

TECHNICAL SPECIFICATION REQUIREMENTS

FOR BATTERY CONTAINERIZATION

St Helena Project (3MWh/3.2 MW)

For Information	-	For Proposal/ Purchase	×	For Design	-
For Approval	-	For Construction	-	As Built	-

About This Document

This document has been generated for the Hybrid & Energy Storage plant constructed and operated by Sterling and Wilson. This document must not use anywhere until it is specially released for the project.

Copyright

All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law. For permission requests, write to the publisher, addressed "Attention: Permissions Coordinator," at the address below

Sterling and Wilson Private Limited (Hybrid & Energy Storage).

Document History

Sr. No.	Document Name	Rev No.	Produced By	Date of Release
1	Technical Specification for Container	R0	VT	07.04.2021
2				
3				

STERLING AND WILSON PRIVATE LIMITED (HYBRID & ENERGY STORAGE)

Contents

About This Document.....	2
Copyright	2
Document History.....	2
1. INTRODUCTION	4
2. OVERALL SCOPE.....	4
3. SUPPLY SCOPE BIFURICATION	5
4. Specification	6
4.1 Battery	6
4.1.1 Battery Rack Specification	6
4.1.2 Battery Module Specification	8
4.1.3 Battery Cell Specification.....	9
4.1.4 Heat Generated	9
4.2 Battery Container	9
4.3 DC Combiner Panel.....	11
4.4 HVAC.....	13
4.5 Fire Fighting System	14
4.6 Auxiliary Distribution board	15
4.7 UPS.....	16
4.8 Cabling	16
4.9 Sensors.....	16
4.10 Container Lighting	16
4.11 CCTV.....	17
4.12 ENVIRONMENTAL MONITORING SYSTEM	17
4.13 EXTERNAL EMERGENCY STOP.....	17
4.14 GROUNDING	17
4.15 AUXILLARY CONSUMPTION	17
5. Documents to be provided	18

1. INTRODUCTION

1. This specification covers Design, engineering, manufacture, assembly and testing at works, as specified complete with all accessories for efficient and trouble-free operation.
2. It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guaranteed
3. Deviations if any should be brought out very clearly. Otherwise it will be construed that the bidder's offer is in line with what has been stated /asked for in this specification.

2. OVERALL SCOPE

The intent of this specification is to provide guidelines for Containerization of battery along with associated equipment.

Bidder is expected to perform following design & documentation

- HVAC Designing
- Fire Fighting System Designing
- DC Combiner Panel Designing
- Auxiliary Panel Designing
- UPS Sizing
- DC cable Sizing
- Container GA drawing with HVAC & FAS arrangement (in 3D)
- Installation Procedure
 1. Civil foundation drawing for Container
 2. Installation of racks inside container
 3. Installation of DC combiner panel inside container
 4. Installation of Auxiliary Cabinet, UPS & other associated equipment.
 5. Installation of Communication cabinet
 6. Installation of Fire Protection System
- Container Electrical drawing (needs to be done in 3D)
 1. DC cabling for Rack to DC combiner panel
 2. Auxiliary cabling
 3. Communication Cabling up to Control Cabinet

3. SUPPLY SCOPE BIFURICATION

Here we have provided tentative scope bifurcation for all major items any other tools, equipment, software required to complete the work will be in scope of bidder. Due to transport limitation, we need to provide 20 feet Container in this project.

S/N	Item	Unit	Qty.	Remarks	Supply Scope
1	Battery Container (20 feet)	set	2	Overall, 2 containers & total racks are 12	Bidder scope
Specification of Each Container					
1.1	Container	pcs	1		Bidder scope
1.2	Battery Rack	pcs	6	1, Made by CATL. 2, Excluding battery modules and cables between the battery modules.	Battery OEM
1.3	DC Combiner Panel (6 in 1 out)	pcs	1	Including disconnecter, fuses, DC Busbars, surge protection device, etc.	Bidder scope
1.4	Auxiliary Panel	pcs	1	Including MBMU and ETH supplied by CATL and managed Ethernet switch supplied by bidder.	Bidder scope
1.6	Fire Suppression System	set	1	Including gas extinguishing panel, system status unit, temperature sensors, smoke sensors, alarm bell, etc.	Bidder scope
1.7	UPS 3kVA,1hrs@BOL	pcs	1		Bidder scope
1.8	Environment Monitoring System	set	1	Including temperature sensors, humidity sensors, limit switch, combustible gas detection sensor, combustible gas detection sensor etc.	Bidder scope
1.8.1	PLC	pcs	1	Hard wiring with FSS, Environment monitor system and communicate with HVAC.	Bidder scope
1.9	CCTV	set	1		Bidder scope
1.9.1	Infrared IP camera	pcs	2		Bidder scope
1.10	General Lighting	set	1	Including lamps and switches.	Bidder scope
1.11	Emergency Lighting	pcs	2		Bidder scope
1.12	Cable	set	1	Cable inside the Battery Container, excluding cables between the battery modules.	Bidder scope
1.12.1	Battery rack to DC Combiner Panel	set	1	Specified by CATL	Bidder scope
1.12.2	Signal cable	set	1		Bidder scope
1.12.3	Communication cable	set	1		Bidder scope
1.12.4	Control cable	set	1		Bidder scope
1.12.5	Auxiliary panel power supply cable	set	1		Bidder scope
2	Air Conditioner Cabin	set	1	Air conditioner and cabin	Bidder scope
2.1	Air Conditioner	pcs	1		Bidder scope

S/N	Item	Unit	Qty.	Remarks	Supply Scope
3	NVR and switch for CCTV	set	1		Bidder scope
3.1	Ethernet switch	pcs	1		Bidder scope
3.2	NVR	pcs	1		

4. Specification

4.1 Battery

Battery along with racks, controllers & BMS will be free issued to the bidder, erection of it inside container along with associated power & communication cabling will be in scope of bidder.

Following information is shared with bidder:

- Cell, module & rack specification
- Heat generated by batteries

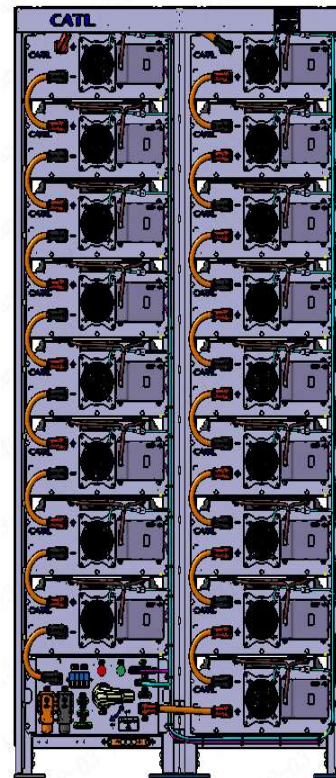
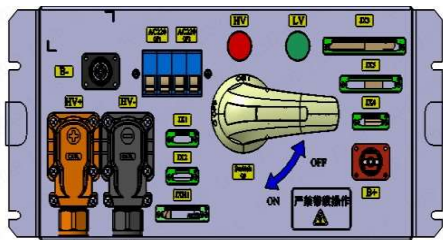
Specification shared here will provide basic input for following:

- Layout preparation
- CFD designing
- HVAC designing
- Fire protection System
- Cable selection
- Auxiliary Panel Designing

4.1.1 Battery Rack Specification

ITEM	SPECIFICATION
Configuration	(1P20S)17S
Rated Energy	304.6kWh@25°C, BOL
Rated Voltage	1088V
Voltage Range	952V~1224V
Weight	2850kg
Dimension (H * W * D)	2300mm*1200mm*1000mm
Operation Range of Temperature	Min:0°C Max:40°C
Cooling Method	Air Cooling

Humidity	0%~95%, No condensing
Nominal Power Consumption	Fan circuit: 204W(408VA) , PF:0.5 Control circuit:55W (142VA) , PF:0.46
Inrush Power Consumption	Fan circuit:255W(510VA) @3s , PF:0.5 Control circuit:105W (255VA) @30ms PF:0.46
Communication Protocol	Modbus +CAN
Certification	IEC 62619, UL 1973, UN38.3
Rack Short circuit current	11KA/ms

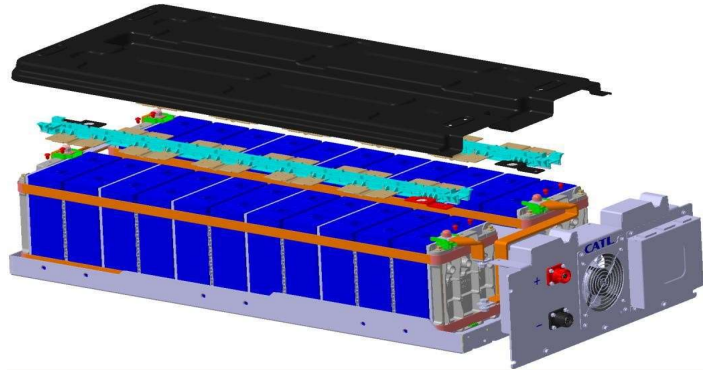


4.1.2 Battery Module Specification

ITEM	SPECIFICATION
Cell	LFP-280Ah
Configuration	1P20S
Rated Energy	17.92kWh @25°C, BOL
Rated Voltage	64V
Voltage Range	Min:56V Max:72V
Weight	135kg
Dimension (H * W * D)	234mm(H)*516mm(W)*950mm(D)
Operation Range of Temperature	Min:0°C Max:40°C
Cooling Method	Air Cooling
Humidity	0%~95%, No condensing
Certification	IEC62619, UL1973, UN38.3

CSC

- Passive Balancing
- Cell voltage measurement
- Temperature measurement



4.1.3 Battery Cell Specification

ITEM	SPECIFICATION
Nominal capacity	$\geq 280\text{Ah}$ @ 25°C, 0.25C, BOL
Nominal voltage	3.2V
Dimension(W*H*D)	173.9×207.3×71.5mm
Weight	5.15±0.2kg
Impedance(1kHz,BOL,40%SOC)	0.15±0.06mΩ
Reversible capacity loss (25°C, 100% SOC / month)	$\leq 3.5\%$
Operation temperature (case dependent)	-30°C ~ 60°C
Storage temperature (case dependent)	-30°C ~ 60°C
Certification	IEC62619, UL1973, UN38.3



4.1.4 Heat Generated

The heat generated at operating power (1 C) is equal to 13915 watts/rack. Recommended operating Temperature of 20±3°C, average 20 °C.

Cooling air volume is 1280m³/h

4.2 Battery Container

Please provide certification cost also for IP54 container.

Please also confirm if you will be providing certification for fire rating of Container 1 hr.

As recommended battery OEM, Pressure relief dampers should be there.

1	Container Structure	20 feet Standard Container IP54Complied		No's	2	
1.1	Base Floor					
a	Bottom Side Rail Long	ISMC 200/equivalent		No's	2	Sectional size detail may change as per design
b	Bottom Side Rail Short	ISMC 200/equivalent		No's	2	
c	Cross member	ISMC 200/equivalent		No's	23	
d	Base Floor	5mm Thk. Steel Plate		No's	1	Density - 2500kg/m ²
e	Insulation	50mm thick rock wool color steel sandwich insulation board, double-sided 0.6mm white gray color steel plate		No's	1	
f	Insulation finish	Plain GI Sheet		No's	1	Minimum Average Zinc coating 350 g/m ²
9.2	Roof					
a	Roof Sheet	3mm Thk. Corrugated Steel Sheet		No's	1	Minimum Average coating 350 g/m ²
b	Insulation	Rock Wool		No's	1	
c	Insulation finish	Aluminium Sheet		No's	1	Density - 2800 kg/m ³
9.3	Side Wall					
a	Long Wall	2.3mm Thk. Corrugated Steel Sheet		No's	2	Minimum Average
b	Short Wall	2.3mm Thk. Corrugated Steel Sheet		No's	2	

						coating 350 g/m2
c	Insulation long wall	50mm thk.		No's	2	
		0.5mm EGA sheet		No's	2	
d	Insulation Short wall	50mm thk.		No's	2	
		0.5mm EGA sheet		No's	2	
e	Top Side Rail Long	ISMC 200/equivalent		No's	2	Sectional size detail may change as per design
f	Top Side Rail Short	ISMC 200/equivalent		No's	2	
9.4	Corner Post	SHS (6 thk.) YSt 240		No's	4	Section size as per design
9.5	Corner Casting	Weldable Castings		No's	8	As per ISO 1161
9.6	Door Assembly	Door Frame with 2 leaves, Gasket, Door Panel, Pins & Hinges, Door Handle, Locking Device, Door Holder & Receptacle and etc.		No's	1	Door Material - SS400
9.7	Sealing	Silicon Sealant		LOT	1	Industrial standard
9.8	Ventilators			No's	-	Not Required
9.9	Surface Protection	Acrylic Paint/Epoxy Paint		LOT	1	Industrial standard
9.10	fire resistance limit of wall	Should not be less than 1 hrs				

20" High cube standard container (outside dimension): 6.096 (L) x 2.44 (W) x 2.90 m(H)

4.3 DC Combiner Panel

Each Container with 6 racks will have 1 DC Combiner Panel. Given specification is tentative & bidder is required to propose as per their experience. Bidder need to confirm that with adequate fuse protection we can connect 6 racks to PCS. Proposed PCS is having DC side short circuit rating 73kA. Rack short circuit current is 11kA, so in total we have 66kA.

1	DC combiner panel		No's	1
1.1	Enclosure		No's	1
1.2	DC disconnect Switch		No's	1
1.3	Outgoing fuse		No's	1(1 on each polarity)
1.4	Mounting Plate		No's	1
1.5	Incoming Fuse		No's	6 (6 on each polarity)
1.6	Fuse holder		No's	6
1.7	Cu Busbar for suitable size		No's	1
1.8	Cu link		No's	6
1.9	Cable Glands Input		No's	12
1.10	Cable Glands Output		No's	Depends upon number of outgoing cable
1.11	Cable Glands earthing		No's	1
1.12	Surge Protection device , Type II		No's	1
1.13	Earth terminal block		No's	1
1.14	Wiring Accessories, Cable, Lugs, sleeves, Acrylic Sheet, ferrules, screws etc,		lot	1
	General Parameters			
1	Operating temperature range			-30~+55°C
2	Relative humidity range			0~95% (no condensation)
3	Operating altitude			2000m
4	Weight	Bidder to suggest the same after	kg	

		doing heat test		
5	Dimension	Bidder to suggest the same after doing heat test	mm	

We should be able to monitor fuse & DC isolator status.

Bidder to provide DC Combiner SLD specifying following :

1. Incoming side Fuse details
2. Outgoing side Fuse details
3. Rated bus bar current
4. SPD details

Also provide following information :

5. Recommended cable size between DC Combiner panel and PCS
6. Panel Internal Design

4.4 HVAC

As per Battery OEM, following is the requirement, bidder needs to please comply following:

- a) Temperature sensors need to be located on top side of each hot and cold aisle as per S&W configuration.
- b) Annual average inlet cooling air temperature to be 20°C or lower. (inlet air temperature could be 20±3°C, but the daily average inlet cooling temperature should be 20°C or lower)
- c) Cooling air volume of single rack ≥ 1280m³/h

The cooling system of the storage system must be resistant to dust and sand.

Following features should be there in HVAC system:

- It must be capable of maintain recommended operating Temperature of 20±3°C, average 20 °C.
- Intelligent Control
- Capable of working Wide voltage range: 400Vac 50/60Hz

Request you to please share the HVAC Power (in kW) & Auxiliary Consumption (in kWh) for both the Standby & Operational state. Bidder to provide the HVAC Operational strategy.

Also please mention the dimension of Cooling System.

4.5 Fire Fighting System

To protect the battery system, it is to be equipped with FFS (Fire Fighting (Suppression) System) inside the container.

FFS to include smoke detector, control panel, alarm device, exhaust pipe and bump head.

It should use clean fire suppression gas to minimize the second loss such as HFC-227ea or HFC23 or any other.

Before gas blow-out, system controller should send signal to HVAC main power switch to stop working as well as the fan thus achieve fire suppression process.

Fire Fighting System should be capable of working in both Automatic & Manual modes.

Bidder to prepare detail BOQ clearly mentioned qty & make of following, if applicable:

Gas Cylinder
Complete , high rated Discharge Valve, Auto / Manual Actuator with Explosive Cartridge, Pressure Gauge, Pressure Switch, Discharge Hose, Protection Cap, Wall Bracket etc
Smoke Sensor
H2 Gas Sensor
Temperature Sensor
Combustible Gas Sensor
Heat detectors
Automatic Discharge Nozzles
Conventional Microprocessor Based 4 Zone Fire Alarm Panel with Single gas discharge module with inbuilt charger and with battery
Inhibit Switch / Abort Switch Suitable for semi outdoor application
Electronic Dual Tone Hooter with Flashing Lamp for Indoor Application./Acoustooptic alarm
Manual alarm button
Fire emergency start stop button

4.6 Auxiliary Distribution board

The auxiliary panel provides necessary auxiliary power to all the AC equipment inside the container and lighting of the container. Following tentative Auxiliary panel design

No.	Particulars	Requirements
1	Rated Voltage	400V
2	Rated Frequency	50Hz
3	Types of Supply System	3P4W
4	Energy Measurement Accuracy of Multifunction Meter	Class 0.5
5	Power Cable Outlet Position	Bottom of the Panel
6	PLC	With AI, DI and DO interface, it can receive signals of Environment monitor system, FSS and other devices, and communicate with the air conditioner via RS-485.
7	MBMU	Communicate with battery rack by CAN. Provided by CATL Bidder to have provision either in Aux panel or separate Control panel
8	ETH	Communicate with EMS by Ethernet provided by CATL Bidder to have provision either in Aux panel or separate Control panel
9	Switch for Control	8-ports managed Ethernet switch, PHOENIX QTY: 1 each container

Aux DB to have provision to provide supply to following :

- Rack Fan
- Lighting
- HVAC
- FAS
- CCTV etc.
- PCS (3.5kW, 230V)

Bidder to provide supporting Auxiliary SLD

4.7 UPS

3kVA UPS should be provided to cater the Auxiliary requirement of Critical Equipment's & Communication equipment along with its distribution board, It should be capable enough to have 1 hr back up. UPS DB to have provision to provide supply to following :

- Rack Control Circuit
- MBMU
- ETH
- PCS Control Circuit (0.5kW, 230Vac)

4.8 Cabling

All cables used for DC cabling should Cu XLPE Unarmoured cable of suitable size.

Communication Cabling up to Control Cabinet will be done by CAN bus cables.

For others communication STP CAT-6 cable to be used.

All cables to be routed in cable ducts, communication and power cables will be installed separately to prevent EMI problems.

Lugs & glands required to be suitably selected for cables.

Water proof cable inlets to allow a sealed inlet of power cables, the communication cables, and the auxiliary power supply. The sealing to fits for each cable type.

4.9 Sensors

The access doors to have a door contact to allow to check and to log the status of the doors (open or closed).

The battery container is to be equipped with temperature sensors (PT 100) to constantly monitor the room temperature of the system.

The battery container is to be equipped with one humidity sensor for 0...100% relative humidity with a CAN open IO module that can be connected to SCADA system or/and the site controller. Operation temperature is -30 ... +70°C.

4.10 Container Lighting

The BESS container to have LED lamps or similar installed inside at the ceiling of the housing. These lights can be switched on and off with a switch located at the access door(s).

Emergency lighting should be provided.

4.11 CCTV

Infrared IP camera installed strategically to cover the container area along with required switch & NVR. Bidder to specify proposed numbers of CCTV along with NVR specification.

4.12 ENVIRONMENTAL MONITORING SYSTEM

The environmental monitoring system will collect the following signals and send them to the remote monitoring system or related equipment via Ethernet for display and storage.

- 1) Status of the container doors.
- 2) Temperature inside the container
- 3) Humidity inside the container
- 4) Concentration of H₂
- 5) DC Combiner Panel Fuse & isolator status
- 6) Auxiliary Panel MFM

4.13 EXTERNAL EMERGENCY STOP

4.14 GROUNDING

Bidder to provide their recommendation for grounding

4.15 AUXILIARY CONSUMPTION

Bidder to provide overall container Auxiliary Consumption in kW & kWh in below table :

S.No	Loads	Number of Items per prefab room/Container	Per Unit Auxiliary Power required during charging & discharging (KW)	Per Unit Auxiliary Power required during standby(KW)	PF	Max. Peak Power Requirement (KVA)	Auxiliary Power required during charging & discharging (KW)	Auxiliary Power required during standby(KW)	Number of hours for Charging (h)	Number of hours for Discharging (h)	Number of hours in standby (h)	Total Aux Cons per day (Charging + Discharging + Standby) (KWh)
1	PCS	1	3.5	0.235	1	3.5	3.5	0.235	2.5	2.5	19	21.965
2	PCS control circuit	1	0.5	0.5	1	0.5	0.5	0.5	2.5	2.5	19	12
3	Battery fan											
4	Battery Control Circuit											
5	MBMU+ETH+ Managed switch+PLC											
6	A/C (0.87 PF considered)*											
7	FSS											
8	Lighting											

5. Documents to be provided

1. TEMPERATURE RISE CALCULATION INSIDE CABINET
2. TEST CERTIFICATES
3. DETAILED BOQ
4. GA
5. Operational & Maintenance Manual.
6. Installation Manual
7. Recommended Spares for O & M, commissioning
8. DATASHEET OF FUSES, MCBs, ISOLATOR & SPDs etc..