end cells for connecting to charger. - Terminals of cells shall be clearly and unmistakably identifiable and marking shall be of permanent nature. Terminal posts shall be suitably sealed at the lid to prevent leakage of any gas. Any gas escape shall be only through the venting device provided. - Positive, negative and 80% tapping terminal posts shall be clearly and indelibly marked for easy identification. - The terminal posts Shall be of solid brass and adequately dimensioned for strong construction with least Electrical resistance - The cell terminals posts shall be provided with connector bolts and nuts, and washers, effectively lead-coated. The material for bolts and nuts shall be brass/mild steel. Bolts and nuts, for connecting the cells, shall be effectively lead-coated to prevent corrosion from Sulphuric acid. The fasteners when used in bolt-on type terminal shall preferably have a plastic head for insulation purpose with an access point to enable voltage measurement. - Each terminal posts shall have two bolt holes of the same diameter, preferably at right angles to each other. - The thickness of lead-coating of connectors should be not less than 25 micron. - Terminals and cells inter-connectors shall be fully insulated or shall have insulation shrouds.



PROJECT ENGINEERING & SYSTEMS DIVISION
[TECHNICAL SPECIFICATION FOR STATIONARY
VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet 8 of 13

		• All live surfaces of battery shall be shrouded and connectors insulated. Only copper cables and lugs shall be used on battery terminals. • Connectors shall meet all the requirements as stipulated in IS-15549/IEC.
c)	Suitability	Must be suitable to withstand short circuit current and the battery charge/discharge current without damage to the cell as a result of terminal heating.
d)	Type of inter cell/inter row/interbank connectors	• PVC insulated lead plated heavy duty Copper shall be provided for Inter-cell connectors. • Flexible PVC insulated lead plated heavy duty Copper cables shall be provided for Inter-row and interbank connectors. • All the terminals and inter-cell connectors shall be fully insulated or shrouded. • All inter-row, inter-cell connectors shall confirm to safety requirements of ANSI/UL94.
6.	Venting device	
a)	Purpose:	• To prevent Explosion by allowing the vented gases to outside environment. • Regulating valve shall not allow the gas (air) to enter into the cell but shall allow the gas to escape from the cell above certain internal pressure which shall not lead to deformation or cause container to crack or cause failure of seals. • Flame arrestor shall be mounted on the cell so that all the gasses diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back in the cell to cause explosion. • The hydrogen released from valve regulated lead acid cells shall be sufficiently low to make these cells suitable for use in office, control rooms and equipment environments. The gas leakage rate of the cell shall not exceed 0.05cm³/hr at 27⁰ C and 101.3kpa. • Venting device including flame arrestor shall be designed as per IS-15549/IEC.
b)	Type	Explosion resistant, self-re-sealing & pressure regulating type.
7.	Cell Containers and Cell lids	
a)	Material:	• The material shall be as per IS-15549/IEC unless otherwise mentioned in project specific data.



PROJECT ENGINEERING & SYSTEMS DIVISION

[TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]

Std. / Doc. Number

PY55434

Rev. No.

00

Sheet 9 of 13

b)	Properties	- Container shall be restricted breathing type and house positive and negative plates, separators, receptacles, hold-down bar, vent tubes, name plates and vent plugs. - The containers shall be strong enough, so that excessive bulging of container does not occur during service. - Container and Lid should be welded and should not cause leakage of electrolyte/gases during operation even in case of normal mechanical/electrical abuses. - The components such as containers, lids, covers and seals used in manufacture shall meet the fire, flame and smoke resistance rating as defined in IS 15549/IEC and have an oxygen index of at least 28 in accordance with ASTM d-2863. - Each cell shall have a separate container and construction of cells shall ensure proper air circulation between the cells for heat dissipation/ventilation (by providing either insulated button separators integral with the outer surface of the cell container or by suitably designing the inter cell connectors).
8.	Cable Take-Offs	
a)	Cable interconnection with charger	- End take off connections from positive and negative poles of batteries shall be made by single core cables having stranded copper conductors and PVC insulation. Scope of cable supply by BHEL. - The cable connecting Tap cell and end terminal plate is in Bidder's scope of supply. - Size of terminal plate shall be suitable for the cable size to be furnished during detail engineering.
b)	Cable accessories for termination at battery end	Lead-coated bent copper plate, bolts, nuts & washers etc. shall be furnished for connection of outgoing stranded copper cables from battery to charger.
9.	Battery Stand	
a)	Material	Mild steel corrosion resistant
b)	Rack Construction	- Stackable modules - Free standing type mounted on porcelain/ hard rubber/ PVC pads insulators. - Pretreatment & three (3) coats of anti-acid (epoxy) paint of approved shade for the batteries racks and supports.
c)	Name plate	Cell Numbering stickers/plates, resistant to acid, shall be attached to each cell.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION [TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]	Std. / Doc. Number	
			PY55434	
			Rev. No.	00
			Sheet 10 of 13	

		- Wherever racks are transported in dismantled conditions, match markings shall be provided to facilitate easy assembly. - Acid resistant Name plates with Tag Nos. for each battery bank (Tag Nos. shall be furnished during detail engineering) shall be provided.
d)	Rack Arrangement	- Arrangement shall be as per vendor recommendation. - If the site location falls under Seismic Zone, Batteries along with rack shall be designed & tested for seismic requirement. Accordingly, relevant type test certificates shall be furnished for customer approval.
e)	Layout	- Layout drawing indicating dimension of each cell, overall dimensions of Battery banks, total weight of the battery banks with cells etc., shall be submitted separately for approval. - While proposing the battery room layout, Bidder shall consider sufficient clear space for attending individual cells for inspection.
f)	Ground clearance from the bottom tier of stand.	As per vendor recommendation

5.1 ACCESSORIES

Each set of battery shall be supplied with all accessories, including, but not limited to following for facilitating installation, testing and maintenance activities.

Sl. No.	Description	Quantity
1.	Battery stand (In Stackable modules)	1 Set
2.	Inter cell connectors (As required for complete installation with 3% extra)	1 Set
3.	Inter row connectors (As required for complete installation with 3% extra)	1 Set
4.	Interbank connectors and end takeoffs (As required for complete installation with 3% extra)	1 Set
5.	Stand Insulators (As required for complete installation with 3% extra)	1 Set
6.	Bolts, nuts & Washers (As required for complete installation with 5% extra)	1 Set
7.	Corrosion preventive Petroleum jelly (As required for complete installation min. 1Kg)	1 Set

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION [TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]		Std. / Doc. Number	
				PY55434	
				Rev. No.	00
				Sheet 11 of 13	

8.	Following accessories for testing and maintenance	
a)	3.5 digit digital Multimeter	1 no.
b)	Set of insulated Spanners	1 set
c)	End Take off Terminals (To connect isolation box/charger)	1 Set
d)	Instruction card	2 nos.
e)	Battery maintenance record book	2 nos.

6.0 PERFORMANCE GUARANTEE

Sl. No.	Description
6.1	Manufacturers shall guarantee that Battery shall meet the duty cycle requirements as stipulated in this specification and as confirmed by them in technical data sheets. In case, the performance of battery at site is not as per the performance guarantee, the manufacturer should replace the Battery at site free of cost.

7.0 TESTING REQUIREMENTS

7.1	Test Requirements	- All Acceptance and Routine tests as per latest editions of relevant IS/IEC standards whichever is stringent shall be carried out by manufacturer on each rating of the cell/battery. - A copy of above test results shall be submitted for approval before the dispatch of batteries. Specified number of bound copies of complete test results shall be furnished with the batteries. - BHEL/End User reserves the right to witness all tests with 2 weeks prior notice from Manufacturer. - Sampling scheme and criteria for Acceptance tests shall be as per IS/IEC which ever stringent.
7.2	Test Facility	- All the tests shall be carried out in an authorized Laboratory at manufacturer works. The laboratory shall have national/international accreditation. - If the Lab facility does not meet the criteria and are not to the satisfaction of the purchaser, the test shall be carried out in a third party accredited Lab such as NABL, ERDA/CPRI etc. - Manufacturer shall furnish details of test Lab facility including traceability and their accreditations.
7.3	Type test Certificates	- Type test Certificates shall be furnished as per relevant IS/IEC standard & the same shall be submitted for purchaser's review. These certificates shall not be older than 5years as on date of Tender enquiry. - Test certificates for the type tests should be for the test conducted on the equipment of similar design, type & rating to those proposed to be supplied under the present contract.

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION [TECHNICAL SPECIFICATION FOR STATIONARY VALVE REGULATED LEAD-ACID (VRLA) BATTERIES]	Std. / Doc. Number	
			PY55434	
			Rev. No.	00
			Sheet 12 of 13	

		- However, if the contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case, the type test report(s) are found not meeting the specification requirements, the vendor shall conduct all such tests under this contract at no additional cost and delivery implications to the owner either at third party lab or in presence of client /owners representative and submit the reports for approval. - Type tests to be performed further as required by owner shall be as per project specific data.
7.4	Site Acceptance Tests:	
a)	General	The following minimum tests/ checks shall be conducted at site. Any other tests/ checks as per the manufacturer's recommendation shall also be carried out.
b)	Tests	a) Visual examination as per IS-15549/IEC b) Checking of dimension as per manufacturer's drawing c) Test for capacity (C10 and C1 capacity) d) Test for capacity and test for voltage during discharge. (C10 and C1 capacity) e) Battery duty cycle test to meet the load cycle requirement shall also be performed at site after installation as part of commissioning.

8.0 PACKING AND DESPATCH

8.1 All the batteries shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer.

8.2 The batteries shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to finish. Crates/cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', weight', 'Owner's particulars' 'PO nos.', shall be clearly marked on the package together with other details as per purchase order. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature unless otherwise agreed.

8.3 Additionally packing requirement if any shall also be referred in project specific data sheet.

8.4 For Overseas/Export order, sea worthy packing shall be considered as per project specific data.

8.5 PREPARATION FOR DELIVERY:

The batteries shall be perfectly packed so as to protect the equipment from damages/corrosions caused either by mechanical shock or by the weather. Electrolyte and other corrosive material shall be packed in cases of suitable resistant material, ensuring non-occurrence of damage/spill-over during transit and storage.



Std. / Doc. Number	
PY55434	
Rev. No.	00
Sheet 13 of 13	

[illegible]

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION		Std. / Doc. Number	
				ANNEXURE-1 TO PY55434	
				Rev. No.	00
				Sheet 1 of 15	

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PROJECT SPECIFIC DATASHEET (ANNEXURE-1)

(THIS DOCUMENT SHALL BE READ IN CONJUNCTION WITH
VRLA BATTERY MAIN SPECIFICATION-PY55434)



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

The following details are project specific data for Battery. Please refer to the particular main specification of the respective battery for details of technical requirements as applicable. In case of conflict between requirements in main technical specification and this Annexure-1, this **ANNEXURE-I** requirements shall supersede the main Battery specification.

1.0 PROJECT SPECIFIC PURCHASER'S DATA (DATA SHEET):

PROJECT DETAILS:			
Name of the customer		M/S NALCO, Damanjodi, Odisha, India	
Consultant Name		M/S M N Dastur & Company(P) Ltd, Kolkata	
Project Name		1x18.5 MW STG Set, Unit#06	
Sl. No.	Description	Unit	Requirements
A. Site conditions			
1.	Ambient temperature		
	a. Minimum	°C	3
	b. Maximum	°C	46.6
2.	Design ambient temperature	°C	45
3.	Atmosphere		Dusty, Tropical and Corrosive as found in process Industry
4.	Average Altitude from MSL	meters	910
5.	Location		Damanjodi, Odisha
6.	Relative Humidity	%	89
7.	Seismic zone		As per IS:1893-2002
B. Technical requirements			
1.	Application of Battery	DC/UPS	DC
2.	Rated DC system	Volts	110
3.	Type of battery		SMF VRLA
4.	Plate construction		Flat Pasted
5.	Discharge type		Heavy Duty
6.	Quantity of all battery banks		
a)	Battery Bank-1	Sets	2
b)	Battery Bank-2	Sets	2



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

ANNEXURE-1
TO PY55434

Rev. No. 00

Sheet 3 of 15

7.	Battery capacity		Bidder to furnish quoted AH capacity and battery sizing as per Load Duty Cycle mentioned at Cl. No. 2.0 below.
8.	End Cell Voltage(ECV) to be considered for battery sizing	Volts	1.85V
9.	Nominal Float Voltage	Volts	2.2 to 2.25
10.	Boost Voltage	Volts	Bidder to furnish the detail along with offer
11.	Battery Configuration:		
a)	Battery Bank-1		2X100%
b)	Battery Bank-2		2X100%
12.	Tap cell	No.	80% of total no. of cells
13.	Battery delivery condition to site	Charged/ Un-charged	Charged
14.	Battery cell container type		Poly propylene co-polymer material.
15.	Boost charging time		Bidder to furnish the detail along with offer
16.	Recommended boost charging rate		Bidder to furnish the detail along with offer
17.	Recommended trickle charging rate		Bidder to furnish the detail along with offer
18.	Type of inter cell connectors		PVC insulated/Nickel plated/ Lead coated Heavy duty copper/flexible insulated copper cable/completely insulated solid copper connectors.
19.	Battery cell terminal material/Terminal posts		Solid brass/ Lead coated brass
20.	Battery stand type	Mild Steel/ Teak wood	Mild Steel
21.	Battery stand/rack formation		Stackable
22.	Paint shade of the rack		631 of IS-5 (Tentative & shall be finalized during detailed Engg.)



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

23.	Type tests requirement		1. Type test reports (for the type tests indicated in the main specification as per latest editions of IS: 15549 & IEC-60896) not older than 5 years (as on the date of enquiry) shall be submitted.
24.	Sea Worthy Packing		Not Applicable
25.	Cable termination details(Tentative) – Cable by BHEL		
	<i>From</i>	<i>To</i>	<i>Cable type</i>
	Battery-1 of DC System-1A	Battery Charger through Isolation Box	1CX630 Sq.mm, XLPE, Al cable, 3 runs/pole
	Battery-2 of DC System-1B	Battery Charger through Isolation Box	1CX630 Sq.mm, XLPE, Al cable, 3 runs/pole
	Battery-2 of DC System-2A	Battery Charger through Isolation Box	4CX120 Sq.mm, XLPE, Al cable, 1 Core/pole
	Battery-1 of DC System-2B	Battery Charger through Isolation Box	4CX120 Sq.mm, XLPE, Al cable, 1 Core/pole

Preferably end take ofs (positive and negative) & tap cell(+ve) end take of shall be provide at one place.

2.0 LOAD DUTY CYCLE & DESIGN PARAMETERS :

Refer Annexure-A & B for Duty Cycle & Design Parameters.

3.0 FACTORS TO BE CONSIDERED FOR BATTERY SIZING:

Sl. No.	Parameter description	Parameter value
1.	Battery Sizing Methodology, Temperature correction factors, Capacity Factors etc.	IEEE 485 shall be the principle for sizing the battery.
2.	Float Voltage	Bidder to furnish the detail along with offer
3.	No. of Cells/Battery bank	Bidder to furnish the detail along with offer

4.0 ADDITIONAL REQUIREMENTS (PROJECT SPECIFIC)

Sl. No.	Description	Requirements

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR VRLA BATTERIES)		Std. / Doc. Number	
				ANNEXURE-1 TO PY55434	
				Rev. No.	00
				Sheet 5 of 15	

1.	At the take-off points for the purchaser's cable connection, a suitable arrangement will be made to suit termination of purchaser's cables. The termination points will be shrouded with transparent covers in order to avoid any accidental contact.
2.	Manufacturer will demonstrate the performance of the battery at the specified duty cycle, at the specified min. ambient temperature during pre-dispatch inspection, by conducting test on a randomly selected cell, if requested.

5.0 DOCUMENTATION

5.1. Documents to be submitted along with offer:

Sl. No.	Description
1.	Completely filled in technical Battery Datasheets.
2.	Type test Reports (As per Annexure-A above & Main specification-PY55434)
3.	Battery sizing calculation with respect to load duty cycle specified above to be provided along with supporting documents (capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue) for considered factors.
4.	GA drawing and foundation details of battery stand including ventilation requirements (for information only)
5.	Battery Room Layout
6.	"Check list" with bidder's signature and company stamp.
7.	"Deviation Schedule" with bidder's signature and company stamp.
8.	Unpriced Price Schedule (Annexure-II) as enclosed with NIT with "Quoted" word against items with bidder's signature and company stamp.

5.2. Documents to be submitted after award of contract for review and approvals:

Sl. No.	Document	Category	Submission Schedule
1.	Completely filled in technical datasheets as per datasheet format provided at Cl. No. 11.0 below	A	Within 1 week from PO
2.	Battery sizing calculation (Including battery catalogues, curves etc.) (as per IEEE-485 or Equivalent Standard)	A	Within 1 week from PO

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR VRLA BATTERIES)	Std. / Doc. Number	
			ANNEXURE-1 TO PY55434	
			Rev. No.	00
			Sheet 6 of 15	

3.	GA drawing and foundation details of battery stand (**)	A	Within 1 week from PO
4.	Dimensional drawings of battery and space requirement for battery room (**)	A	Within 1 week from PO
5.	Battery room layout (**)	A	Within 1 week from PO
6.	Bill of Material for battery	A	Within 1 week from PO
7.	Battery accessories list	A	Within 1 week from PO
8.	Ventilation requirements of Battery room (Necessary sizing calculation shall be furnished)	I	Within 1 week from PO
9.	Fault calculation & Connector sizing calculation	A	Within 1 week from PO
10.	Cable Termination arrangement for battery terminal	A	Within 1 week from PO
11.	Manufacturing Quality Plan for battery	A	Within 1 week from PO
12.	Field Quality Plan for battery	I	1 week after inspection
13.	O & M manual for battery	A	Within 1 week from PO

A: Approval I: Information R: Review

** - Battery Overall Layout shall vary subject to space availability. Vendor to revise & submit the actual layout as per the requirements which shall be informed during detailed engineering.

5.3. Package Execution Schedule:

Sl. No.	Event	Schedule for Vendor Drawings
1	Drawings/Data Sheet	Within 1 week from P.O. date
2	BHEL Comments	Within 1 week from receipt of the "Drawings in line with Specification"
3	Revised Drawings submission	Within 1 week from BHEL's comments date
4	BHEL Comments / Approval for Manufacture Clearance	Within 1 week from receipt of the revised Drawings

However, it is vendor responsibility to ensure cycle time reduction for submission of drawing.

5.4. Instruction manuals:



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

- a) Instruction manuals for the installation, operation and maintenance of battery to be supplied shall be submitted at least two months before the date of dispatch of equipment.
- b) The installation & maintenance manual of battery shall contain the following.

Sl. No.	Description
1.	General description giving type and rating of various batteries
2.	Technical data
3.	Salient constructional details
4.	Instruction to be followed on receipt at site
5.	Instructions for foundations, if any
6.	Erection procedures and checks
7.	Procedure for filling electrolyte
8.	Commissioning procedures and site tests
9.	Routine, periodic and preventive inspection and maintenance procedures
10.	Safety rules
11.	Possible faults, their causes and remedies
12.	Copies of Type, acceptance and routine test certificates in bound volume
13.	Catalogues, literatures and drawings
14.	Outline dimension drawings showing constructional features, relevant cross sectional views and earthing details, operator oriented description of equipment and accessories.
15.	Operating procedures, maintenance procedures & precautions to be taken during operation and maintenance work.

5.5. No. of prints to be submitted by manufacturer after award of contract:

Sl. No.	Description	No. of copies	No. of CD-ROMs	Remarks
1.	First submission/subsequent submission	Soft copy in PDF format		
2.	Final approved drgs. /docs. for distribution	10 copies	2 CD-ROMs	
3.	Operation & Maintenance manual	Soft copy in PDF format		
4.	Approved Operation & Maintenance manual (*)	14 copies	2 CD-ROMs	
5.	Type test certificates	4 copies	1 CD-ROMs	



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

6.0 AS-BUILT DRAWINGS

6.1 Though only supply of equipment is under manufacturer's scope, manufacturer may note that all as-built correction (as given by purchaser to manufacturer) shall have to be incorporated in the originals by the manufacturer and copies of the as-built corrected drawings / documents as per requirement shall be submitted by the manufacturer.

7.0 SPARES

Sl. No.	Description
1.	<u>O&M spares</u> Not Applicable
2.	<u>Mandatory Spares</u> Not applicable
3.	<u>Commissioning spares</u> The spares which would be required during plant or equipment testing, start-up and commissioning. These spares have to be supplied along with the main equipment. The list of commissioning spares for battery shall include minimum of following items: • Inter cell connectors – 3 nos. • Inter row connectors – 2 nos. • Terminal plate – 1 no. • Nuts / Bolts & washers – 10 nos. each. In addition to above, any other spares recommended for commissioning shall also be included. Complete list of commissioning spares to be submitted to BHEL during detail engineering stage for information.

8.0 BATTERY PACKAGE DETAILS:

Sl. No.	Material Code	Item Description	Quantity	Measuring Unit	Remarks
A.	110V VRLA BATTERY FOR DC SYSTEM-1				
1.	PY9755434003	DC System-1: 110V VRLA BATTERY (as per the specified Load Duty Cycle) including Commissioning spares, Battery stand as per this specification.	2	Set	

ESP-001-2A
Rev.00

PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

ANNEXURE-1
TO PY55434

Rev. No. 00

Sheet 9 of 15

Sl. No.	Material Code	Item Description	Quantity	Measuring Unit	Remarks
2.	PY9755434003	DC System-1: Battery Accessories as per specification.	2	Set	
B.	Supervision of I & C of Batteries for DC System-1				
1.	PY9855434021	DC System-1: Lump sum price for travel by Battery Package OEM to and from Site per visit. (1 Set = 1 Visit)	2	Set	
2.	PY9855434021	DC System-1: Lump sum price including Services, Lodging, Boarding etc. for Battery Package OEM at site. (1 Set = 3 Days)	2	Set	
C.	110V VRLA BATTERY FOR DC SYSTEM-2				
1.	PY9755434011	DC System-2: 110V VRLA BATTERY (as per the specified Load Duty Cycle) including Commissioning spares, Battery stand as per this specification.	2	Set	
2.	PY9755434011	DC System-2: Battery Accessories as per specification.	2	Set	
D.	Supervision of I & C of Batteries for DC System-2				
1.	PY9855434030	DC System-2: Lump sum price for travel by Battery Package OEM to and from Site per visit. (1 Set = 1 Visit)	2	Set	
2.	PY9855434030	DC System-2: Lump sum price including Services, Lodging, Boarding etc. for Battery Package OEM at site.(1 Set = 3 Days)	2	Set	

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

**ANNEXURE-1
TO PY55434**

Rev. No. 00

Sheet 10 of 15

9.0 DEVIATION SCHEDULE (TECHNICAL)

Sl. No.	Cl. No./ Page No./ Sec No.	Description as specified	Deviation taken	Remarks/Reason for Deviation

NOTES:

1. Bidder may give a consolidated list of deviations in this form only. Only the deviations listed here in conjunction with the original tender, shall constitute the contract document for the award of the job to the Bidder.
2. Deviation listed elsewhere shall be ignored & will be summarily rejected.
3. If there are no deviations, bidder shall submit signed copy of this format, mentioning "**No Deviations**" & it shall be henceforth implied that Bidder is complying with all the clauses of the bidding document.
4. Attach more sheets in this format, if required.
5. Bidder shall state reason for the deviations in the remark column.
6. Bidder confirms that all clauses of the Bidding document, except those that are listed above in the Deviation Schedule, are fully complied by the Bidder.

(Signature of the Vendor)

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

**ANNEXURE-1
TO PY55434**

Rev. No. 00

Sheet 11 of 15

10.0 CHECK LIST:**(TO BE FILLED BY BIDDER AND SUBMITTED ALONG WITH TECHNICAL OFFER)**

Enquiry No. Date :
Name of the Bidder :
Project :
Specification No : PY55434, Rev00
Item : VRLA Battery

Sl. No.	Check point description	Supplier Confirmation(✓)
1.	Completely filled-in Technical Data sheet as per specification enclosed.	
2.	Battery sizing calculation with respect to load duty cycle (provided in Annexure-A & B) enclosed along with supporting documents (capability / discharge curve, temperature correction factor, float charging factor & published technical catalogue) for considered factors.	
3.	Duly signed Deviation Schedule (Technical)/ No Deviation Schedule enclosed	
4.	Relevant Type Test Certificates enclosed	
5.	Unpriced Schedule (As per BHEL Format) enclosed as per BHEL specification complying to following: 1. Signed & Stamped 2. All items are quoted	
6.	Battery GA enclosed (for information)	
7.	List of commissioning spares enclosed	
8.	List of O&M spares (Recommended) for 2 years of plant operation (Unpriced) enclosed	
9.	Catalogues enclosed	
10.	Clause wise confirmation to BHEL specification included in technical offer except the deviations listed in deviation schedule (Signed & stamped Technical specification).	

Note: Bidder to submit **this checklist** duly filled & signed along with the Offer. No deviation is acceptable in this regard. Without duly signed & stamped checklist, offer shall not be considered for evaluation.

BIDDER'S STAMP & SIGNATURE



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

ANNEXURE-1
TO PY55434

Rev. No. 00

Sheet 12 of 15

11.0 DATASHEET FORMAT (TO BE SUBMITTED DURING DETAILED ENGG.):

Sl. No	Description	Units		
1.	Battery Type			
2.	Tag no. of the battery			
3.	Manufacturer name			
4.	Type and manufacturer Model no			
5.	Applicable standard		IEC-60896-2	
6.	Average life	Years		
7.	Ampere hour capacity at 27°C and end cell voltage	Ah		
7.	AH efficiency at 10hr rate	%		
8.	Short circuit current of the battery bank	kA		
9.	Short circuit withstand time	Sec		
10.	Max. Allowable temp. of electrolyte which the cells can withstand without injurious effects			
	a. Continuously			
	b. For short periods			
11.	Cell voltage at end of full discharge at 10 hours rate	Volts/cell		
12.	Ampere-hour capacity at min. ambient temperature of 0°C at End Cell Voltage (ECV)	Ah		
13.	Ampere-hour capacity at ambient temperature of 27°C at ECV	Ah		
14.	Discharge rates			
a)	Ah capacity at one minute rate.	Ah		
b)	Ah capacity at 30 minute rate.	Ah		
c)	Ah capacity at 60 minute rate.	Ah		
d)	Ah capacity at 2 hour rate	Ah		
e)	Ah capacity at 5 hour rate	Ah		
f)	Ah capacity at 10 hour rate	Ah		
15.	Boost/Quick charging current			
a)	Max. Safe boost charging current.	Amperes		



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

b)	Recommended Boost charger rating in 8/10 hours	Amperes		
c)	Permissible ripple content acceptable to battery	%		
16.	Boost/Quick charging voltage			
a)	Max. Boost charging voltage per cell	Volts		
b)	Recommended Boost charging voltage per cell for constant voltage finishing charging	Volts		
17.	Float charging voltage per cell			
a)	Max. float charging voltage per cell	Volts		
b)	Recommended float charging voltage range per cell for constant voltage finishing charging	Volts		
18.	Float charging current			
a)	Max. float charging current	Volts		
b)	Float charging current range	Amperes		
c)	Permissible ripple content acceptable to battery	%		
19.	Recommended Equilibrium/Trickle charging current of the battery	mA		
20.	Battery cell Plate Details			
a)	Type and material of positive plate			
b)	Type and material of negative plate			
c)	No. of positive plates per cell	Nos.		
d)	No. of negative plates per cell	Nos.		
21.	Separator Details			
a)	Type of Separators			
b)	Material			
c)	Thickness			
22.	Connectors Details			
a)	Type of Inter-cell connectors			
b)	Type of Inter-row connectors			
c)	Total Resistance of the connectors			
23.	Cell details			
a)	No. of cells per battery			



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

ANNEXURE-1
TO PY55434

Rev. No. 00

Sheet 14 of 15

b)	Taps provided at cell No.			
c)	Type of cell and designation			
d)	Material of the container			
e)	Type of the container			
f)	Cell dimensions			
	a. Width	mm		
	b. Length	mm		
	c. Depth	mm		
24.	Electrolyte			
a)	Confirms to IS-266/IEC	Yes/No		
b)	Amount of electrolyte for first filling per cell per set.	(Liters)		
c)	Specific gravity of electrolyte at the end of full charging at 27° C			
d)	Specific gravity of electrolyte at the end of full discharging at 10 hours/5 hours rate at 27° C			
25.	Racks			
a)	Type and Material of the rack			
b)	Overall dimension of the rack	(L X B X H) mm		
c)	Net weight of rack	Kg		
g)	Weight of complete cell with electrolyte	Kg		
h)	Weight of complete cell without electrolyte	Kg		
i)	Rack dry weight	Kg		
j)	Net rack weight with electrolyte	Kg		
k)	Total shipping weight of one battery unit (without electrolyte)	Kg		
26.	Insulator material for			
a)	Cells			
b)	Racks			

ESP-001-2A
Rev.00



PROJECT ENGINEERING & SYSTEMS DIVISION
(TECHNICAL SPECIFICATION FOR VRLA BATTERIES)

Std. / Doc. Number

**ANNEXURE-1
TO PY55434**

Rev. No.

00

Sheet **15** of **15**

27.	Inter-row and inter-tier connection			
a)	Material and quantity			
28.	Terminal post			
a)	Material			
29.	Recommended size of Bus bar/cable			
30.	Hydrogen evaluation			

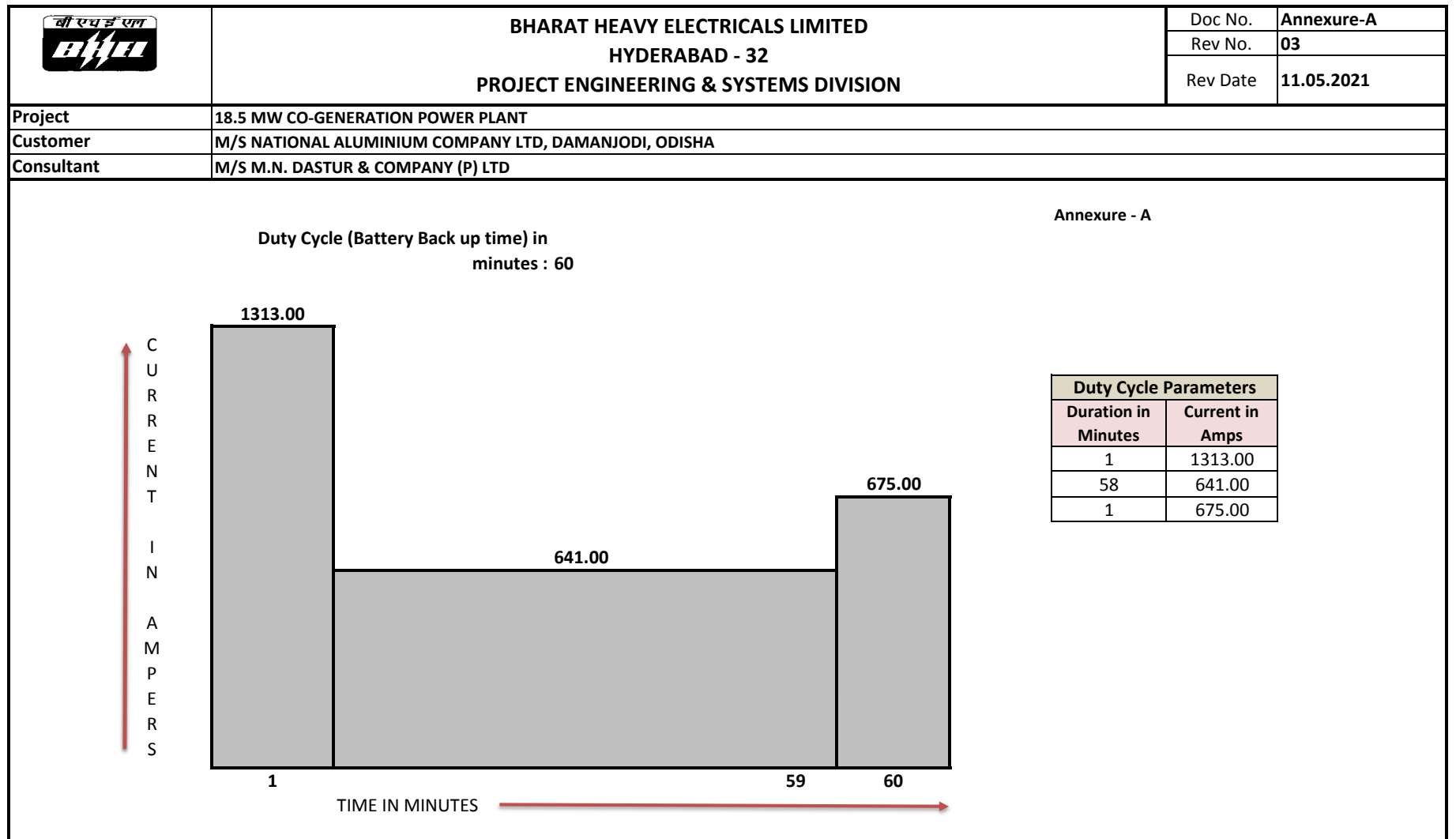
Battery-1 Duty Cycle & Design Parameters:

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	Doc No.	Annexure-A
		Rev No.	03
		Rev Date	11.05.2021
Project	18.5 MW CO-GENERATION POWER PLANT		
Customer	M/S NATIONAL ALUMINIUM COMPANY LTD, DAMANJODI, ODISHA		
Consultant	M/S M.N. DASTUR & COMPANY (P) LTD		
ANNEXURE - A			
STG Area:			
SIZING CALCULATIONS FOR SMF VRLA BATTERY AND CHARGER			
DC system has a configuration of 1x100% Battery banks, 1x100% Float & 1x100% Flaot cum Boost Battery Charger - Total 2 sets			
Design Parameters :			
System Voltage (V)	=	110	
Voltage variation in %	=	+10%	-10%
Permitted Voltage Variation	Max (V)	=	121
	Min (V)	=	99
Design margin (DM)	=	1	
Battery backup time (min)	=	60	
Ageing factor (AF)	=	1.25	
Future Growth (FG)	=	1	
End Cell Voltage (V)	=	1.85	
Float Cell Voltage (V)	=	2.25	
Boost Cell Voltage (V)	=	2.3	
Nominal Cell Voltage (V)	=	2	
Min. Ambient Temperature considered for battery sizing	=	3°C	
No of Cells considering Lowest permissible voltage	=	Lowest permissible Voltage /End Cell Voltage 53.51	
No of Cells considering Highest permissible voltage	=	Highest permissible Voltage /Float Cell Voltage 53.78	
Hence the optimum req. No.of Cells	=	54	
Cell no. to be tapped	80% =	44	
Lowest Possible Voltage	=	100	
Max. Possible Voltage	=	122	
Both the possible voltage ranges are well within the acceptable limits. Hence the No. of cells chosen are appropriate.			
			
Note: Future growth of 25% for complete non motor loads & 25% of two heighest rating DC Motors has been considered for battery sizing.			

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION								Doc No.	Annexure-A
									Rev No.	03
									Rev Date	11.05.2021
Project	18.5 MW CO-GENERATION POWER PLANT									
Customer	M/S NATIONAL ALUMINIUM COMPANY LTD, DAMANJODI, ODISHA									
Consultant	M/S M.N. DASTUR & COMPANY (P) LTD									
Annexure - A SIZING CALCULATIONS FOR SMF VRLA BATTERY AND CHARGER D.C System Voltage in V = 110 V Duty Cycle (Battery Back up time) in minutes = 60 min										
Sl. NO.	SUB-DESCRIPTION	RATED PWR IN WATTS	RATED CURRENT IN AMPS	STARTING/ IN RUSH CURRENT IN AMPS	Period 1 (M1) 1st min		Period 2 (M2) 2nd min to 59min		Period 4 (M4) 59th min to 60 min	
1.0	11KV VCB PANELS									
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		25	68.18	0	0.00	2	5.45
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00
	Numerical Relays	20	0.18		25	4.55	25	4.55	25	4.55
	Auxillary Relays	10	0.09		25	2.27	25	2.27	25	2.27
	Indicating lamps @ 7 lamps/panel	11.5	0.10		25	2.61	25	2.61	25	2.61
2.0	6.6KV VCB PANELS									
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		25	68.18	0	0.00	2	5.45
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00
	Numerical Relays	20	0.18		25	4.55	25	4.55	25	4.55
	Auxillary Relays	10	0.09		25	2.27	25	2.27	25	2.27
	Indicating lamps @ 7 lamps/panel	11.5	0.10		25	2.61	25	2.61	25	2.61
3.0	11KV VCB PANELS-ESP Chiller Area									
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		2	5.45	0	0.00	2	5.45
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00
	Numerical Relays	20	0.18		2	0.36	2	0.36	2	0.36
	Auxillary Relays	10	0.09		2	0.18	2	0.18	2	0.18
	Indicating lamps @ 7 lamps/panel	11.5	0.10		2	0.21	2	0.21	2	0.21
4.0	11KV VCB PANELS-RCWPH Area									
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		2	5.45	0	0.00	2	5.45
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00
	Numerical Relays	20	0.18		2	0.36	2	0.36	2	0.36
	Auxillary Relays	10	0.09		2	0.18	2	0.18	2	0.18
	Indicating lamps @ 7 lamps/panel	11.5	0.10		2	0.21	2	0.21	2	0.21

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION								Doc No.	Annexure-A
									Rev No.	03
									Rev Date	11.05.2021
Project	18.5 MW CO-GENERATION POWER PLANT									
Customer	M/S NATIONAL ALUMINIUM COMPANY LTD, DAMANJODI, ODISHA									
Consultant	M/S M.N. DASTUR & COMPANY (P) LTD									
Annexure - A										
5.0	11KV VCB PANELS-DM Plant Area	03								
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		2	5.45	0	0.00	2	5.45
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00
	Numerical Relays	20	0.18		2	0.36	2	0.36	2	0.36
	Auxillary Relays	10	0.09		2	0.18	2	0.18	2	0.18
	Indicating lamps @ 7 lamps/panel	11.5	0.10		2	0.21	2	0.21	2	0.21
6.0	STEAM TURBINE GENERATOR									
	AVR	1500	13.64		1	13.64	1	13.64	1	13.64
03	Control,relay & Synchronization panels (As per cl. 10.11.2(g) control and relay panel for - 3set i.e 1) Control panel 2) Relay panel & 3) Synchronization panel(Approx. 6Nos.)	2000	18.18		1	18.18	1	18.18	1	18.18
	Generator Air Duct-Illumination	500	4.55		1	4.55	1	4.55	1	4.55
7(a)	STG Transformer Aux. Supply	500	4.55		1	4.55	1	4.55	1	4.55
7(b)	STG Transformer -RTCC Panel	250	2.27		1	2.27	1	2.27	1	2.27
8(a)	11/6.6KV Transformer Aux. Supply	500	4.55		2	9.09	2	9.09	2	9.09
8(b)	11/6.6KV Transformer -RTCC Panel	250	2.27		2	4.55	2	4.55	2	4.55
9.0	STEAM TURBINE (DC MOTORS)									
a	Emergency Oil Pump Motor	15000	136.36	272.73	1	272.73	1	136.36	1	136.36
b	Jacking Oil Pump Motor	18500	168.18	336.36	1	336.36	1	168.18	1	168.18
c	Illumination-Turbine Enclosure	500	4.55		1	4.55	1	4.55	1	4.55
10.0	BOILER (DC MOTORS)									
a	Scanner Air fan motor	5500	50.00	100.00	1	100.00	1	50.00	1	50.00
b	DC Drive motr for AHP	5500	50.00	100.00	1	100.00	1	50.00	1	50.00
11.0	DC Emergency Lighting	5000	45.45		1	45.45	1	45.45	1	45.45
	TOTAL LOAD					1089.76		532.49		559.76
Current Considering 25% of Future Growth for all Non motors loads & all motor loads except Sl. No. 10(a) & Sl.No 10(b)						1312.20		640.61		674.70

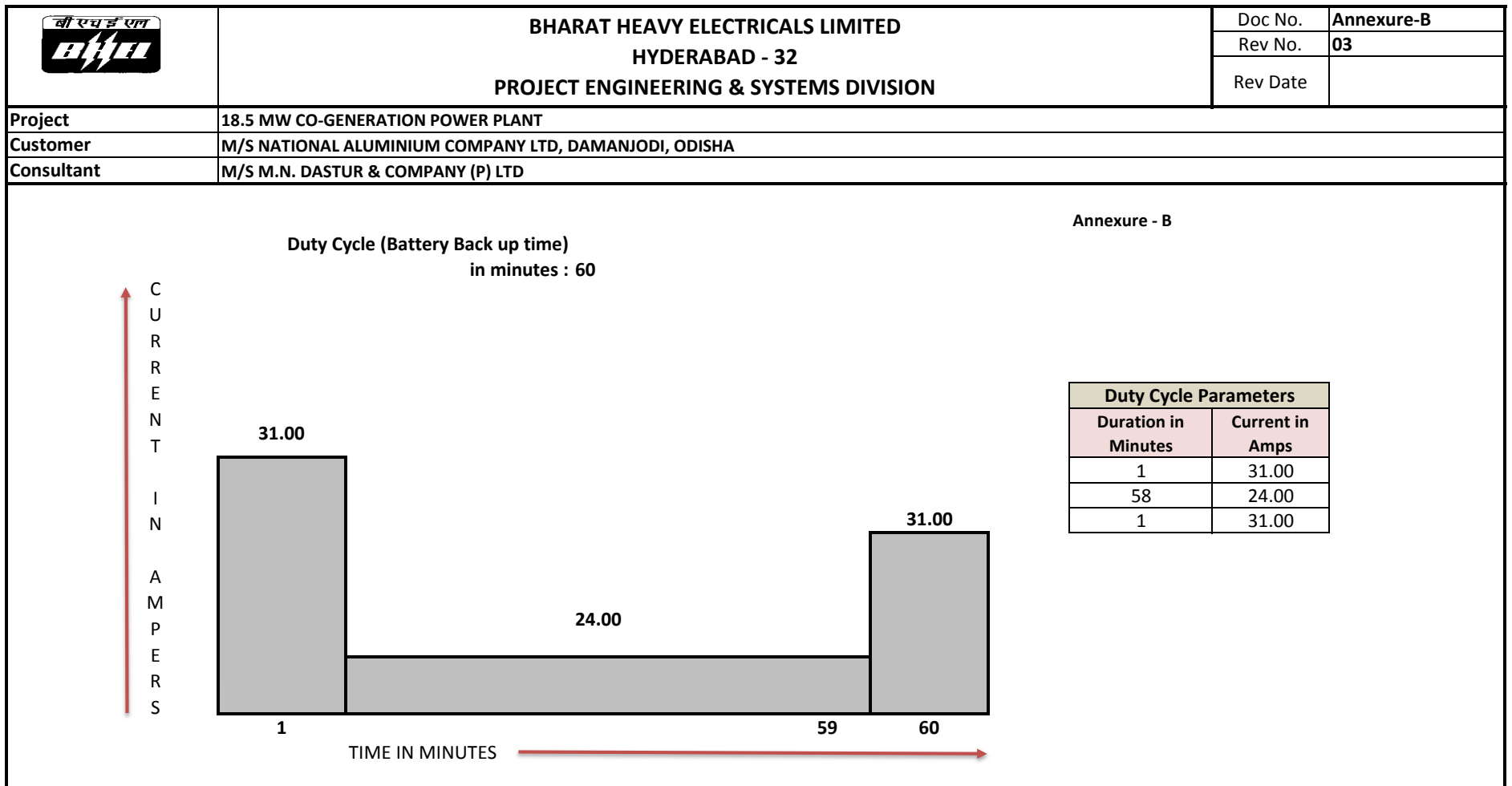
Note: As per cl. 8.3,section-III(Electrical) auxiliary supply for spring charging motors of 11KV,6.6KV & 415V switchboards shall be 240V AC.



Battery-2 Duty Cycle & Design Parameters

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	Doc No.	Annexure-B
		Rev No.	03
		Rev Date	
Project	18.5 MW CO-GENERATION POWER PLANT		
Customer	M/S NATIONAL ALUMINIUM COMPANY LTD, DAMANJODI, ODISHA		
Consultant	M/S M.N. DASTUR & COMPANY (P) LTD		
ANNEXURE - B			
Ammonia Storage Area:			
SIZING CALCULATIONS FOR SMF VRLA BATTERY AND CHARGER			
DC system has a configuration of 1x100% Battery banks, 1x100% Float & 1x100% Flaot cum Boost Battery Charger - Total 2 sets			
Design Parameters :			
System Voltage (V)	=	110	
Voltage variation in %	=	+10%	-10%
Permitted Voltage Variation	Max (V)	=	121
	Min (V)	=	99
Design margin (DM)	=	1	
Battery backup time (min)	=	60	
Ageing factor (AF)	=	1.25	
Future Growth(FG) for battery sizing	=	1	
End Cell Voltage (V)	=	1.85	
Float Cell Voltage (V)	=	2.25	
Boost Cell Voltage (V)	=	2.3	
Nominal Cell Voltage (V)	=	2	
Min. Ambient Temperature considered for battery sizing	=	3°C	
No of Cells considering Lowest permissible voltage	=	Lowest permissible Voltage /End Cell Voltage 53.51	
No of Cells considering Highest permissible voltage	=	Highest permissible Voltage /Float Cell Voltage 53.78	
Hence the optimum req. No.of Cells	=	54	
Cell no. to be tapped	80% =	44	
Lowest Possible Voltage	=	100	
Max. Possible Voltage	=	122	
Both the possible voltage ranges are well within the acceptable limits. Hence the No. of cells chosen are appropriate.			

	BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION							Doc No.		Annexure-B	
								Rev No.		03	
								Rev Date			
Project	18.5 MW CO-GENERATION POWER PLANT										
Customer	M/S NATIONAL ALUMINIUM COMPANY LTD, DAMANJODI, ODISHA										
Consultant	M/S M.N. DASTUR & COMPANY (P) LTD										
Annexure - B											
SIZING CALCULATIONS FOR SMF VRLA BATTERY AND CHARGER											
D.C System Voltage in V					=		110 V				
Duty Cycle (Battery Back up time) in minutes					=		60 min				
Sl. NO.	SUB-DESCRIPTION	RATED PWR IN WATTS	RATED CURRENT IN AMPS	STARTING/ IN RUSH CURRENT IN AMPS	Period 1 (M1) 1st min		Period 2 (M2) 2nd min to 59min		Period 4 (M4) 59th min to 60 min		
1.0	11KV VCB PANELS-Ammonia Storage Area										
	Tripping Coil/Closing Coil of incomer feeder/buscoupler	300	2.73		2	5.45	0	0.00	2	5.45	
	Spring charging motor	0	0.00	0.00	0	0.00	0	0.00	0	0.00	
	Numerical Relays	20	0.18		2	0.36	2	0.36	2	0.36	
	Auxillary Relays	10	0.09		2	0.18	2	0.18	2	0.18	
	Indicating lamps @ 7 lamps/panel	11.5	0.10		2	0.21	2	0.21	2	0.21	
2.0	DC Emergency Lighting	2000	18.18		1	18.18	1	18.18	1	18.18	
	TOTAL LOAD					24.39		18.94		24.39	
					Current Considering 25% Future Growth						
					30.49			23.67		30.49	
Note: As per cl. 8.3,section-III(Electrical) auxiliary supply for spring charging motors of 11KV,415V switchboards shall be 240V AC.											



This Duty Cycle along with parameters mentioned at page 1 of 3 of Annexure-B shall be considered for battery sizing calculations.

Annexure-2 to PY 55434,Rev00

Price Schedule								
Project: Nalco, Damanjodi, Unit#6								
Item: Battery Package								
PR No.: 1900137744								
Sl. No.	Material Code	Material Description	Quantity	Unit of Measurement	Unit Price	Total Price	Price in % of Total Price	Remarks
1	PY9755434003	110V, 54 Cell, VRLA Battery-1 as per Duty Cycle at Annexure-A	2	Set			86.6%	
2	PY9755434011	110V, 54 Cell, VRLA Battery-2 as per Duty Cycle at Annexure-B	2	Set			5.6%	
3	PY9855434021	Supervision of E&C of Battery-1	2	Set				Data shall be filled in break-up i.e. in Sl. No. 3.1 and 3.2.
Break up for Item Sl. No. 3 is as follows:								
3.1	PY9855434021	Lump Sum Price for Travel by Battery Package OEM to and fro site per Visit (1 SET = 1 VISIT)	2	Set			1.3%	
3.2	PY9855434021	Lump sum Price Including Services, Lodging, Boarding etc., for Battery Package OEM at Site (1 SET = 3 DAYS)	2	Set			2.6%	
4	PY9855434030	Supervision of E&C of Battery-2	2	Set				Data shall be filled in break-up i.e. in Sl. No. 4.1 and 4.2.
Break up for Item Sl. No. 4 is as follows:								
4.1	PY9855434030	Lump Sum Price for Travel by Battery Package OEM to and fro site per Visit (1 SET = 1 VISIT)	2	Set			1.3%	
4.2	PY9855434030	Lump sum Price Including Services, Lodging, Boarding etc., for Battery Package OEM at Site (1 SET = 3 DAYS)	2	Set			2.6%	

PLEASE NOTE:

1. Bidder to quote Lumpsum Price (including Basic, P&F, and Freight cost, but exclusive of GST) in the Price Bid.
2. Price for individual line items will be determined by multiplying the weightage percentages mentioned above with the Overall Price quoted by the Bidder.
3. GST payment to vendor shall be after GST credit availability to BHEL in GST portal.

TD-201 Rev No. 00 Form No.		PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE-3 TO PY55434
			Rev No. 00
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	QAP GUIDELINES & FORMAT		

VENDOR'S NAME & ADDRESS:			MANUFACTURING QUALITY PLAN						QP. NO.:				
			CUSTOMER: BHEL, HYDERABAD – 32.			BHEL P.O.NO.:			REV NO:		DATE:		
			PROJECT:			P.O.DATE:			PAGE 1 OF 1				
PRODUCT:			BHEL SPEC:			REV:							
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
2.0	INPROCESS INSPECTION												
3.0	FINAL INSPECTION & TESTING												
4.0	PRESERVATION & PACKING												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS:			TYPICAL MANUFACTURING QUALITY PLAN						QP. NO.:				
			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			REV NO:		DATE:		
									PAGE 1 OF 10				
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
	ACTIVE MATERIAL POSITIVE & NEGATIVE	APPEARANCE/STRUCTURE	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		CHEMICAL COMP	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASUREMENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	CONTAINER	MATERIAL	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASUREMENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		IMPACT STRENGTH	MAJOR	MECHANICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICATE REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

VENDOR'S NAME & ADDRESS:			TYPICAL MANUFACTURING QUALITY PLAN							QP. NO.:			
			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO				REV NO:		DATE:	
										PAGE 2 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		FITMENT	MAJOR	MECHANICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	RUBBER COMPONENTS	VISUAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASUREMENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		HARDNESS	MAJOR	MECHANICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		CHEMICAL RESISTANCE	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	SEPARATOR	MATERIAL	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICATE REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

VENDOR'S NAME & ADDRESS:			TYPICAL MANUFACTURING QUALITY PLAN							QP. NO.:			
			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO				REV NO:		DATE:	
										PAGE 3 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		DIMENSIONS	MAJOR	MEASURE MENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	VENT PLUG	TYPE	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASURE MENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		FITMENT	MAJOR	MECHANIC AL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	ELECTROLYTE	COMPOSITION ANALYSIS	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	INTER CELL,ROW,BANK CONNECTORS	VISUAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICATE REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

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			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO				REV NO:		DATE:	
										PAGE 4 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		DIMENSIONS,NUMBERS	MAJOR	MEASUREMENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		PVC LEAD PLATED Cu CABLE	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	BATTERY STAND & ACCESSORIES	VISUAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASUREMENT	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		ELECTROLYTE RESISTANCE	MAJOR	CHEMICAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	FLAME ARRESTORS	VISUAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART- I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICATE REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

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			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY				BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			REV NO:		DATE:	
										PAGE 5 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
	CELL TERMINAL	VISUAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART-I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		MATERIAL	MAJOR	VISUAL	SAMPLING AS PER IS-2500,2000 PART-I INSPECTION LEVEL(S-4)	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
2.0	INPROCESS INSPECTION												
	POCKET FILLING	FILLING w.r.t VISUAL CHECK FOR EMPTY POCKET	MAJOR	MEASURE MENT	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	MAT CUTTING	CUT OFF LENGTH MAT WIDTH THICKNESS	MAJOR	MEASURE MENT	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	FRAME WELDING	VISUAL	MAJOR	VISUAL	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		CONFIGURATION	MAJOR	VISUAL	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
	PLATE PRESSING	VISUAL	MAJOR	VISUAL	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		THICKNESS	MAJOR	MEASURE MENT	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSIONS	MAJOR	MEASURE MENT	100%	AS PER APPD DRG/APPD DATASHEET/BH EL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHE L SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICATE REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

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			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY				BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			REV NO:		DATE:	
										PAGE 6 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
	STACK ASSEMBLY	CONFIGURATION	MAJOR	VISUAL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		SHORT CIRCUIT	MAJOR	ELECTRIC AL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		POLARITY & MARKING	MAJOR	ELECTRIC AL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	HEAT SEALING	APPEARANCE	MAJOR	VISUAL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		AIR PRESSURE	MAJOR	MECHANIC AL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	ELECTROLYTE PREPARATION	COMPOSITION	MAJOR	CHEMICAL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		CHECK OF IMPURITIES	MAJOR	CHEMICAL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		SPECIFIC GRAVITY	MAJOR	MECHANIC AL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
3.0	FINAL INSPECTION & TESTING												
	ROUTINE TEST	PHYSICAL EXAMINATION	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		MARKING	MAJOR	MEASURE MENT	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICAT REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

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			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO				REV NO:		DATE:	
										PAGE 7 OF 10			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		DIMENSION,MASS & LAYOUT	MAJOR	MEASURE MENT	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
	ACCEPTANCE TEST	PHYSICAL EXAMINATION TEST	MAJOR	MEASURE MENT	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2	1		
		DIMENSIONS	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2	1		
		MARKING	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2	1		
		TEST FOR VOLTAGE DURING DISCHARGE	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2	1		
		CAPACITY TEST	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2	1		
	TYPE TEST	VERIFICATION OF CONSTRUCTIONAL REQUIREMENTS/VISUAL EXAMINATION	MAJOR	MECHANIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		MARKING	MAJOR	MEASURE MENT	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		DIMENSION	MAJOR	VISUAL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		TEST FOR AH CAPACITY	MAJOR	ELECTRIC AL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

LEGEND: **P**: PERFORM, **W**: WITNESS, **V**: TEST CERTIFICAT REVIEW. INDICATE **1** FOR BHEL / BHEL NOMINATED INSPECTION AGENCY, **2** FOR VENDOR/SUB VENDOR & **3** FOR END USER/END USER'S REPRESENTATIVE AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

VENDOR'S NAME & ADDRESS:		TYPICAL MANUFACTURING QUALITY PLAN							QP. NO.:				
		CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY				BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			REV NO:		DATE:		
									PAGE 8 OF 10				
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		TEST FOR VOLTAGE DURING DISCHARGE	MAJOR	MECHANICAL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		AH & WH EFFICIENCY TEST	MAJOR	ELECTRICAL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		TEST FOR LOSS OF CAPACITY/RETENTION OF CHARGE ON STORAGE	MAJOR	ELECTRICAL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		Short circuit current and internal resistance measurement test	MAJOR	ELECTRICAL	as per IEC-60896-1	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		Test for suitability for floating operation	MAJOR	ELECTRICAL	As per IEC-60896-1	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	
		Air Pressure Test	MAJOR	MEASUREMENT	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC	TEST CERTIFICATE	√	2		1	
		ENDURANCE LIFE CYCLE TEST	MAJOR	ELECTRICAL	AS PER IS-8320	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	√	2		1	

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		CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY				BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			REV NO:		DATE:		
		PAGE 9 OF 10											
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
	Site Acceptance Test	a) Marking and packing b) Verification of dimensions c) Test for capacity d) Test for voltages during discharge.	MAJOR	VISUAL/ MEASUREMENT / ELECTRIC AL	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	IR		2	1		These tests should be conducted at Site
	ACCESSORIES ,SPECIAL TOOLS,TACKLES & SPARES	BOM,VISUAL	MAJOR	ELECTRIC AL	100%	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	TEST CERTIFICATE	✓	2	1		
4.0	PRESERVATION & PACKING												
		PACKING*	MAJOR	VISUAL	RANDOM	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	AS PER APPD DRG/APPD DATASHEET/BHEL SPEC.	Packing List	✓	2		1	*Packing for export orders shall be seaworthy (i.e. as per HY0490573)

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									REV NO:		DATE:		
			CUSTOMER: BHEL, HYDERABAD – 32. BHEL, MOU.NO. : PRODUCT: BATTERY			BHEL REF. NO. : BHEL SPEC: REV: VALID UP TO			PAGE 10 OF 10				
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
									D	P	W	V	

NOTE:-

- 1) This MQP should be read along with specification, approved drawings & approved data sheet.
- 2) Latest revisions of specifications/drawings as per P.O., approved drawings & bill of materials are applicable.
- 3) All test certificates/reports reviewed and certified by TPI/BHEL shall be submitted to BHEL as documentation package.
- 4) Drawing/data sheet/specification shall prevail over quality plan for contradiction if any between quality plan and drawing/specification/drawing
- 5) Any project/customer specific requirement which shall be notified have to be fulfilled by the vendor at the time of execution of order.
- 6) If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.

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INSPECTION PROCEDURE (IP) FOR ELECTRICAL EQUIPMENT AT MANUFACTURERS' WORKS

Project : NALCO CGPP
Contractor's Name :
Package Description : BOILER & TURBOGENERATOR

Contract/P.O. No. :
Contract Specification Reference : NALCO CGPP-3CA01-PWR-01(R1)
IP No. & Rev. : IP-28812-E-XX Rev. 0

List-A			List-A			List-B			
Test & Test Certificates			Test & Test Certificates			Documents			
1	Visual & Workmanship	16	Dynamic Balancing	31	Galvanizing test	B1	GA Drawing duly approved	B13	Manufacturer's conformity Certificate
2	Dimensional	17	Oil BDV Test	32	Flame Proof Test	B2	Data Sheet duly approved	B14	Contractor's Internal Test Report
3	Ultrasonic Test	18	Measurement of tan delta & capacitance	33	Measurement of Noise	B3	BOM duly approved	B15	Test Certificate for bought-out items
4	Routine test as per relevant standard	19	FRLS Tests	34	Measurement of Vibration	B4	SLD/Schematic duly approved		
5	Acceptance Test as per relevant standard	20	Contact resistance measurement	35	Load test	B5	Terminal Plan duly approved		
6	Type test as per relevant standard	21	Environmental tests	36	Measurement of no load current	B6	Cable Schedule/Earthing Schedule		
7	Pressure/Vacuum test	22	Operational & Fuctional Tests	37	Checking for ease of maintenance	B7	Manufacturer's Catalogue		
8	High Voltage Test	23	Burn-in tests	38	Checking for safety provisions	B8	Control Philosophy		
9	Measurement of Insulation Resistance	24	Measurement of shaft voltage	39	Relay operation check by current injection (Primary/Secondary)	B9	Painting Certificate		
10	Enclosure Protection	25	Measurement of ripples			B10	Calibration Certificates from NABL accredited Laboratory		
11	Painting Shade & Thickness Check	26	Measurement of harmonics	40	Measurement of Gain/SNR/Attenuation	B11	Functional Description		
12	Temperature Rise Test	27	LPT Tests			B12	Test Certificates from statutory bodies like CMRI/ NEPA/UL/FM/ BASEFA		
13	Impulse Test	28	Physical & Chemical Properties						
14	Oil leakage test	29	Over speed test						
15	PI Value measurement	30	Short Circuit Test						

General Note :-

- 1) Three sets of test certificates (2 sets hard & 1 set soft) duly verified and signed by the main Contractor shall be furnished.
- 2) IP number and revision status to be indicated by M.N.Dastur & Co. (P) Ltd.
- 3) Drawing approval authority shall be as per contract.
- 4) If quantity is in lot/set, substantial quantity shall be offered for economy of inspection & lot/set break-up details should be certified by the competent authority.
- 5) Attempt shall be exercised to furnish IP for all the items if the package in single lot.
- 6) Calibration Certificate of all measuring Instruments and Gauges used in inspection & testing shall be from NABL Lab.

Sl. No.	Contract/ Billing Schedule/ Item No.	Equipment/Item Description	Qty.	In-Process Inspection (Select from List-A)			Final Inspection (Select from List-A)			Acceptance Norm (Indicate applicable Standards, Methods, Procedures] & Documents from List B	Test Certificates & Documents to be submitted by Contractor (Select from List A&B)	Remarks/Sampling Plan, if any
				M	C	D	M	C	D			

Abbreviation:-

M : Manufacturer C : Contractor D : M.N.Dastur & Company (P) Ltd. R : Document Review

Signature of Contractor & Seal
Name:

Signature of Client
Name:

Signature of Inspection Agency & Seal
Name: M.N. Dastur & Company (P) Ltd.