Appendix F: Hazard Mitigation Analysis and Phase I ESA

COFFMAN ENGINEERS



SEAFLOWER BATTERY ENERGY STORAGE SYSTEM PROJECT

Hazard Mitigation Analysis

COFFMAN PROJECT NO. 251227

ISSUED FOR CUP SUBMITTAL

October 9, 2025

Prepared for: Samsung

HAZARD MITIGATION ANALYSIS

FOR

SAMSUNG
SEAFLOWER BATTERY ENERGY STORAGE SYSTEM PROJECT

Menifee, California

Project Number: 251227

Revision	Date	Description
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PREPARED BY:

COFFMAN ENGINEERS, INC.

CONTACT:

Patrick Wicker. P.E. (Registered in CA)
Engineer, Fire Protection Engineering
619-398-9603

&

Christopher S. Thomas, P.E. (Registered in AZ)
Discipline Manager, Fire Protection Engineering
818-285-2650

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ABBREVIATIONS

AHJ	Authorities Having Jurisdiction
BMS	Battery Management System
DC	Direct Current
EMS	Energy Management System
ESS	Energy Storage System
FACP	Fire Alarm Control Panel
FCC	Fire Command Center
IFC	International Fire Code
HMA	Hazard Mitigation Analysis
HVAC	Heating, Ventilation, and Air Conditioning
IDLH	Immediately Dangerous to Life and Health
kV	Kilovolt
LFL	Lower Flammability Limit
LPC	Local Plant Controller
MW	Megawatt
MWh	Megawatt-hour
MV	Medium Voltage
NEC	National Electric Code
NESC	National Electric Safety Code
PCS	Power Conversion System
PEL	Permissible Exposure Limits
SCADA	Supervisory Control and Data Acquisition
UPS	Uninterruptible Power Supply

1 PROJECT BACKGROUND

1.1 Introduction

Coffman Engineers, Inc. provides this Hazard Mitigation Analysis (HMA) in accordance with the 2022 California Fire Code (CFC), as amended and adopted by the city of Menifee, for the Seaflower Battery Energy Storage System project. The site will utilize 102 SolBank 3.0 battery enclosures from e-STORAGE containing Prismatic Lithium Iron Phosphate (LFP) batteries, totaling 100 Megawatts (MW) of battery energy storage. The City of Menifee Fire Department is the Authority Having Jurisdiction (AHJ) for this project. The life safety of personnel shall be the highest priority during any event.

1.2 Site Location

The Seaflower Battery Energy Storage System project is located at 28636 Matthews Rd, Menifee, CA 92584 corresponding to APN 331-250-021, 331-250-002. See Figure 1.2.1 below for site location and layout.

Project Summary	
Owner	Seaflower Energy, LLC.
Engineering, Procurement and Construction	Samsung C&T Corporation
Utility	SCE Valley Substation
ESS Enclosure Type (Model Number)	Enclosure Type IP-55 SolBank 3.0 (CSI-SolBank-S-5016-4h-NA)
Number of ESS Enclosures	102 Enclosures
Total Site Footprint	3.70 acres
Capacity	100MW / 400MWh

The project will utilize SolBank 3.0 outdoor-rated energy storage system (ESS) enclosures and associated on-site support facilities including inverters, collection lines, fencing, access roads, SCADA, and other ancillary equipment. The SCE Valley Substation is located off-site approximately 0.04 miles from the Seaflower ESS location.

The typical equipment arrangement is a group of three SolBank 3.0 ESS enclosures connected to a single transformer which is then connected to the site substation. Each block of three SolBank 3.0's connects a single power conversion system (PCS).

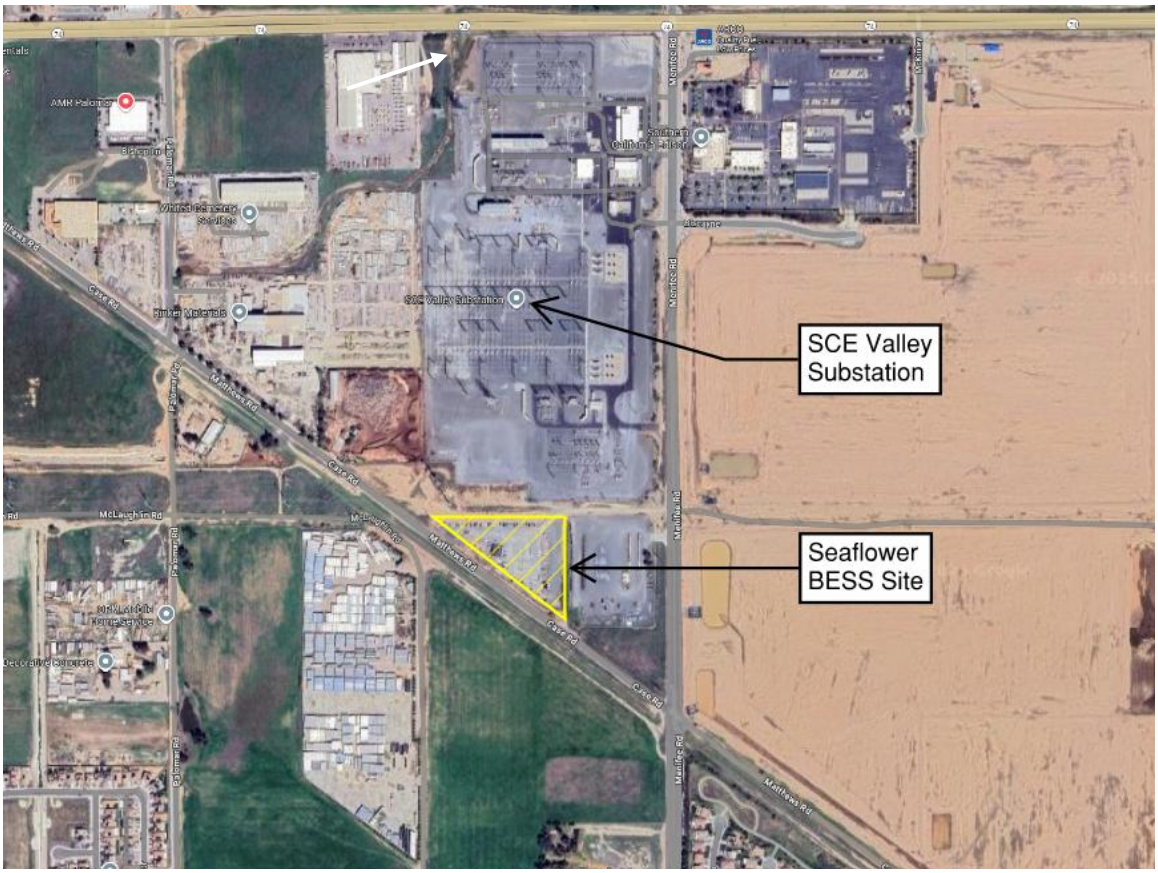


Figure 1.2.1 – Seaflower BESS Vicinity Map (North ↑)

1.3 Project and Code Summary

1.3.1 Enclosure and Battery Requirements

ESS REQUIREMENTS		
Code	Requirement	Compliance Status
Equipment Listing: *CFC §1207.3.2*	ESS shall be listed in accordance with UL 9540.	**Compliant.** SolBank 3.0 ESS Enclosure, SGS-CSTC certified to UL 9540.
ESS Type: *CFC §202 CFC 2022 Edition Definition)*	An Energy Storage System Cabinet is defined as a system where personnel cannot enter the enclosure other than reaching in to access components for maintenance purposes.	**Compliant.** Classification: Energy Storage System Cabinet Note: "ESS enclosure", and "non-walk-in" are used synonymously with "Energy Storage System Cabinet" in this report. All terms refer to the SolBank 3.0 enclosure. *Additional details: HMA Section 1.6*
Technology: *CFC §1207.6*	Requires lithium-ion ESS to comply with provisions relating to thermal runaway and explosion control.	**Compliant.** ESS Enclosures are provided with an Energy Management System and explosion prevention system.
Size and Separation: *CFC §1207.5.1, 1207.5.2*	Allows groups to exceed 50 kWh with less than 3-ft spacing based upon large-scale testing. The ESS's Maximum allowable stored energy (600 kWh) to be exceeded where an HMA and large-scale testing justify an increase.	**Compliant.** 4,800 kWh total per enclosure. Large-scale testing (UL 9540A) has been conducted to justify reduced spacing.
Hazard mitigation analysis: *CFC §1207.1.4*	The ESS's Maximum allowable stored energy (600 kWh) to be exceeded where an HMA and large-scale testing justify an increase.	**Compliant.** Hazard Mitigation Analysis will be submitted to the AHJ for final Approval.
Thermal Runaway: *CFC §1207.6.5*	Listed device or approved method required to preclude, detect, and minimize the impact of thermal runaway.	**Compliant.** Thermal runaway mitigation provided via UL9540A tested design and UL1973 listed Battery Management System (BMS) which actively monitors the voltage and temperature of all cells. *Additional details: HMA Section 3.3*
Explosion Control: *CFC 1207.6.3*	Explosion prevention or deflagration venting measures required.	**Compliant.** NFPA 69 Explosion Protection by Mechanical Ventilation system has been included. *Additional details: HMA Section 3.4*
Fire Detection: *CFC §1207.5.4*	Requires a smoke fire detection system be installed in all rooms containing ESS	**Compliant.** The SolBank 3.0 enclosure is equipped with an automatic fire detection system (smoke and heat detectors) and a gas detection system. *Additional details: HMA Section 3.1*

1.3.2 ESS Site Requirements

SITE REQUIREMENTS		
Code	Requirement	Compliance Status
Outdoor ESS Installation Type: *CFC §1207.8*	Outdoor ESS installations less than 100 feet from adjacent to site exposures, buildings, lot lines, or public ways shall be classified as "Near Exposures." Installations greater than 100 feet are "Remote locations.	**Compliant.** Classification: Outdoor ESS installations, location near exposures.
Clearance to Exposures: *CFC §1207.8.3*	A 10-foot clearance from ESS to lot lines, public ways, buildings, combustible materials, and other potential exposure hazards is required to prevent fire spread.	**Compliant.** The installation complies. A minimum of 15 feet is provided in all directions within the BESS Yard. *Additional details: HMA Figure 1.6.2*
Site Fire Water Source: *CFC §507.1 (inferred)*	Requires adequate on-site fire water source.	**Compliant**. UL 9540A testing was completed without water suppression. Water availability for site non-ESS fire events will be provided via on-site hydrants. *Additional details: HMA Section 3.2*
Vegetation Control: *CFC §1207.5.7*	Areas within 10 ft on each side of outdoor ESS shall be cleared of combustible vegetation and other combustible growth.	**Compliant.** Decomposed granite or paved areas are provided at least 10ft on all sides of the ESS enclosures.
Fire Department Access: *CFC Chapter 5*	Ensures adequate site access for emergency events and would require proper features including road widths, turnarounds, grade/surface and signage/markings.	**Compliant.** The site will incorporate all requirements within these access provisions established by CFC Chapter 5 as amended by the City of Menifee Municipal Code and subject to AHJ requirements and approval.
Impact Protection: *CFC §1207.4.5*	ESS shall be located or protected to prevent physical damage from impact where such risks are identified.	**Compliant.** There is limited risk to vehicle impact without individual bollards based upon the following: 1) Completely fenced off area with no public access. 2) Only technicians familiar with the site will access the site. 3) Enclosures are located at least 5-ft from the edge of the access roads 4) Vehicle traffic speeds will be limited to 10-mph. At a minimum there will be bollards placed at the corners of the road for turning protection.
Security of installation *CFC §1207.4.9*	ESS shall be secured against unauthorized entry and safeguarded in an approved manner.	**Compliant.** A 10-foot fence is provided around the entire site with no public access. The entrance gates are manually opened, and pad locked closed.

1.3.3 ESS Provisions not Applicable to this Project

REQUIREMENTS NOT APPLICABLE TO THIS PROJECT		
Code	Requirement	Compliance Status
Fire Area Separation: *CFC §1207.7.4*	Rooms or spaces containing ESS shall be separated from other areas of the building by 2-hour fire barriers.	**Not Applicable.** Enclosures have no fire rating requirement as they are not installed in a building.
Exhaust Ventilation: *CFC §1207.6.1*	N/A for Lithium-Ion technology	**Not Applicable.** Not required/applicable as it does not off-gas during normal charging operations.
Fire Suppression Systems: *CFC §1207.5.5*	Requires rooms containing ESS systems shall be equipped with an automatic sprinkler system installed.	**Not Applicable.** No suppression is required per the UL 9540 listing of the enclosure. 9540A testing shows limited propagation with no suppression. Enclosures are also non-walk type. Additional details: HMA Section 3.2
Spill Control: *CFC §1207.6.2*	N/A for lithium-ion technology	**Not Applicable.** Not required/applicable as the electrolyte is sealed.
Safety Caps: *CFC §1207.6.4*	N/A for Lithium-Ion technology	**Not Applicable.** Not required/applicable.
Means of Egress Separation: *CFC §1207.5.8*	A 10-foot separation between ESS enclosures and egress paths is required to ensure safe escape routes in case of fire.	**Not Applicable.** The ESS enclosures are not installed in a building, occupied areas, or adjacent to an egress path. No egress path separation provisions apply.

1.4 Code Requirements

1.4.1 Applicable Codes and Standards

The AHJ for the project has been identified as the City of Menifee Fire Department. The applicable codes with regards to fire protection and life safety with local amendments are listed below.

- CFC, California Fire Code, (2022 Edition), as adopted and amended by the City of Menifee Municipal Code
- NFPA 69, Standard on Explosion Prevention Systems (2019 Edition)
- NFPA 72, National Fire Alarm and Signaling Code (2022 Edition)
- NFPA 70, National Electric Code (NEC) (2020 Edition)
- UL 9540, Standard for Energy Storage Systems and Equipment (2020 Edition)
- UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (2019 Edition)

1.4.2 Guidance Standards

The following non-mandatory standards that have not officially been adopted for this area may be used as guidance and meeting industry best practices.

- NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition

1.5 Hazard Mitigation Analysis

1.5.1 Purpose

This HMA report is required by CFC § 1207.1.4 to support the approval of maximum energy storage quantities greater than 600 kWh for lithium-ion battery installations.

1.5.2 Basis of Analysis

This HMA report is a technical assessment conducted by a qualified professional fire protection engineer (compliant with CFC §104.8.2) to evaluate the consequences of single failure modes as required by CFC §1207.1.4.1.

The fire protection and life safety strategies incorporated into the HMA are informed by manufacturer documentation, results of full-scale fire testing (UL 9540A), and site planning for the Seaflower BESS. Manufacturer documentation is included in the appendix.

The HMA should be kept in a safe location and reviewed annually by the site operator and owner. As part of the management of change process, any modifications or changes to equipment type could trigger a permit by the AHJ. As the Engineer of Record for this project, revisions to this document must be completed by Coffman Engineers.

1.5.3 AHJ Evaluation Criteria

The AHJ may approve increased maximum energy storage quantities. An approved HMA must support this approval. The HMA should evaluate the consequences of the following hazard and incorporate large-scale fire testing evidence and analysis.

CFC	Hazard Consequences Evaluated	Compliance Assessment
§ 1207.1.4.2 (1)	Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated walls identified in Section 1207.7.4.	This minimum duration of the fire-resistance-rated walls provision is not applicable to this project as the ESS is an outdoor installation and is not a room within a building. There is no requirement for fire-resistance-rated separations.
§ 1207.1.4.2 (2)	Fires in occupied work centers will be detected in time to allow occupants within the room to evacuate safely.	This provision is not applicable to this project as the ESS is an outdoor, unoccupied installation.
§ 1207.1.4.2 (3)	Toxic and highly toxic gases released during fires will not reach concentrations in excess of the Immediate Dangerous to Life or Health (IDLH) level in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area.	This provision is not applicable to this project as the ESS is not in a building, is non-occupiable, and is accessed from the exterior (not walk-in).
§ 1207.1.4.2 (4)	Flammable gases released from ESS during charging, discharging, and normal operation shall not exceed 25 percent of their lower flammability limit (LFL).	The batteries are hermetically sealed and do not vent under normal charging or discharging operating conditions. Flammable gases are not released during normal operations.
§ 1207.1.4.2 (5)	Flammable gases released from ESS during fire, overcharging, and other abnormal conditions shall not create an explosion hazard that will injure occupants or emergency responders.	SolBank 3.0 enclosure is equipped with a mechanical ventilation system, which will operate upon activation of the gas detection system. The mechanical venting system is designed to maintain combustible gas concentrations below 25% of the Lower Flammable Limit (LFL), to prevent development of an explosion hazard with the potential to injure service personnel and emergency responders.

Table 1.5.3 - AHJ Evaluation Criteria

1.6 System Overview

The SolBank 3.0 ESS enclosure is designed as an outdoor installation complying with CFC Section 1207. See Appendix for additional information.

1.6.1 ESS System Description

The SolBank 3.0 ESS enclosures are non-walk-in outdoor steel ESS Cabinets. They are not intended for occupancy and will be accessed externally for maintenance only. See the configuration in the table below for a high level of each component.

				
Component	**Cell**	**Module**	**Rack/Unit**	**SolBank 3.0 Enclosure**
Manufacturer	CSI Energy Storage Co., Ltd.	CSI Energy Storage Co., Ltd.	CSI Energy Storage Co., Ltd.	CSI Energy Storage Co., Ltd.
Model	CSI314	CSI-SolBank-P-104.5-2h-A	CSI-SolBank-R-418-4h-A	CSI-SolBank-S-5016-4h-NA
Nominal Voltage (V)	3.2	332.8	1331.2	n/a
Nominal Capacity (kWh)	n/a	104.5	418	3,794
Weight (lbs.)	12.35	1,477	5820	94,800
Dimensions (in)	6.81 x 8.15 x 2.83	31.10 x 85.83 x 9.76	n/a	20 ft x 8 ft x 9.5 ft
Configuration / Chemistry	Prismatic Lithium Iron Phosphate (LiFePO4)	104 Cells (104S)	4 Modules	12 battery rack/units 48 modules
Thermal Management	n/a	n/a	Liquid Cooling System	Liquid Cooling System
Listing / Certification	UL 1973	n/a	n/a	UL 9540

Table 1.6.1 – SolBank 3.0 Configuration

2 FIRE TEST ANALYSIS

2.1 Cell Test

2.1.1 Setup and Conditions

Test Standard: UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 4th Edition, Section 7, November 12, 2019.

A lithium iron phosphate (LiFePO4, LFP) battery cell (Model CSI314), certified to UL 1973, was tested according to UL 9540A. Thermal runaway was induced using an external heater. Vent gas was captured in a 140L pressure vessel for analysis. Gas flammability was assessed using the ASTM E918 method at both ambient and cell vent temperatures.

The cell level test document that was references for this report was published by TUV Rheinland (Shanghai) Co., Ltd. Dated 8/6/2024, Test Report No. CN243TAR 001. The Cell Test can be found in Appendix A.

2.1.2 Cell Test Results

The cell's average venting temperature was 167.4 °C (333.3 °F), with an average thermal runaway temperature of 238.5 °C (461.3 °F). Vent gas analysis confirmed flammability when mixed with air. The LFL was 8.3% (vol in air) at 25°C, decreasing to 7.3% at vent temperature. The vent gas contained significant amounts of hydrogen, carbon dioxide, carbon monoxide, and various hydrocarbons.

2.2 Module Test

2.2.1 Setup and Conditions

This test evaluates fire hazards within a battery module as part of an ESS installation. Measurements include chemical heat release rate, maximum temperature, vent gas composition, enclosure integrity, and the presence of explosions, hazardous ejections, and external flaming. Thermal runaway was induced using external heaters at a rate of 4-7°C per minute.

The module level test document that was references for this report was published by TUV Rheinland (Shanghai) Co., Ltd. Dated 3/22/2025, Test Report No. CN25HYJ6 001. The Module Test can be found in Appendix A.

2.2.2 Module Test Results

The module level test was performed by heating three cells using film heaters. Each module contains 104 cells. A total of five cells within the module went into thermal runaway, the three initiating cells and two adjacent cells. No external flaming or sparking and no explosion or flying debris was observed.

2.3 Unit Test

2.3.1 Setup and Conditions

This test evaluated fire behavior and propagation within a SolBank 3.0 ESS unit with a focus on containment and preventing flying debris or explosive gas discharge. Thermal runaway was induced using external heaters at a rate of 4-7°C per minute. No BMS or fire suppression systems were active.

The unit level test document that was references for this report was published by TUV Rheinland (Shanghai) Co., Ltd. Dated 3/28/2025, Test Report No. CN25DK3S 001. The Unit Test can be found in Appendix A.

2.3.2 Unit Test Results

The enclosure level test results demonstrate that thermal runaway propagation was limited to three cells. There was no module-to-module propagation of thermal runway and no observations of external flaming, deflagration, or explosive discharge of gases.

3 ESS SAFETY SYSTEMS

The SolBank 3.0 ESS enclosures utilized at the Seaflower BESS site will incorporate the following safety features:

- Automatic Fire Alarm: Smoke, heat or gas detection will trigger sounder beacons to provide an alert.
- Flammable Gas Detection & Ventilation: This system detects flammable gases and triggers ventilation when the concentration reaches 10% LFL.

3.1 Fire Detection and Alarm

Each battery ESS enclosure will be monitored by site level fire command center (FCC) panel, monitoring each ESS enclosure, which is equipped with two smoke detectors and two heat detectors within the main ESS container, as well as one smoke detector and one heat detector within the enclosure's integration cabinet. Additionally, each ESS enclosure is equipped with an integrated fire alarm control panel (FACP). Status indicators will be visible at the FCC and the ESS container's associated FACP.

3.1.1 Code Requirements

CFC §1207.5.4 requires all fire areas containing ESS systems located within buildings or structures to be provided with a smoke detection system in accordance with NFPA 72. The SolBank 3.0 enclosures comply with this requirement.

3.1.2 System Description

The fire alarm system incorporates multiple detection technologies, integrated actions, and redundant monitoring/:

- Detection: Each SolBank 3.0 ESS container will contain smoke detectors, heat detectors, and combustible gas detectors. These detectors, compliant with NFPA 72 standards, were not active during the UL 9540A unit (rack) level test.

- Integration: Detection systems also transmit signals to the BMS system. Upon gas detection, the system automatically shuts down the HVAC, halts charge/discharge processes, and activates off-gas ventilation.
- Monitoring: The SolBank 3.0 stand-alone fire alarm panels are monitored at the FCC featuring an annunciator display just within the site entrance. All alarms, supervisory, and trouble signals are transmitted to the FCC and off-site monitoring service. FACPs include an uninterruptible power supply (UPS) for 24 hours of standby plus 2 hours of alarm.

3.1.3 Safety Assessment

- The fire alarm system's design aligns with relevant sections of CFC and NFPA 72 standards to provide the following benefits:
    - Fire Detection: Detection enables reliable identification of thermal runaway hazards with overlapping coverage.
    - Redundancy: Networked FACPs and off-site monitoring ensure continuous oversight and minimize response delays.
    - Proactive Mitigation: Automatic ventilation triggered by gas detection reduces the risk of flammable gas buildup.

3.2 Fire Suppression System

3.2.1 Code Requirements

The SolBank 3.0 ESS enclosures are classified as outdoor, non-occupiable installations. CFC § 1207.5.5 requires “rooms” containing stationary storage battery systems to be equipped with an automatic sprinkler system and designed in accordance with NFPA 13. As they are not considered "rooms" within buildings, CFC § 1207.5.5 does not require in-unit fire suppression systems.

3.2.2 System Description

The SolBank 3.0 ESS enclosures do not have the infrastructure to support an internal water spray system, and they were tested without an automatic water supply in accordance with UL 9540A rack-unit testing procedures.

3.2.3 Safety Assessment

UL 9540A tests demonstrated that the SolBank 3.0 ESS design successfully prevents thermal runaway propagation between modules without an internal suppression system. This indicates that the ESS enclosure design effectively contains fire hazards. The decision to rely on the fire department for water supply aligns with CFC provisions for outdoor, non-occupiable installations while still offering a level of fire protection.

Fire water may either be brought to the site via tankers or accessed by on-site fire hydrants. The fire water can be used to cool adjacent ESS enclosures, but is not recommended for direct application on effected batteries within an ESS enclosure.

3.3 Thermal Runaway Protection

3.3.1 Code Requirements

The design of the SolBank 3.0 ESS system aligns with the fire safety provisions outlined in the CFC regarding thermal runaway prevention in lithium-ion ESS:

- CFC § 1207.6.5: This paragraph mandates the use of listed devices or other approved methods to prevent, detect, and minimize the impact of thermal runaway events.
- CFC § Table 1207.6: Table emphasizes the necessity of specific protection against potential fire and explosion hazards associated with thermal runaway in lithium-ion batteries.
    - Footnote E, Table 1207.6: This footnote clarifies that thermal runaway mitigation strategies can be incorporated into the BMS, provided the BMS has been evaluated in conjunction with the battery using UL 1973 standards.

3.3.2 System Description

The SolBank 3.0 ESS module employs a thermal runaway design prevention based on thermal management and is comprised of the following elements:

- Battery Management System (BMS): The BMS plays a central role in monitoring and safeguarding the health of the batteries. It continuously tracks critical parameters, including voltage, temperature, and state of charge. See Appendix B for additional information. Essential BMS functions include:
    - Fault Detection: The BMS monitors for over-temperature, over-charge, over-discharge, over-current conditions, and overall system health. Upon detection of faults or parameters exceeding safe tolerances, the BMS will isolate affected battery strings and transmit alarm signals to the Emergency Management System (EMS).
    - Thermal Management: The BMS actively oversees temperature monitoring and control, ensuring optimal operating conditions to prevent thermal events.
- Liquid Cooling System: Cooling liquid powered by an internal pump will circulate inside battery modules and take the heat from the batteries and will circle back to a heat exchanging tank. This design feature actively cooling the batteries to reduce the potential of thermal runaway, reducing the risk of cascading failures.
- LFP Chemistry: Lithium Iron Phosphate (LFP) batteries are inherently more stable and resistant to thermal runaway when compared to other lithium-ion chemistries, offering a foundational layer of fire safety.

3.3.3 Safety Assessment

The effectiveness of the SolBank 3.0 ESS design in containing and mitigating thermal runaway events has been validated through UL 9540A unit (rack) level testing. Key findings from these tests include:

- Containment: In tests initiating thermal runaway, the event was successfully confined to a small number of cells within a single module resulting in no sparks, flaming, electrical arcs, or other electrical events during test.

- Minimal Hazards: The tests observed no deflagration, external flaming, projectiles, explosive events, or other hazards that could pose a risk to personnel or surrounding property.

3.4 Explosion Control Systems

3.4.1 Code Requirements

The SolBank 3.0 ESS installation incorporates an explosion control system to mitigate the risks associated with flammable gas release during potential fire events. This system aligns with the following code requirements (reference Appendix D for NFPA 69 report):

- CFC § 1207.6.3: Mandates explosion control measures for ESS installations.
- CFC § 911: Permits the use of NFPA 69 or NFPA 68 compliant systems.
- NFPA 69 Section 8.3.1: Requires the maintenance of flammable gas concentration below 25% of the Lower Flammability Limit (LFL).

3.4.2 System Description

The explosion control system within the SolBank 3.0 ESS enclosure employs a proactive approach that integrates gas detection devices, ventilation system, and operational safeguards:

- Gas Detection: Each ESS container houses two gas detectors specifically designed to detect Hydrogen gas (factory calibrated), which was the highest concentration of gas analyzed during the UL 9540A Cell Level test.
- Exhaust Ventilation (NFPA 69): Upon gas detection, exhaust fans activate to remove flammable gases from the ESS container. Reference Appendix D for the full report.
- Operational Controls: Detection triggers several actions: alarms are sent, charging/discharging processes halt, off-gassing valves open, and exhaust ventilation activates.

3.4.3 Safety Assessment

An analysis of UL 9540A Testing supports the design and effectiveness of the explosion control system. Gas release data obtained during these tests provides a reliable prediction of the expected gas concentration, composition, and LFL release from a thermal runaway event to validate the ventilation system design.

Even with the explosion control system in place, strict safety protocols are essential. During fire or thermal runaway events, personnel must not approach ESS containers until the ventilation system has effectively cleared flammable gases and all alarm conditions have been reset.

The explosion control system implemented in the SolBank 3.0 ESS enclosure design is based on testing and validated analysis and aligns with relevant fire codes. These proactive measures, in conjunction with safety procedures, significantly reduce the risk of explosion hazards.

FAULT CONSEQUENCE ANALYSIS

Failure	Safety Compliance Level	System Response	Failure Consequence	Severity Risk Analysis
Thermal Runaway §1207.1.4.1 (1)	Containment of fire/gas within the originating module or ESS unit, preventing spread to adjacent units.	Thermal runaway contained to the originating module. Detection of combustible gas, smoke, or heat triggers a fire alarm. The ventilation system activates, purging gases. BMS monitors parameters and disconnects power if necessary.	A thermal runaway event remains confined to the affected module, or unit (rack). Potential smoke/gas release is likely. A fire alarm signal is transmitted.	While a thermal runaway event is disruptive, the demonstrated containment capability limits the potential damage. The fire alarm signal alerts personnel and triggers further mitigation measures.
BMS Failure §1207.1.4.1 (2)	System design and safeguards prevent thermal runaway, even without the BMS.	Affected battery modules cease charging/discharging.	Failure of the BMS (not caused by thermal runaway) results in halted charging/discharging. However, isolated batteries still store electrochemical energy. Other fire and gas detection remains active.	A BMS failure removes an active layer of protection but does not eliminate the inherent energy storage risk of electrochemical batteries. The continued function of other detection systems provides a crucial safety net.
Ventilation or Exhaust System Failure §1207.1.4.1 (3)	A transmitted trouble signal to initiate an investigation or shutdown reduces the risk of thermal runaway. No unsafe conditions or thermal events were created.	Batteries remain in a normal, non-off-gassing state. Combustible gas and smoke detectors trigger a fire alarm signal.	A ventilation system failure in isolation has minimal immediate impact. In a dual-fault scenario with thermal runaway, redundant detection systems, alarms, and procedures alert personnel and prevent unsafe approaches.	While a ventilation failure alone poses minimal risk, its consequences become more severe if coupled with thermal runaway. The presence of redundant safety systems and emergency procedures significantly reduces the likelihood and potential severity of this dual-fault scenario.
Voltage Surge §1207.1.4.1 (4)	Surge protection prevents widespread equipment damage or immediate fire risks. No unsafe conditions or thermal events were created.	Protective relays/breakers shut down affected ESS portions. Surge arresters divert excess voltage. BMS monitors and shuts down affected segments if anomalies are detected.	Electrical code compliance, surge arresters, and the BMS minimize the potential for severe damage to SolBank 3.0 ESS components from voltage surges.	The system incorporates multiple layers of protection against voltage surges, significantly reducing the likelihood and severity of potential damage.
Short Circuit (Load Side) §1207.1.4.1 (5)	Overcurrent protection prevents widespread damage within the ESS. No unsafe conditions or thermal events were created.	Overcurrent protection devices activate, isolating the fault.	Adherence to electrical codes and the UL 9540 certification of the SolBank 3.0 ESS significantly reduce the likelihood and potential severity of load-side short circuit events.	Code compliance and UL 9540 certification provide a high degree of confidence in the system's ability to withstand and manage short-circuit events safely.
Fire Detection Equipment Failure §1207.1.4.1 (6)	Immediate trouble signals provide impairment notification. Detection redundancies ensure monitoring continues. No unsafe conditions or thermal events were created.	Redundant detection (smoke, heat, gas) remains operational. Smoke detector failure transmits a trouble signal. EMS triggers ESS container shutdown upon smoke/heat detector failure. The tiered alarm system activates. NFPA 72 maintenance minimizes failure likelihood.	Delayed detection of smoke or heat is possible. However, redundancy, trouble signaling, automated EMS shutdown, and proactive maintenance significantly reduce the risk and potential severity posed by a single detector failure.	While complete detection system failure is a remote possibility, the multiple safeguards and maintenance protocols in place significantly mitigate the likelihood and adverse consequences of such an event.

FAULT CONSEQUENCE ANALYSIS

Failure	Safety Compliance Level	System Response	Failure Consequence	Severity Risk Analysis
FACP Failure §1207.1.4.1 (6)	Immediate trouble signals provide impairment notification. Redundant FACPs or signaling pathways ensure continued alarm functionality or notification of impairment.	Trouble signals were sent to FCC, EMS, and LPC. EMS initiates shutdown of the affected ESS container group. Redundant fiber-optic pathways ensure signaling for other ESS container groups.	An FACP failure primarily affects only the directly connected ESS container group. Trouble signals, shutdown procedures, and redundant pathways mitigate the potential consequences.	The localized impact, automated response, and redundant signaling design limit the severity of an FACP failure. While disruption to the affected ESS container group is likely, the overall ESS installation maintains a high level of protection.

4 FAULT CONSEQUENCE ANALYSIS

4.1 Thermal Runaway in a Single ESS Module or Rack/Unit

This analysis assesses the potential for a thermal runaway event within a single SolBank 3.0 ESS module, or rack/unit.

4.1.1 Mitigation and System Response

- **Containment:** UL9540A test results confirm that thermal runaway will not propagate to adjacent modules, racks/units. This containment feature significantly reduces the potential impact of the event.
- **Early Detection:** Initial signs of thermal runaway are likely to include the detection of combustible gas released from off-gassing battery cells or the presence of smoke. Detection triggers a fire alarm signal transmitted to the fire alarm panel and a monitored location.
- **Ventilation:** Upon detection, the ventilation system activates to purge combustible gases, maintaining concentrations below 25% of the LFL and 50% of the IDLH.
- **Battery Management System (BMS):** The BMS continuously monitors battery voltage, temperature, and other operational parameters. In the event of irregularities, the BMS will proactively disconnect power to help prevent the escalation of an abnormal condition into a thermal runaway event.

4.1.2 Consequence and Severity

The UL 9540A testing demonstrates successful containment of a thermal runaway event within the originating module. Additional measures of protection beyond the test configuration include sparker systems, deflagration ventilation, and proactive BMS intervention, which significantly reduce the potential severity of a single module thermal runaway event within the SolBank 3.0 ESS system. These integrated safety measures are designed to prevent a localized module failure from cascading into a catastrophic event.

4.2 Failure of Battery or Energy Management System

This analysis assesses the impact of a failure within the SolBank 3.0 ESS battery system or its associated BMS.

4.2.1 Mitigation and System Response

- **BMS Functionality:** The SolBank 3.0 ESS incorporates a BMS designed to protect battery modules from common triggers for off gassing or thermal runaway, including over/under voltage, excessive temperatures, and short circuits.
- **BMS Failure Response:** Upon BMS failure, the affected battery modules immediately cease charging and discharging. This mitigates electrical conditions that could exacerbate a hazardous situation.

4.2.2 Consequence and Severity

While a BMS failure removes active charging and discharging, it does not eliminate the inherent energy storage risk of electrochemical batteries. Even in isolation, batteries can still pose a hazard. Fire safety and emergency response plans, compliant with relevant CFC guidelines, address the potential consequences of this residual risk.

4.3 Failure of the Emergency Ventilation System

This analysis assesses the impact of a ventilation system failure within a SolBank 3.0 ESS installation.

4.3.1 Mitigation and System Response

- **Normal Operation:** Under normal operating conditions, SolBank 3.0 ESS batteries do not off-gas. This minimizes the immediate impact of a ventilation failure.
- **Dual-Fault Scenario:** In the unlikely event of a ventilation failure coinciding with a thermal runaway event, several safeguards remain in place: Combustible gas, smoke, and heat detectors continue to function. Alarms are transmitted to remote fire alarm panels, the ESS yard entrance annunciator, and a constantly monitored location. Emergency procedures mandate that personnel maintain a safe distance until safety checks are complete and alarms are silenced.

4.3.2 Consequence and Severity

A ventilation system failure in isolation carries minimal immediate risk due to the lack of off-gassing during normal battery operation. In the unlikely dual-fault scenario involving thermal runaway, redundant detection systems and emergency procedures alert personnel and prevent unsafe approaches. While a complete ventilation failure coupled with a thermal runaway could have severe consequences, the layered safety measures in place significantly reduce the likelihood and potential severity of such an event.

4.4 Voltage Surges on the Primary Electric Supply

This analysis assesses the impact of voltage surges on the primary electrical supply to SolBank 3.0 ESS.

4.4.1 Mitigation and System Response

- **Electrical Code Compliance**: System design adheres to electrical code standards, including protective relays and breakers that trigger ESS shutdown in response to voltage fluctuations outside operational limits.
- **Surge Arresters**: Substation switches for each MV feeder are equipped with 35kV surge (lightning) arresters. These limit the severity of surges by diverting excess current to ground.
- **Battery Management System (BMS)**: The BMS continuously monitors battery voltage (individual cells and total). If excessive charge or discharge voltage is detected, the BMS immediately shuts down the affected ESS portion.

4.4.2 Consequence and Severity

The combination of code-compliant design, surge arresters, and the BMS significantly minimizes the potential for damage to the ESS from voltage surges. While surges present an inherent risk, these layered mitigation strategies reduce the likelihood of a severe incident.

4.5 Short Circuits on the Load Side of the ESS

This analysis assesses the potential impact of short circuits occurring on the load side of the SolBank 3.0 ESS installation. Short circuits pose a risk of electrical arcing, which could lead to fires or damage to ESS components.

4.5.1 Mitigation and System Response

The system incorporates several safeguards to address load-side short circuits:

- **Electrical Code Compliance:** The entire system design adheres to all relevant electrical codes, including specific provisions for short circuit protection. This ensures the use of appropriate overcurrent protection devices and system design practices to minimize the risk and severity of short-circuit events.
- **UL 9540 Certification:** The SolBank 3.0 ESS has achieved UL 9540 certification. This assessment includes short circuit studies, verifying the system's ability to withstand and manage potential short circuit faults.

4.5.2 Consequence and Severity

The combined effect of code compliance and UL 9540 certification reduces the likelihood and potential severity of load-side short circuit events in the SolBank 3.0 ESS.

4.6 Failure of the Fire Detection Equipment System

This analysis assesses the impact of a smoke or heat detector failure within a SolBank 3.0 ESS container. While detector failure poses a risk, the system incorporates multiple safeguards to mitigate potential consequences.

4.6.1 Mitigation and System Response

- **Redundancy:** The system employs overlapping detection capabilities with smoke, heat, and combustible gas detectors. Failure of a single detector is unlikely to disable fire detection fully.
- **Trouble Signaling:** Smoke detector failures automatically transmit a trouble signal to the site fire alarm panel and a monitored location, alerting personnel to the need for system maintenance.
- **EMS Response:** Failure of either smoke or heat detection triggers an automatic shutdown of the affected ESS container via the Energy Management System (EMS). This puts the batteries into an idle state, reducing the risk of thermal runaway. The ESS container remains offline pending manual inspection and restoration.

- **Alarm Tiers:** A tiered alarm system (Level 1, Level 2) ensures a graduated response. A single smoke or heat detector activation initiates HVAC shutdown, EMS alert, external notification, and cessation of charge/discharge operations.
- **Inspection & Maintenance:** A formal documented inspection, testing, and maintenance program compliant with NFPA 72 standards proactively minimizes the likelihood of fire detection system failures.

4.6.2 Consequence and Severity

The combination of redundant detection systems, trouble signaling, automated EMS shutdown, tiered alarms, and strict maintenance protocols significantly reduces the risk and potential severity posed by a single smoke or heat detector failure. While complete system failure remains a remote possibility, these integrated safeguards mitigate the impact of such an event.

4.7 Failure of the FACP

This analysis addresses the impact of an FACP failure within a SolBank 3.0 ESS installation.

4.7.1 Mitigation and System Response

- **Localized Impact:** An FACP failure primarily affects the SolBank 3.0 ESS containers directly connected to it. Other ESS container groups, linked to separate FACPs, maintain operational status.
- **Trouble Signaling:** An FACP failure automatically transmits trouble signals to the monitoring Fire Command Center (FCC), the site Energy Management System (EMS), and the Local Plant Controller (LPC). This alerts personnel and triggers corrective actions.
- **EMS Shutdown:** Upon receiving a trouble signal, the EMS initiates a shutdown of the affected ESS container group. Batteries enter an idle state, significantly reducing the risk of thermal runaway. The ESS container group remains offline until FACP functionality is restored.

4.7.2 Consequence and Severity

The combination of localized impact, proactive trouble signaling, automated EMS shutdown, and redundant signaling pathways significantly minimizes the potential consequences of an FACP failure. At the same time, the affected ESS container group will experience temporary disruption.

5 CONCLUSIONS

Coffman Engineers, Inc. has prepared this HMA report to satisfy the requirements of CFC § 1207.1.4 to permit the installation of the ESS with lithium batteries which exceeds the limit of 600 kWh from CFC Table 1207.5. The HMA has summarized the fire protection features of the proposed ESS outdoor installation and addressed the single failure modes addressed by CFC § 1207.1.4.1. The analysis is supported by UL 9540A full scale fire testing results (Appendix A) and aligns with applicable code requirements from the CFC.

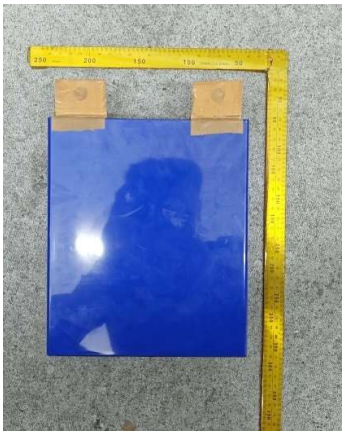
Your consideration of the information presented in this report is appreciated. If there are any questions regarding the content of this report, please contact our office.

APPENDICES

Appendix A

UL 9540A TEST REPORTS

Prüfbericht-Nr.: *Test report no.*:	**CN243TAR 001**	**Auftrags-Nr.:** *Order no.*:	326009576	Seite 1 von 32 *Page 1 of 32*
Kunden-Referenz-Nr.: *Client reference no.*:	2371109	**Auftragsdatum:** *Order date:*	2024-03-26	
Auftraggeber: *Client*:	CSI Energy Storage Co., Ltd. No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China			
Prüfgegenstand: *Test item*:	Battery Cell			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	CSI314			
Auftrags-Inhalt: *Order content*:	Test report			
Prüfgrundlage: *Test specification*:	UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems			
Wareneingangsdatum: *Date of sample receipt*:	2024-05-09			
Prüfmuster-Nr.: *Test sample no:*	Engineering sample			
Prüfzeitraum: *Testing period*:	2024-06-04 - 2024-07-08			
Ort der Prüfung: *Place of testing*:	See page 5 Testing location			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result**:	See main report			



geprüft von:
tested by: Minhao Hu&Yichen Zhao

genehmigt von:
authorized by: Simon Wang

Datum:
Date: 2024-08-06 Minhao Hu Yichen

Ausstellungsdatum:
Issue date: 2024-08-06

Stellung / Position: Project Engineer/Trainee

Stellung / Position: Authorizer

Sonstiges /
Other: N/A

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery: Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

TEST REPORT

ANSI/CAN/UL 9540A:2019
Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems

Report Number. .....:	CN243TAR 001
Date of issue.....:	See Cover Page
Total number of pages.....:	See Cover Page
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.** No. 177, Lane 777, West Guangzhong Road, Jing'an District, Shanghai 200072, P. R. China
Applicant's name .....:	**CSI Energy Storage Co., Ltd.**
Address.....:	No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China
Test specification:	
Standard.....:	ANSI/CAN/UL 9540A:2019
Test procedure .....:	TÜV Rheinland Test Report
Non-standard test method .....:	N/A
Test Report Form No. .....:	UL 9540A-C01
Test Report Form(s) Originator ....:	TÜV Rheinland (Shanghai) Co., Ltd.
Master TRF.....:	Dated 2023-12-25

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the TÜV Rheinland (Shanghai) Co., Ltd., responsible for this Test Report.

Other / Scope:

This report presents the result of cell level tests of UL 9540A: 2019.

All tests were conducted at TUV Rheinland (Shanghai) Co., Ltd. and TUV Rheinland's partner labs that were under supervision of TÜV Rheinland's engineer.

All tests were under supervision of TÜV Rheinland's engineer.

List of Attachments：

Attachment A: Cell Conditioning (Charge/discharge) Profiles

Attachment B: Test method and result

Attachment C: Temperature and voltage profile during the test

Attachment D: Cell vent gas composition, Lower flammability limit (LFL), Vent gas burning velocity (Su) and Vent gas maximum pressure (Pmax)

Attachment E: Sample Photos and Test Photos

Attachment F: List of Test and Measurement Instruments

Summary of testing:

Model No:	CSI314
Ratings (Vdc, Ah):	3.2 V, 314 Ah
Chemistry of test item:	$LiFePO_4$
Compliance with UL1973:	☒ Yes Report No. : CN24XEVJ 001 Cert. No.: CU 72405509 0001 ☐ No
Average cell surface temperature at gas venting:	167.4 °C
Average cell surface temperature at thermal runaway:	238.5 °C
Gas Volume:	180.7 L (std)
Lower flammability limit (LFL), % volume in air at the ambient temperature:	8.3%
Lower flammability limits (LFL), % volume in air at the venting temperature:	7.3%
Burning velocity (Su):	0.973 m/s
Maximum pressure (Pmax):	0.760 MPa

Cell Gas composition

Gas component		Concentration % (v/v)
Methane	CH_4	4.495
Acetylene	C_2H_2	0.157
Ethylene	C_2H_4	2.299
Ethane	C_2H_6	0.729
Propyne	C_3H_4	0.012
Propylene	C_3H_6	0.952
Propane	C_3H_8	0.211
Butylene	C_4H_8	0.616
Butane	C_4H_{10}	0.080

Hydrogen	H_2	49.725
Carbon Monoxide	CO	13.898
Carbon Dioxide	CO_2	26.826
Total	-	100

Cell failure test method performed (summary of method and test clause):

External heating using thin film with 4°C to 7°C thermal ramp.	☒
Nail Penetration	☐
Overcharge	☐
External short circuit	☐
Others	☐

Result of testing:

Performance Criteria in accordance with Clause 7.7 and Figure 1.1:

Thermal runaway was not induced in the cell; and	☐
The cell vent gas did not present a flammability hazard when mixed with any volume of air, as determined in accordance with ASTM E918 at both ambient and vent temperatures.	☐

Necessity of a module level test

The performance criteria of the cell level test as indicated in 7.7 of UL 9540A 4th edition has not been met, therefore a module level testing in accordance with UL 9540A will need to be conducted on a complete module employing this cell.	☒
The performance criteria of the cell level tests as indicated in 7.7 of UL 9540A 4th edition has been met, therefore a module level testing in accordance with UL 9540A need not be conducted.	☐

Tests performed (name of test and test clause):	**Testing location:**
UL 9540A cl 7. Cell Level	National Center of Inspection and Testing on Advanced Energy Storage Products Quality (Jiangsu) 101 xinjin Road, xinwu, Wuxi, Jiangsu

Possible test case verdicts:

- test case does not apply to the test object ... : N/A

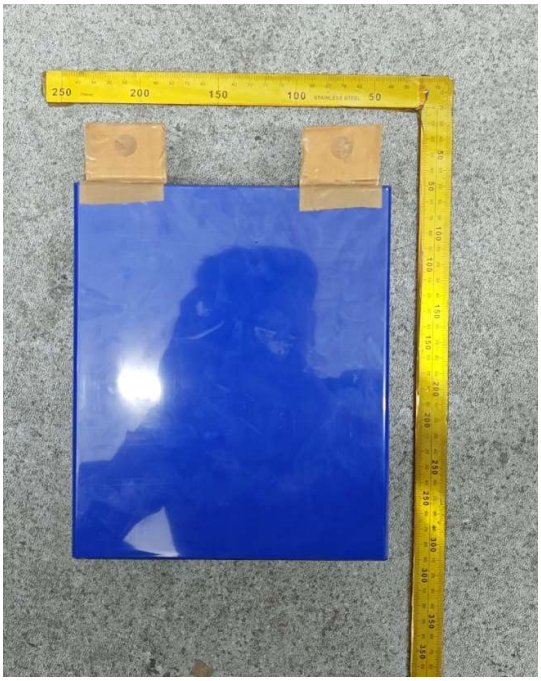
- test object does meet the requirement ..... : P (Pass)

- test object does not meet the requirement ... : F (Fail)

Testing: **Date of receipt of test item ..... :** 2024-05-09 **Date (s) of performance of tests ..... :** 2024-06-04 to 2024-07-08
General remarks:
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**
Name and address of factory (ies) ..... : **Same as applicant**
Other: **N/A**

General product information :

Photo of cell:





Manufacturer ..... :	CSI Energy Storage Co., Ltd.	
Model number ..... :	CSI314	
Chemistry ..... :	☒ $LiFePO_4$ ☐ NMC ☐ NCA ☐ LTO ☐ Other:	
Physical configuration ..... :	☒ Prismatic ☐ Cylindrical ☐ Pouch	
	Weight(g):	5600±200
Electrical rating ..... :	Rated capacity (Ah):	314
	Nominal voltage (V):	3.2
Standard charge method ..... :	Charge current (A):	157
	End of charge voltage(V):	3.65
	Charge temperature range(°C):	0~60
Standard discharge method ..... :	Discharge current (A):	157
	End of discharge voltage(V):	2.5
	Discharge temperature range(°C):	-20~60
Compliance with UL 1973 ..... :	☒ Yes Report No.: CN24XEVJ 001 Cert. No.: CU 72405509 0001	
Diagram with overall dimension(W*H*T) .... :	(173.7±0.5)mm * (207.2±0.5)mm * (71.5±0.5)mm	

ANSI/CAN/UL 9540A:2019			
Clause	Requirement - Test	Result - Remark	Verdict
CONSTRUCTION			--
5	**General**		--
5.1	**Cell**		P
5.1.1	The cells info associated with the BESS include:		P
	Cell chemistry (e.g. NMC, LFP);	See page 7 "General product information "	P
	The physical format of the cell;	See page 7 "General product information "	P
	The cell electrical rating in capacity and nominal voltage;	See page 7 "General product information "	P
	Overall Dimensions, mm	See page 7 "General product information "	P
	Cell Weight, g	See page 7 "General product information "	P
5.1.2	The cells associated with the BESS comply with ANSI/CAN/UL 1973 or not.	See page 7 "General product information "	P
5.1.3	Further details included in the cell level test report.	Refer to 7.6.1	N/A
5.2	**Module**	Cell only	N/A
5.2.1	The modules associated with the BESS that were tested shall be documented in the test report		N/A
5.2.2	The module documentation included in the test report shall indicate if the modules associated with the BESS comply with UL 1973		N/A
5.2.3	Refer to 8.3 for further details		N/A
5.3	**Battery energy storage system unit**		N/A
5.3.1	The BESS unit documentation included in the test report shall indicate the units that comply with UL 9540		N/A
5.3.2	For BESS units for which UL 9540 compliance cannot be determined,		N/A
5.3.3	If applicable, the details of any fire detection and suppression systems that are an integral part of the BESS shall be noted in the test report		N/A
5.3.4	Refer to 9.7, 10.4 and 10.7 for further details		N/A
5.4	**Flow Batteries**		N/A
5.4.1	For flow batteries, the report will cover the chemistry, as well as the electrical rating in capacity and nominal voltage of the cell stack		N/A
5.4.2	The flow battery documentation included in the test report shall indicate if the flow battery system complies with UL 1973		N/A
5.4.3	See 7.6.2 for further details		N/A

ANSI/CAN/UL 9540A:2019			
Clause	Requirement - Test	Result - Remark	Verdict
PERFORMANCE			--
6	**General**		--
6.1	The tests in this standard are extreme abuse conditions conducted on electrochemical energy storage devices that can result in fires		P
6.2	At the conclusion of testing, samples shall be discharged in accordance with the manufacturer's specifications		P
7	**Cell Level**		--
7.1	**General**		P
7.1.1	Effective methods for forcing a cell into thermal runaway in a repeatable manner.	Two external film heaters (size 200mm*150mm)	P
7.2	**Sample**		P
7.2.1	Cell samples conditioned, prior to testing, through charge and discharge cycles for a minimum of 2 cycles using a manufacturer specified methodology to verify that the cells are functional.	See Attachment A	P
7.2.2	The cells charged to 100% SOC and allowed to stabilize for 1 to 8 h before testing.	See Attachment A	P
7.2.3	Cells with flexible laminate casings be constrained during the test to simulates the constraint in the BESS module to prevent excessive swelling.	Two metal plate (size 227*200*1.5 mm) band on either side of the large surface of the prismatic cell surface	P
7.3	**Determination of thermal runaway methodology**		P
7.3.1	General		P
7.3.1.1	Ambient indoor laboratory conditions: 25±5°C and 50±25% RH at the initiation of the test.	External heating thin film used	P
7.3.1.2	The propensity of the cell to exhibit thermal runaway demonstrated by heating the cell with externally applied flexible film heaters that cover as much of the cell case as possible without covering safety features or terminals, for consistent heating of the internal cell electrode assembly.		P
	A surface heating rate of 4°C to 7°C per minute applied to the cell.		P
	Determination of a maximum surface temperature end point criteria shall be developed based upon a review of cell design and chemistry.	Not used, heated until thermal runaway achieved	N/A
	If external heating with a flexible film heater does not cause the cell to exhibit thermal runaway, one of the following methods shall be employed to cause thermal runaway: a) Mechanical (e.g. nail penetration); b) Electrical stresses in the form of overcharging, over discharging or external short-circuiting; or c) Use of alternate heating sources (e.g. oven).		N/A

ANSI/CAN/UL 9540A:2019			
Clause	Requirement - Test	Result - Remark	Verdict
7.3.1.3	When using another cell abuse method to initiate thermal runaway, document the details of it.		N/A
7.3.1.4	In the case of monobloc batteries such as lead acid or nickel cadmium, the monobloc battery can be treated as an individual cell for this testing.		N/A
7.3.1.5	Estimated surface temperature at which internal short circuiting within the cell will occur that could lead to a thermal runaway condition.	Not used, heated until thermal runaway achieved	N/A
7.3.1.6	If using another external heating method, the temperature ramp and max. surface temperature outlined in 7.3.1.2 and 7.3.1.5 shall be used.		N/A
7.3.1.7	The cell's exterior surface temperature was measured	See Attachment C	P
7.3.1.8	The temperature at which the cell case vents due to internal pressure rise was documented.	See Attachment B	P
7.3.1.9	The temperature at the onset of thermal runaway shall be documented.	See Attachment B	P
	If cell venting occurs first, the cell was heated continuously until thermal runaway occurs.	See Attachment C	P
7.3.1.10	When using methods other than the heater method, the stresses (i.e. electrical or mechanical) shall be applied to the cell until thermal runaway occurs.		N/A
7.3.1.11	If the cell exhibits thermal runaway behavior, 3 additional samples tested using the same method and exhibit thermal runaway to demonstrate repeatability	See Attachment B	P
7.3.2	Flow battery thermal runaway determination tests		N/A
7.4	**Cell vent gas composition test**		P
7.4.1	Cell vent gas shall be generated and captured by forcing a cell into thermal runaway inside a pressure vessel.	A 140 L pressure vessel used	P
	The test shall be initiated with an initial condition of atmospheric pressure and less than 1% oxygen by volume.		P
	The initial atmospheric conditions prior to testing.	Pressure inside: 101.3 kPa	P
7.4.2	Cell vent gas composition	See Attachment D	P
	Hydrocarbon gases that represent an ignition or explosion hazard as well as other additional gases.		P
	Hydrogen gas shall be measured with a sensor capable of measuring in excess of 30% by volume.		P
7.4.3	The lower flammability limit of the cell vent gas, samples of the synthetically replicated gas mixture in accordance with ASTM E918.	See Attachment D	P
7.4.4	The synthetically replicated gas mixture used to determine gas burning velocity in accordance with the Method of Test for Burning Velocity Measurement of Flammable Gases.	See Attachment D	P
7.4.5	The synthetically replicated gas mixture used to determine Pmax in accordance with EN 15967.	See Attachment D	P

ANSI/CAN/UL 9540A:2019			
Clause	Requirement - Test	Result - Remark	Verdict
7.5	**Off gas composition for flow battery systems**	Li-ion cell	N/A
7.5.1	The off gas composition from the flow battery testing in a closed container and capturing the off gasses generated, and by collecting the off gasses generated at vent openings and vent ducts during the overcharge and short circuit testing.		N/A
	Composition of these captured gases and their flammability limit.		N/A
7.5.2	The volume of flammable gases measured during the testing shall be scaled to the maximum energy reservoir for the intended flow battery system in order to determine the potential total flammable gas that can be produced by the system under a fault condition that leads to off gassing.		N/A
7.6	**Cell level test report**		P
7.6.1	The report on cell level testing shall include the following:		P
	a) Cell manufacturer name and cell model number;	See production information	P
	b) Cell details per 5.1 (and whether UL 1973 compliant);	See production information	P
	c) Energy storage technology (and whether UL 9540 compliant);	UL 9540 certificate not provided	P
	d) The rated energy storage capacity of the cell;	See production information	P
	e) Voltage and current obtained during conditioning of the cell;	See Attachment A	P
	f) Open-circuit voltage of the cell at initiation of test;	See Attachment B	P
	g) Methods attempted and used to initiate thermal runaway;	See Attachment B	P
	h) Surface temperature at which gases are first vented and the average temperature of the samples tested excluding the gas collection sample;	See Attachment B	P
	i) Surface temperature (and location of maximum temperature) prior to thermal runaway and average temperature of the samples tested excluding the gas collection sample;	See Attachment B	P
	j) Flammable gas generation and composition measurements;	See Attachment D and E	P
	k) The lower flammability limit of the cell vent gas;	See Attachment D	P
	l) Burning velocity of the cell vent gas; and	See Attachment D	P
	m) Pmax of the cell vent gas.	See Attachment D	P
7.6.2	Minimum information of items a) through k) was provided in the report for flow battery		N/A
7.7	**Performance – cell level test**		F
7.7.1	a) Thermal runaway cannot be induced in the cell; and	Thermal runaway induced	F
	b) The cell vent gas does not present a flammability hazard when mixed with any volume of air, as	Vent gas is flammable	F

ANSI/CAN/UL 9540A:2019			
Clause	Requirement - Test	Result - Remark	Verdict
	determined in accordance with ASTM E918 at both ambient and vent temperatures.		
7.7.2	BESS contain cells that all comply with the criteria in 7.7.1 shall be suitable for installation in residential dwelling units.		N/A
7.8	**Performance – flow battery thermal runaway determination tests**		N/A

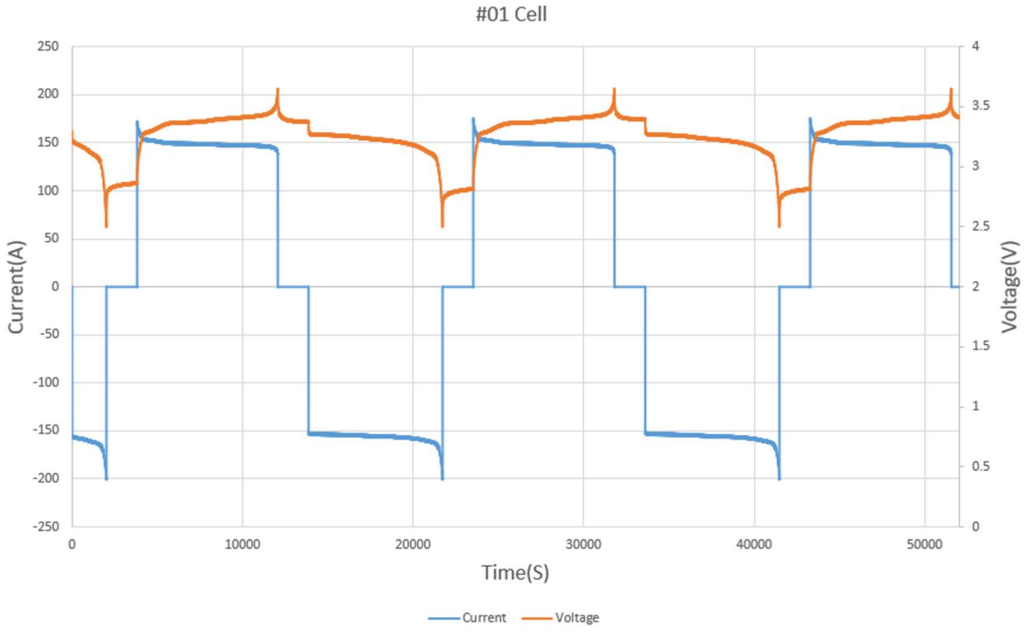
--End of report--

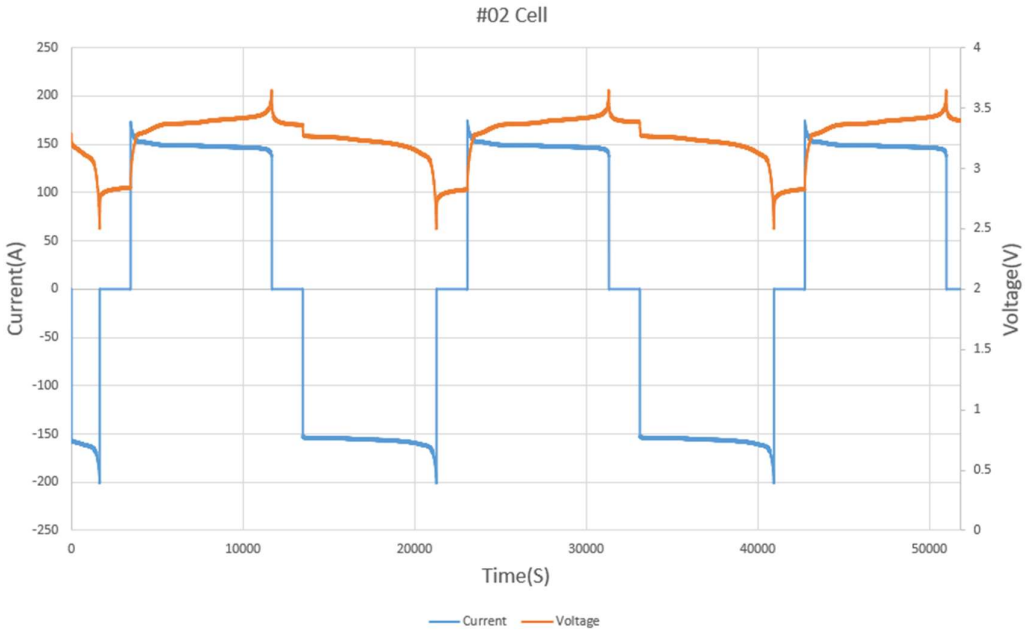
Attachment A: Cell Conditioning (Charge/discharge) Profiles

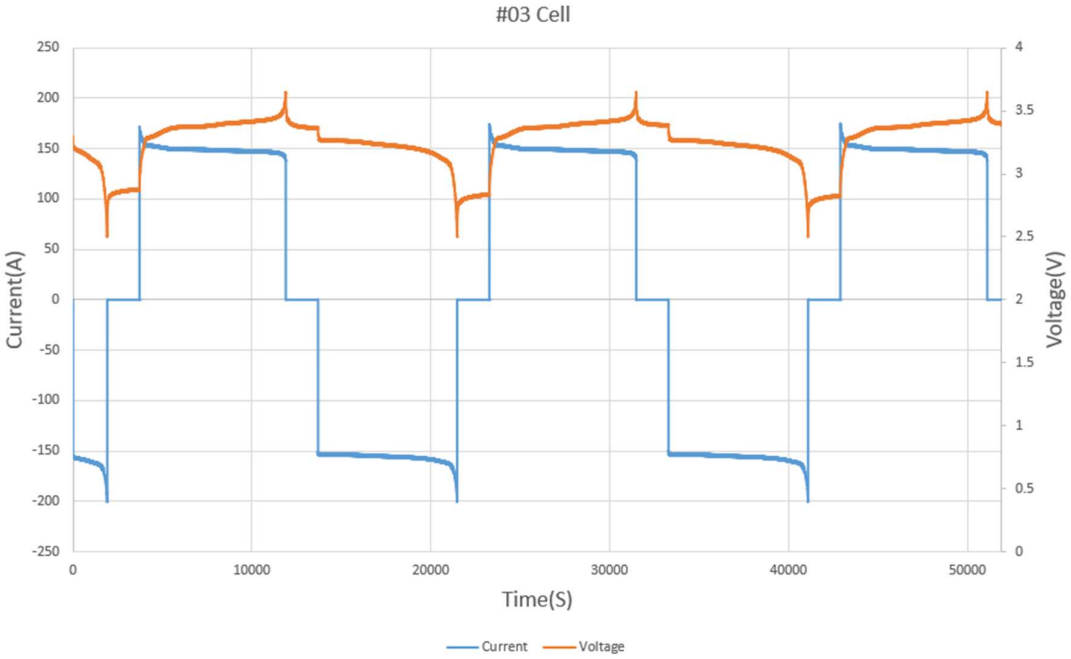
The cells were conditioned, prior to testing, through charge and discharge cycles for 2 cycles using a manufacturer specified methodology.

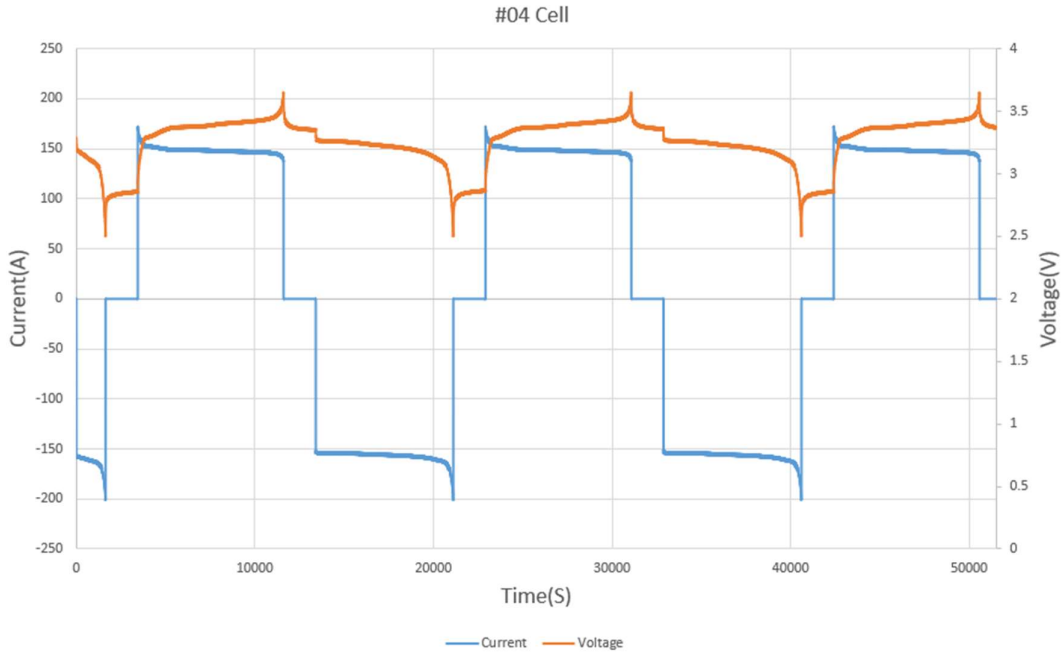
During the cycling, ambient condition is maintained within 25°C±2°C and R.H. 50±5 %.

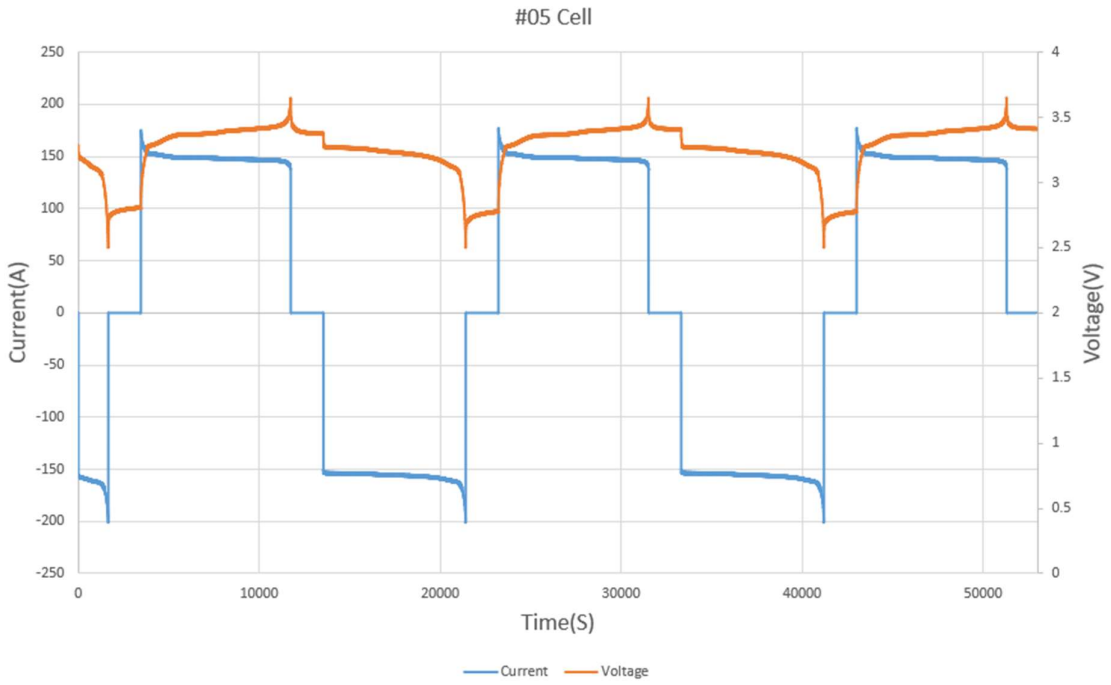
Figure 1. Cell charge and discharge voltage/current profiles





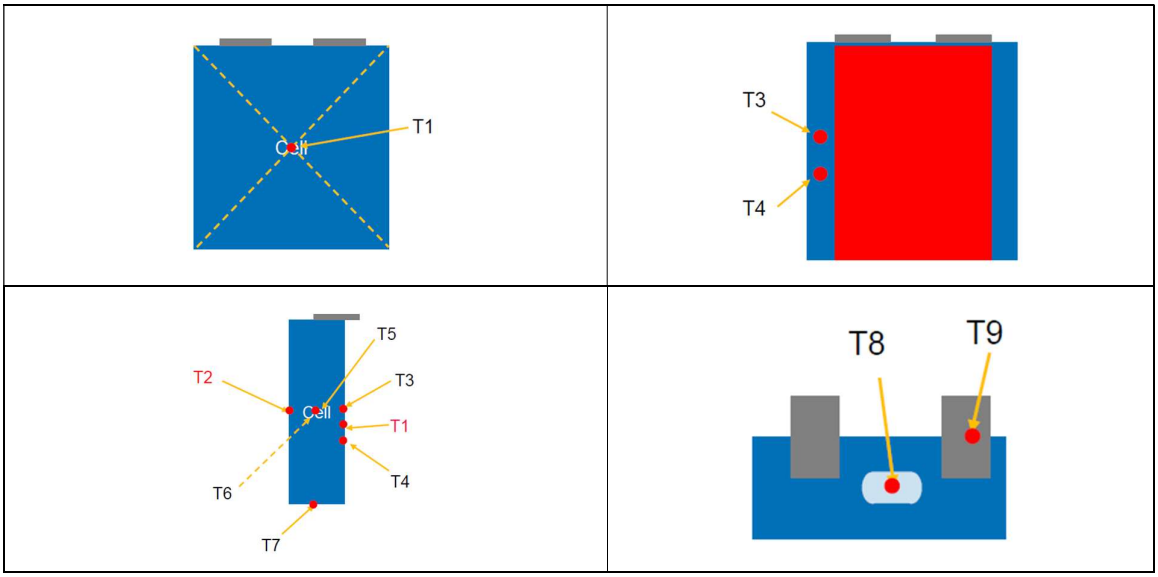

#03 Cell
Current(A)
Voltage(V)
Time(S)
Current
Voltage


#04 Cell
Current(A)
Voltage(V)
Time(S)
Current
Voltage


#05 Cell
Current(A)
Voltage(V)
Time(S)
250
200
150
100
50
0
-50
-100
-150
-200
-250
4
3.5
3
2.5
2
1.5
1
0.5
0
0
10000
20000
30000
40000
50000
Current
Voltage

Attachment B: Test method and result

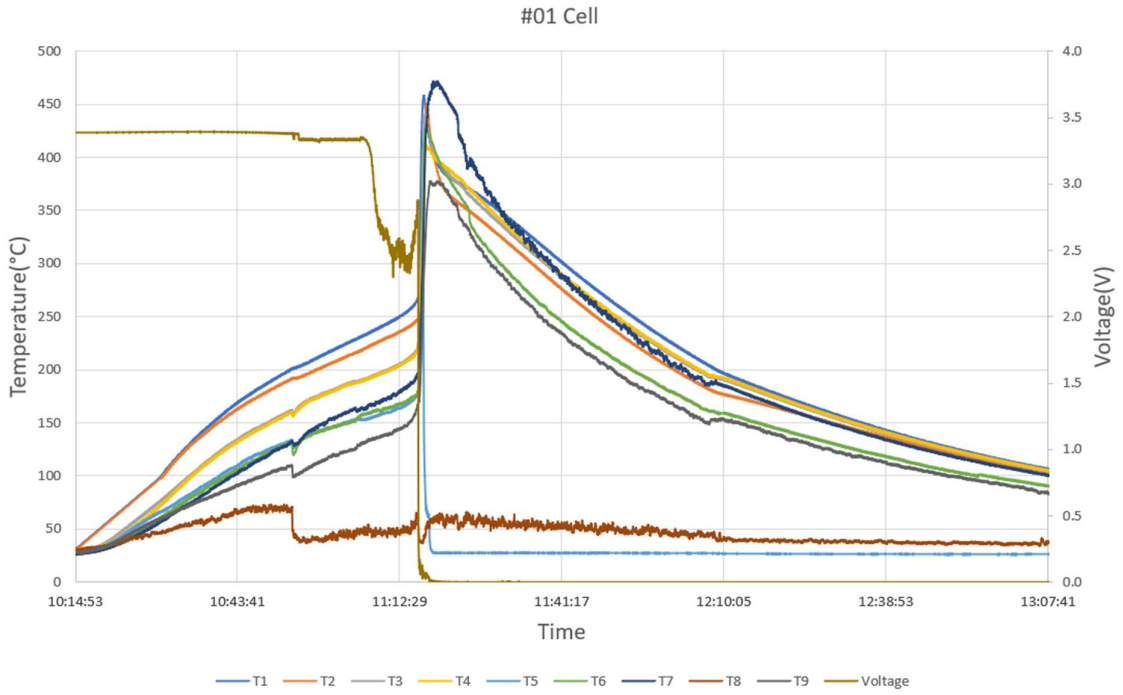
Thermocouple (type K, 24AWG), T1 and T2 were located below the heater, at the center of the cell surface used to record cell temperature. T3 and T4 were located on the side of the wide surface, near the heater to record cell temperature. T5 and T6 were located on the side of the narrow surface. T7 was located on bottom surface of cell. T8 was located on vent of cell. T9 was located on the positive electrode.

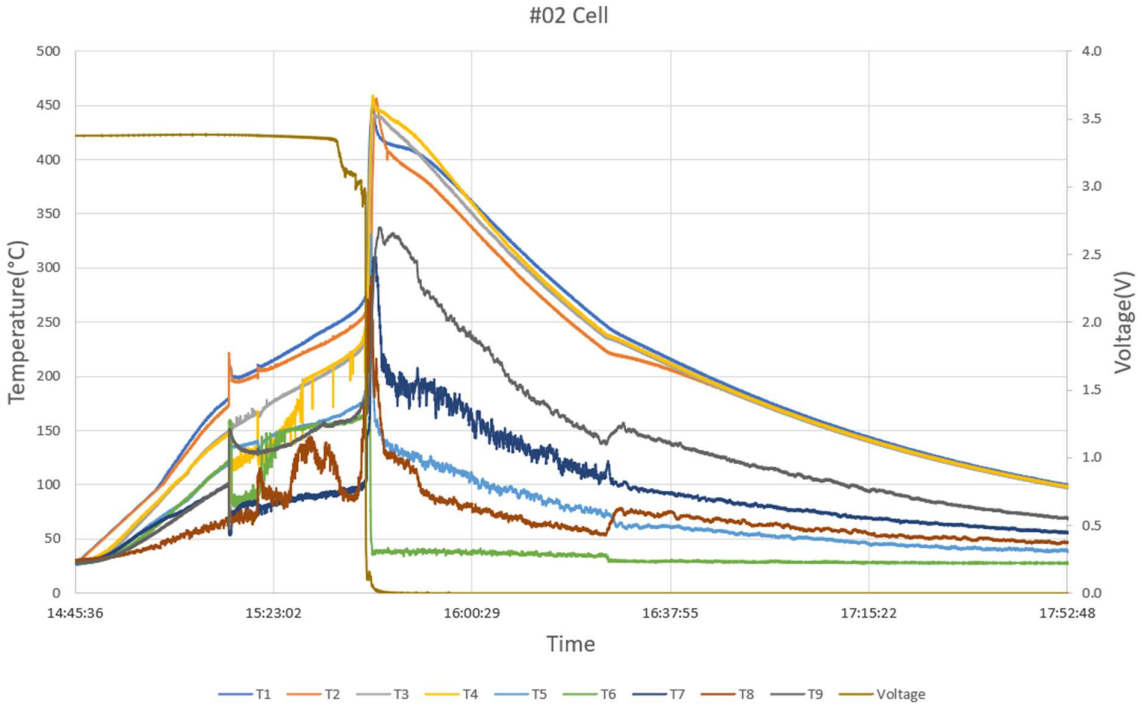


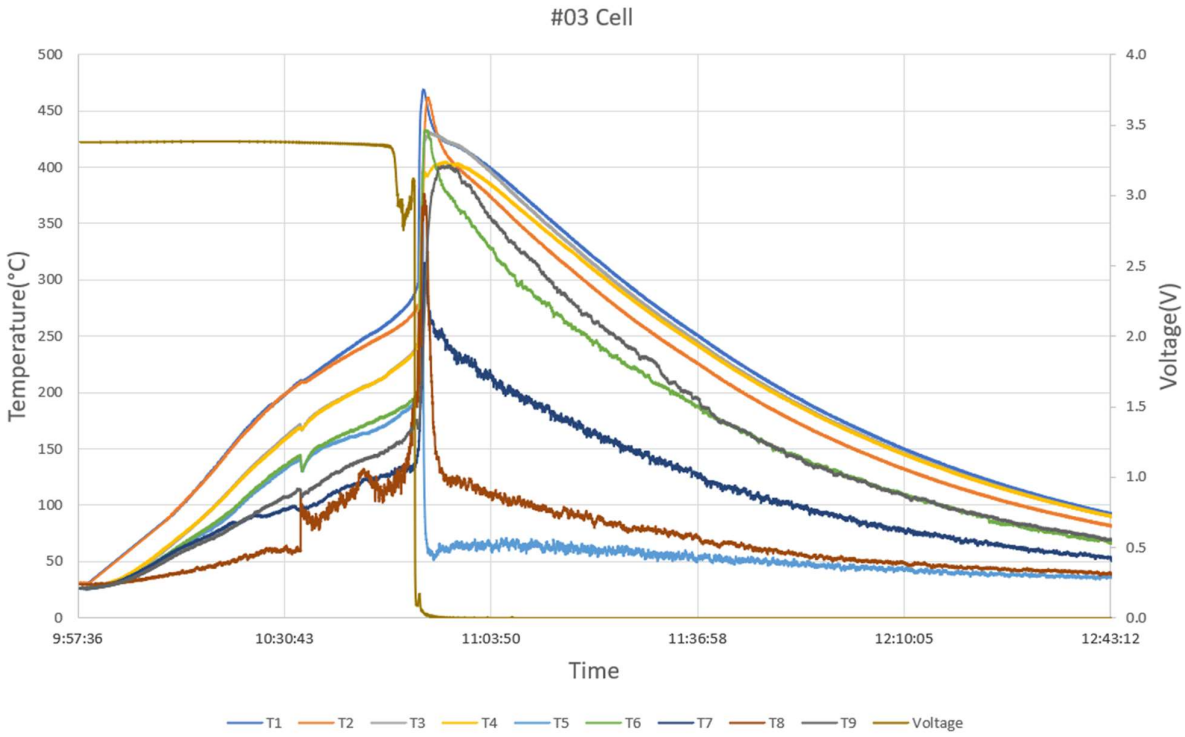
Ambient conditions at the initiation of the test	25.7°C 50% R.H.	24.1°C 55% R.H.	23.9°C 48% R.H.	24.3°C 48% R.H.	23.8°C 46% R.H.
Sample number	#01	#02	#03	#04	#05[1)]
Open circuit voltage before test (V)	3.39	3.38	3.38	3.35	3.41
Cell vent temperature (°C)	162.0	166.0	171.7	169.9	169.7
Cell vent time (seconds)	2368	2061	2127	2114	2087
Thermal runaway onset temperature (°C)	224.1	242.1	242.1	245.9	240.0
Thermal runaway time (seconds)	3718	3313	3254	3362	3109
Maximum temperature (°C)	472.0	459.2	468.7	465.7	636.3
Average cell vent temperature (°C)[2)]	167.4				
Average thermal runaway onset temperature (°C)[2)]	238.5				

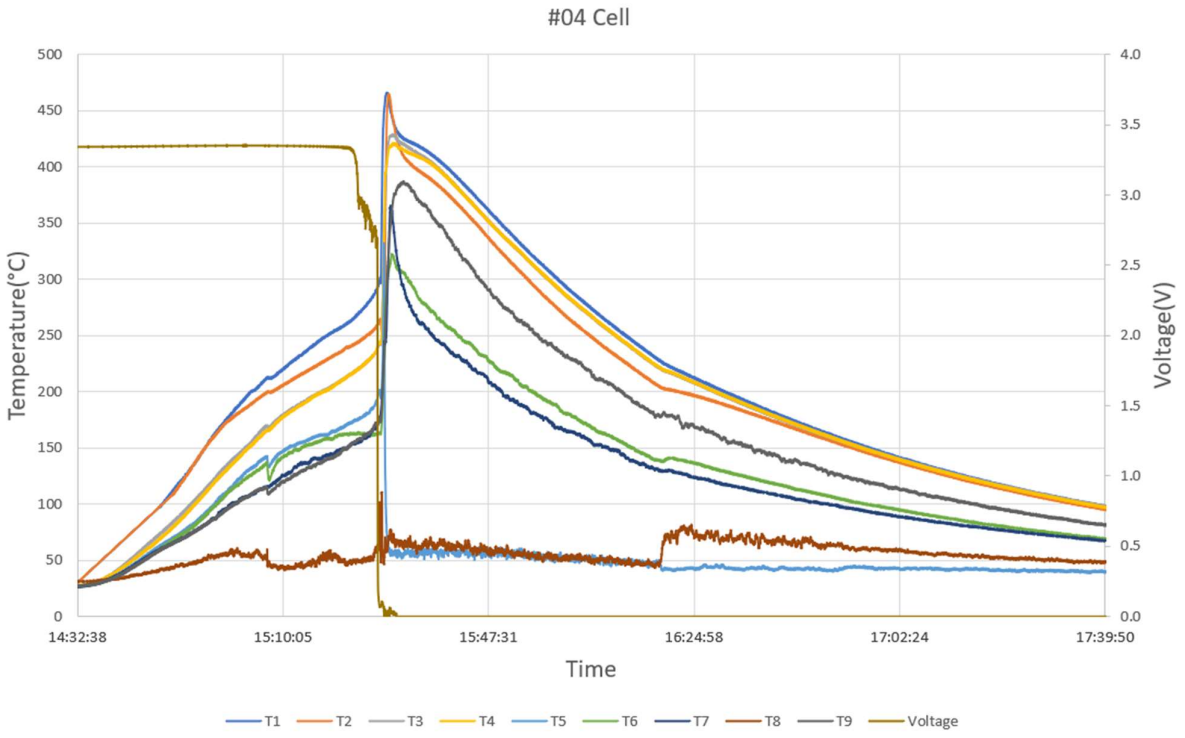
Note:
1) The sample is for gas vent capture.
2) The temperatures were averaged over the tested samples (#01, #02, #03, #04) excluding the gas vent capture sample (#05).

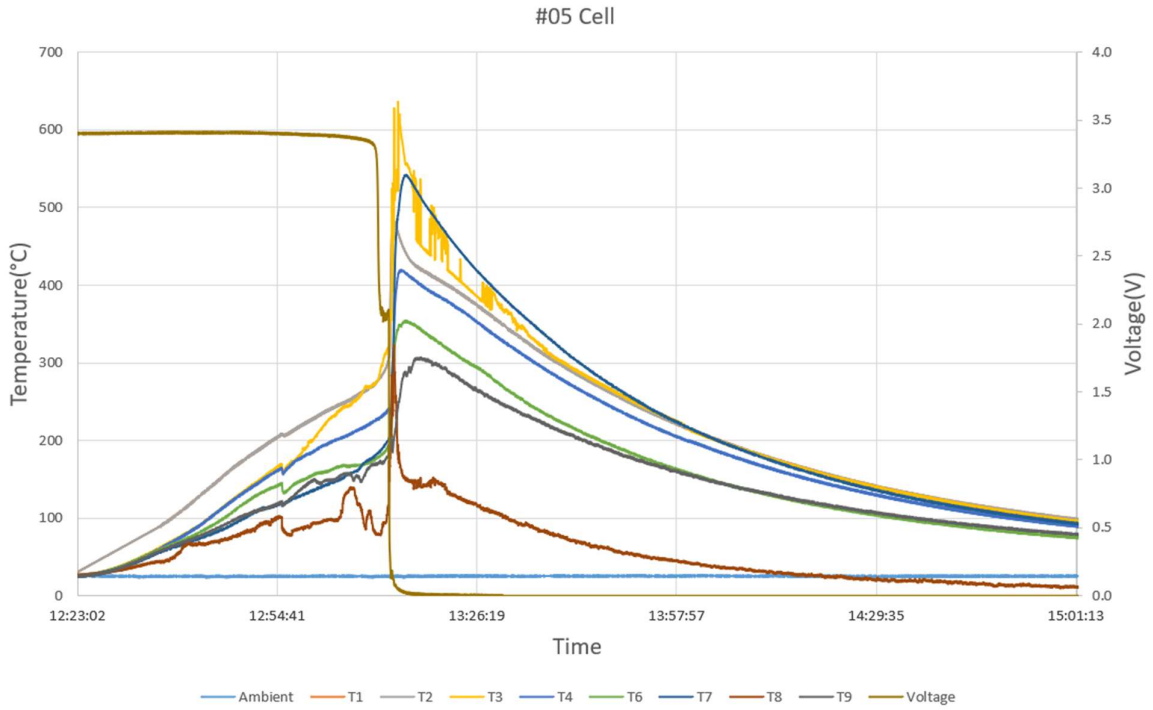
Attachment C: Temperature and voltage profile during the test






#03 Cell
Temperature(°C)
Voltage(V)
Time
9:57:36
10:30:43
11:03:50
11:36:58
12:10:05
12:43:12
T1 T2 T3 T4 T5 T6 T7 T8 T9 Voltage


#04 Cell
Temperature(°C)
Voltage(V)
Time
14:32:38
15:10:05
15:47:31
16:24:58
17:02:24
17:39:50
T1 T2 T3 T4 T5 T6 T7 T8 T9 Voltage



Note: Thermocouple T5 was damaged during the test.

Attachment D: Cell vent gas composition, Lower flammability limit (LFL), Vent gas burning velocity (Su) and Vent gas maximum pressure (Pmax)

The cells to be tested were charged to 100% SOC and allowed to stabilize for a minimum of 1 h and a maximum of 8 h before the start of the test.

A cell was forced into thermal runaway by the external heating as determined in cell thermal runaway methodology test inside a 140L pressure vessel.

Test result

Room ambient condition ..... :	23.8 °C, 46% R.H.
Sample number ..... :	#05
Open circuit voltage before test (V) ..... :	3.41
Pressure vessel size..... :	140 L
Initial oxygen content by volume (%)..... :	< 0.1 %
Cell weight before test (g)..... :	5720
Cell weight after test (g)..... :	4630
Total vent gas produced (L)..... :	180.7 (std)

Gas component		Concentration % (v/v)
Methane	CH_4	4.495
Acetylene	C_2H_2	0.157
Ethylene	C_2H_4	2.299
Ethane	C_2H_6	0.729
Propyne	C_3H_4	0.012
Propylene	C_3H_6	0.952
Propane	C_3H_8	0.211
Butylene	C_4H_8	0.616
Butane	C_4H_{10}	0.080
Hydrogen	H_2	49.725
Carbon Monoxide	CO	13.898
Carbon Dioxide	CO_2	26.826
Total	-	100

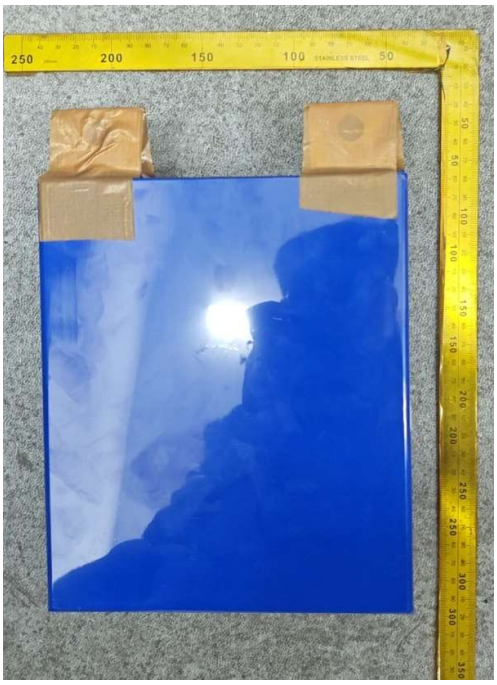
Lower flammability level (LFL)	
Test Method	ASTM E918-19 Standard Practice for Determining Limits of Flammability of Chemicals at Elevated Temperature and Pressure
Lower flammability level (LFL), % volume in air at the ambient temperature	8.3%
Lower flammability level (LFL), % volume in air at the venting temperature	7.3%

Vent gas maximum pressure (Pmax)	
Test Method	BS EN 15967:2022 Determination of maximum explosion pressure and the maximum rate of pressure rise of gases and vapours
Content of flammable substance	27.4% volume
Accuracy	0.2% absolute
Maximum explosion pressure	0.760 MPa

Vent gas burning velocity (Su)	
Test Method	ISO 817:2014 / Amd 2:2021 Refrigerants - Designation and safety classification
Vent gas burning velocity (Su) at room temperature and atmosphere pressure	0.973 m/s

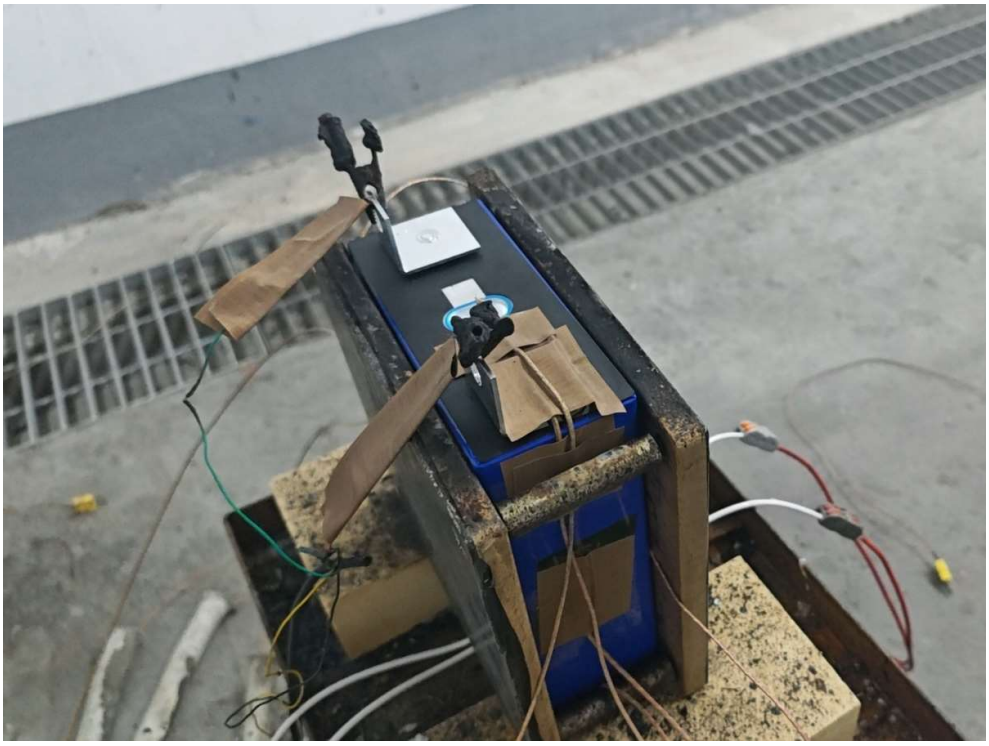
Attachment E: Sample Photos and Test Photos

Cell photos

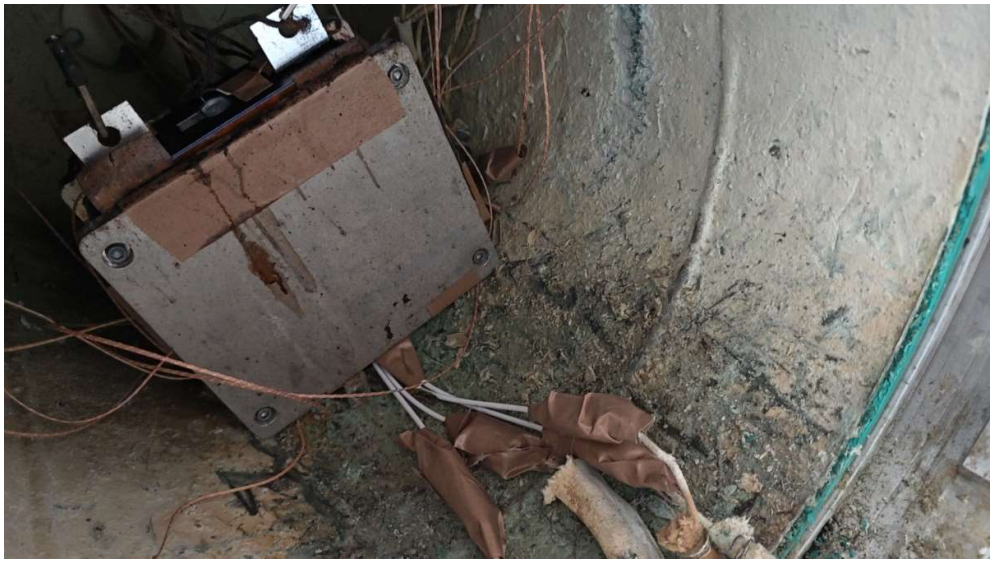




Thermal runaway test setup



Gas generation and capturing setup



Test sample #01 at ambient condition



Venting



Thermal runaway

Test sample #02 at ambient condition



Venting

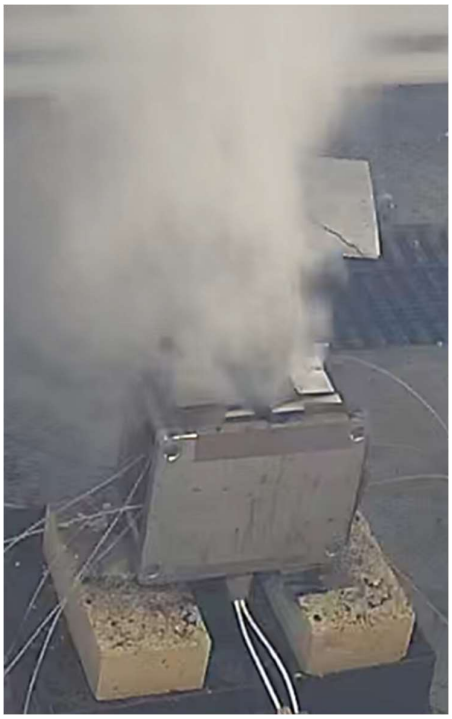


Thermal runaway

Test sample #03 at ambient condition



Venting



Thermal runaway

Test sample #04 at ambient condition



Venting



Thermal runaway

Cell sample after test

#01 cell



#02 cell



#03 cell



#04 cell



#05 cell



Attachment F: List of Test and Measurement Instruments

No.	Equipment	Model	Rating	Inventory no.	Cal. expire date
1.	Ambient monitor	WSB-2-H1	0-40℃, 10-90%RH	S-055	2025.01.03
2	Ambient monitor	WSB-2-H1	0-40℃, 10-90%RH	S-050	2025.01.03
3	Ambient monitor	WSB-2-H1	0-40℃, 10-90%RH	S-044	2025.01.03
4	Ambient monitor	WSB-2-H1	0-40℃, 10-90%RH	S-056	2025.01.03
5	Ambient monitor	WSB-2-H1	0-40℃, 10-90%RH	S-006	2025.01.03
6	Charge/discharge equipment	HRCDS-5V300A	5V/300A	S-057	2025.04.11
7	Ruler	300mm	300mm	S-051	2025.01.03
8	Electronic scale	HC311	0-6000g	S-047	2025.02.12
9	Digital multi-meter	FLUKE101	0-600V	S-038	2025.02.08
10	Heating control equipment	DTB4824	0-1000℃	S-060-3	2025.04.11
11	Data acquisition equipment	ADAM-4117 ADAM-4118	0-10V 0-1000℃	S-060-1 S-060-2	2025.04.11 2025.04.11
12	Heating control equipment	DTB4824	0-1000℃	S-028-3	2025.02.08
13	Data acquisition equipment	ADAM-4117 ADAM-4118	0-10V 0-1000℃	S-028-1 S-028-2	2025.02.08 2025.01.03
14	Heating control equipment	DTB4824	0-1000℃	S-030-3	2025.02.08
15	Data acquisition equipment	ADAM-4117 ADAM-4118	0-10V 0-1000℃	S-030-1 S-030-2	2025.02.08 2025.02.08

16	Heating control equipment		DTB4824	0-800℃	S-058-3	2025.04.11
17	Data acquisition equipment		ADAM-4117 ADAM-4118	0-10V 0-1000℃	S-058-1 S-058-2	2025.04.11 2025.04.11
18	Gas Chromatography		PE Clarus680	——	T-177	2024.11.16
19	Gas Chromatography		GC-2014C	——	T-251	2025.02.10
20	Gas acquisition system 82L	Thermopile	WRNK-191 K	0-1000℃	S-020-1~10	2025.01.03
		Pressure sensor	BD-801KZ	0~90kPa	S-020-11	2025.02.08
		Data acquisition equipment	DTM DTB4824 DTM	0-1000℃ 0-1000℃ 0-10V	S-020-12 S-020-13 S-020-14	2025.01.03
21	Gas acquisition system 10L	Thermopile	GG-K-30-1000	0-800℃	S-046-1~10	2025.06.15
		Pressure sensor	BD-801KZ	0~90kPa	S-020-11	2025.02.08
		Data acquisition equipment	DTM DTB4824 DTM	0-1000℃ 0-1000℃ 0-10V	S-020-12 S-020-13 S-020-14	2025.01.03
22	Gas acquisition system 86L	Thermopile	GG-K-30-1000	0-800℃	S-052-2~11	2025.04.08
		Pressure sensor	BD-801KZ	0~0.5MPa	S-052-1	2025.04.08
		Data acquisition equipment	ADAM-4117 ADAM-4118 DTB4824	0-10V 0-1000℃ 0-1000℃	S-071-1 S-071-2 S-071-3	2025.04.08
23		Thermopile	GG-K-30-1000	0-800℃	S-071-6~15	2025.04.08

	Gas acquisition system 340L	Pressure sensor	PTX-50G2-TC-A3-CA-HO-PB PTX-50G2-TC-A3-CA-HO-PB	0~2MPa -0.1~1MPa	S-071-4 S-071-5	2025.04.08
		Data acquisition equipment	DTM DTB4824 DTM	0-1000℃ 0-1000℃ 0-10V	S-020-12 S-020-13 S-020-14	2025.01.03
24	Oxygen analyzer		HM-BX-02	0-20.9%	S-014	2024.12.20
25	Gas explosion test system (5L)	Temperature measurement	TJ120-CAXL-116U-10-SMPW-M	0-200℃	S-021-1	2025.02.08
		High frequency dynamic pressure sensor	Kistler 603CAA	0~100MPa	S-021-2	2025.05.26
		Pressure gauge	PTX 50G2-TC-A3-CA-H0-PB	-0.1~+0.5MPa	S-021-3	2025.05.26
		Pressure gauge	PTX 50G2-TC-A3-CA-H0-PB	-0.1~+0.3MPa	S-021-4	2025.05.26
26	Gas flammability testing equipment (5L)	Pressure gauge	PTX 50G2-TC-A3-CA-H0-PB	-0.1~+0.15MPa	S-053-1	2025.03.24
		Temperature measurement	TJ120-CAXL-116U-10-SMPW-M	0-300℃	S-053-2	2025.03.24
27	Combustible gas combustion rate device	Temperature measurement	TJ120-CAXL-116U-10-SMPW-M	0~200℃	S-022-1	2025.02.08
		Temperature measurement	TJ120-CAXL-116U-10-SMPW-M	0~200℃	S-022-2	2025.02.08

		Pressure gauge	PTX 50G2-TC-A3-CA-H0-PB	-0.1~+0.5MPa	S-022-4	2025.03.24
		straight steel ruler	Shuguang 1m	1000mm	S-040	2024.12.19
		High speed camera	Photron fastcam miniAX50	216000fps	S-022-3	/

Prüfbericht-Nr.: *Test report no.*:	**CN25HYJ6 001**	**Auftrags-Nr.:** *Order no.*:	326096320	Seite 1 von 33 *Page 1 of 33*
Kunden-Referenz-Nr.: *Client reference no.*:	2371109	**Auftragsdatum:** *Order date:*	2025-02-21	
Auftraggeber: *Client*:	CSI Energy Storage Co., Ltd. No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China			
Prüfgegenstand: *Test item*:	LFP battery module			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	CSI-SolBank-P-104.5-2h-A, CSI-SolBank-P-104.5-4h-A			
Auftrags-Inhalt: *Order content*:	Test report			
Prüfgrundlage: *Test specification*:	UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems			
Wareneingangsdatum: *Date of sample receipt*:	2025-01-19			
Prüfmuster-Nr.: *Test sample no:*	#2025011901			
Prüfzeitraum: *Testing period*:	2025-01-20 - 2025-01-26			
Ort der Prüfung: *Place of testing*:	See page 5 Testing location			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result**:	See main report			

geprüft von:
tested by:Minhao Hu

Datum:
Date: 2025-03-28

Minhao Hu

genehmigt von:
authorized by: Simon Wang

Ausstellungsdatum:
Issue date: 2025-03-28

Stellung / Position: Project Engineer

Stellung / Position: Authorizer

Sonstiges /
Other:

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery: Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

TEST REPORT

ANSI/CAN/UL 9540A:2019

Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems

Report Number. .....:	CN25HYJ6 001
Date of issue .....:	See cover page
Total number of pages.....:	See cover page
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.** No. 177, Lane 777, West Guangzhong Road, Jing'an District, Shanghai 200072, P. R. China
Applicant's name .....:	**CSI Energy Storage Co., Ltd.**
Address .....:	No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China
Test specification:	
Standard.....:	ANSI/CAN/UL 9540A:2019
Test procedure .....:	TÜV Rheinland Test Report
Non-standard test method .....:	N/A
Test Report Form No. .....:	UL 9540A-C01
Test Report Form(s) Originator ....:	TÜV Rheinland (Shanghai) Co., Ltd.
Master TRF.....:	Dated 2023-12-25

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the TÜV Rheinland (Shanghai) Co., Ltd., responsible for this Test Report.

Other / Scope:

This report presents the result of module level tests of UL 9540A: 2019.

All tests were conducted at TUV Rheinland (Shanghai) Co., Ltd. and TUV Rheinland's partner labs that were under supervision of TÜV Rheinland's engineer.

All tests were under supervision of TÜV Rheinland's engineer.

List of Attachments：

Attachment A: Module Conditioning (Charge/Discharge) Profiles

Attachment B: Observations and Records

Attachment C: Module and Initiating Cell(s) Temperature Profiles during Testing

Attachment D: Module Chemical Heat Release Rate and Smoke Release Rate

Attachment E: Flammable Gas Generation and Composition Data

Attachment F: Sample Photos and Test Photos

Attachment G: List of Test and Measurement Instruments

Attachment I: Revision Information

Summary of testing:

Model No:	CSI-SolBank-P-104.5-2h-A
Ratings (Vdc, kWh) :	332.8V, 104.5kWh
Cells in series/parallel:	1P104S
Module dimensions:	2180±5mm(L)×790±3mm(W)×248±5mm(H)
Module weight (kg) :	670±15kg
Module enclosure material:	Metal enclosure with metal cover
Total number of cell(s) went into thermal runaway:	5
Thermal Runaway and Propagation:	3 initiating cells went into thermal runaway and propagated to 2 adjacent cells
Maximum Smoke Release Rate (m^2/s)	1.020
Total Smoke Released: (m^2)	314.482
Total smoke released duration	13:55 to 18:30
Peak Chemical Heat Release Rate: (kW):	No flaming occurred
External Flaming:	No external flaming occurred
Location(s) of Flame Venting:	No flaming occurred
Flying Debris:	No flying debris occurred
Re-ignitions:	No further re-ignitions were observed during post test observation

Summary of Module level test Gas Analysis Data:

Gas Analysis:

Flame ionization detection	☒
Fourier-Transform infrared Spectrometer	☒
Hydrogen Sensor (palladium-nickel, thin-film solid state sensor)	☒
White light source with photo detector (smoke release rate)	☒

Gas Composition & Volume for Each Compound (Pre-flaming and After flame):

Gas Compound	Gas Type	Pre-Flaming (L)	Post-Flaming (L)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	406.43	No flaming
Carbon Monoxide	Carbon Containing	103.79	No flaming
Carbon Dioxide	Carbon Containing	445.65	No flaming
Hydrogen	Hydrogen	236.51	No flaming

Note: 1) The collection time is from 13:55 to 18:30.

2) See attachment E for detail gas analysis data.

Result of testing:

Performance Criteria in accordance with Clause 8.4 and Figure 1.1:

The effects of thermal runaway was contained by the module design	☒
Cell vent gas (based upon the cell level test) was non-flammable	☐

Necessity of a unit level test

The performance criteria of the module level test as indicated in 8.4 and as shown in Figure 1.1 of UL 9540A 4th edition has not been met, therefore unit level testing in accordance with UL 9540A will need to be conducted on a complete unit employing this module.	☒
The performance criteria of the module level test as indicated in 8.4 and as shown in Figure 1.1 of UL 9540A 4th edition has been met, therefore unit level testing in accordance with UL 9540A need not be conducted.	☐

Tests performed (name of test and test clause): UL 9540A cl 8. Module Level	**Testing location:** HangZhou ZhongChuan Fire Quitpment Co., Ltd. No.8, Village 006, Quantou Village, Lankao County, Kaifeng city, Henan Province

Possible test case verdicts:

- test case does not apply to the test object....: N/A

- test object does meet the requirement.....: P (Pass)

- test object does not meet the requirement....: F (Fail)

Testing:

Date of receipt of test item .....: 2025-01-19

Date (s) of performance of tests .....: 2025-01-20 to 2025-01-26

General remarks:
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**
Name and address of factory (ies) ..... : CSI Energy Storage Co., Ltd. No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China
Other: **N/A**

UL 9540A testing information :

Cell level information	
Manufacturer :	CSI Energy Storage Co., Ltd.
Model number :	CSI314
Chemistry :	$LiFePO_4$
Physical configuration :	Prismatic
Electrical rating :	Rated capacity: 314 Ah
	Nominal voltage: 3.2 V
Compliance with UL1973..... :	☒ Yes Report No. CN24XEVJ 001 Cert. No. CU 72405509 0001 ☐ No
UL 9540A cell test report number..... :	CN243TAR 001
Average cell surface temperature at gas venting :	167.4 °C
Average cell surface temperature at thermal runaway :	238.5 °C
Gas Volume:	180.7 L
Lower flammability limit (LFL), % volume in air at the ambient temperature:	8.3%
Lower flammability limits (LFL), % volume in air at the venting temperature:	7.3%
Burning velocity (Su):	0.973 m/s
Maximum pressure (Pmax):	0.760 MPa

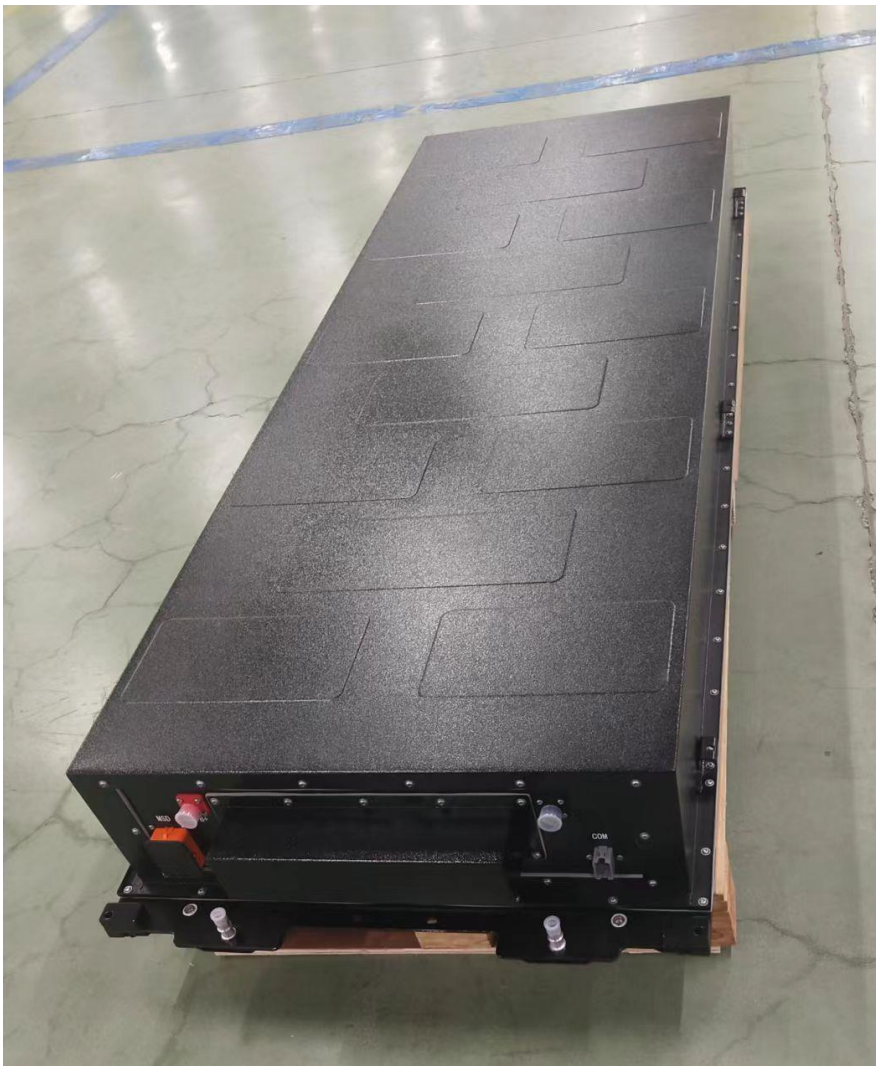
Cell level Gas Composition:

Gas component		Concentration % (v/v)
Methane	CH_4	4.495
Acetylene	C_2H_2	0.157
Ethylene	C_2H_4	2.299
Ethane	C_2H_6	0.729
Propyne	C_3H_4	0.012
Propylene	C_3H_6	0.952
Propane	C_3H_8	0.211
Butylene	C_4H_8	0.616
Butane	C_4H_{10}	0.080
Hydrogen	H_2	49.725

Carbon Monoxide	CO	13.898
Carbon Dioxide	CO_2	26.826
Total	-	100

General product information

Photo of module:

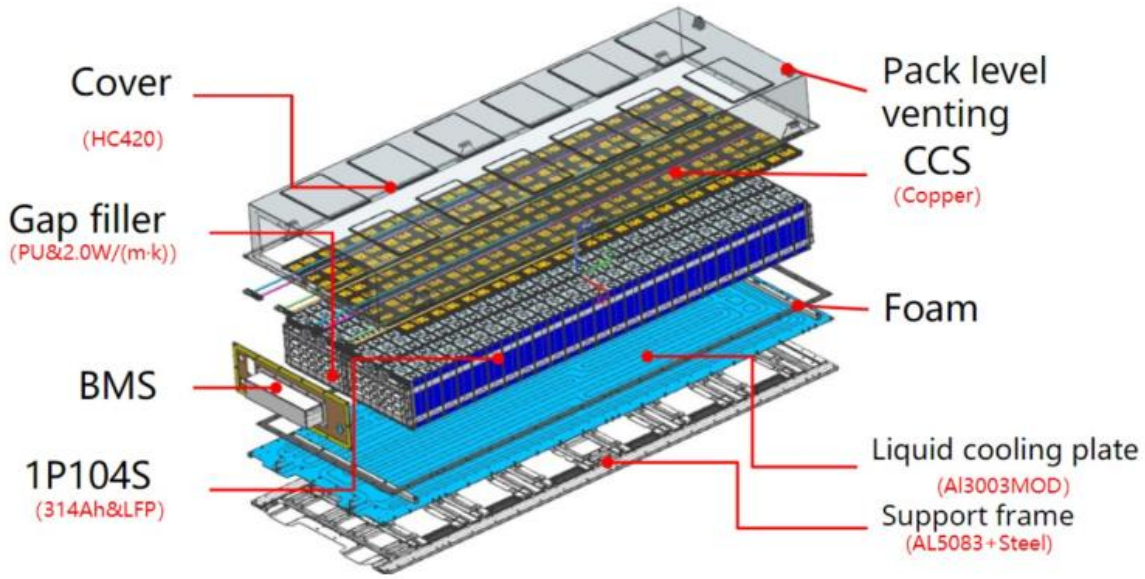


Manufacturer name :	CSI Energy Storage Co., Ltd.	
Model number :	CSI-SolBank-P-104.5-2h-A	CSI-SolBank-P-104.5-4h-A
Physical configuration :	Metal enclosure with metal cover	
	Weight: 670±15kg	
	Cells in series/parallel: 1P104S	

Cooling method :		Liquid cooling	
Separation between cells :		Aerogel	
Electrical rating :		Rated capacity: 314 Ah	
		Nominal voltage: 332.8V	
Standard charge method :	Charge current :	157 A	78.5A
	End of charge voltage :	374.4 V	
	Charge temperature range:	0~55 °C	
Standard discharge method .....:	Discharge current :	157 A	78.5A
	End of discharge voltage :	265.2 V	
	Discharge temperature range:	0~55 °C	
External dimensions (mm) :		2180±5mm(L)×790±3mm(W)×248±5mm(H)	

Module Construction

Figure 1. Layout of the module contents



Diagrams of setup for module level testing

Figure 2. Thermocouples (no. xx) locations of initiating cell

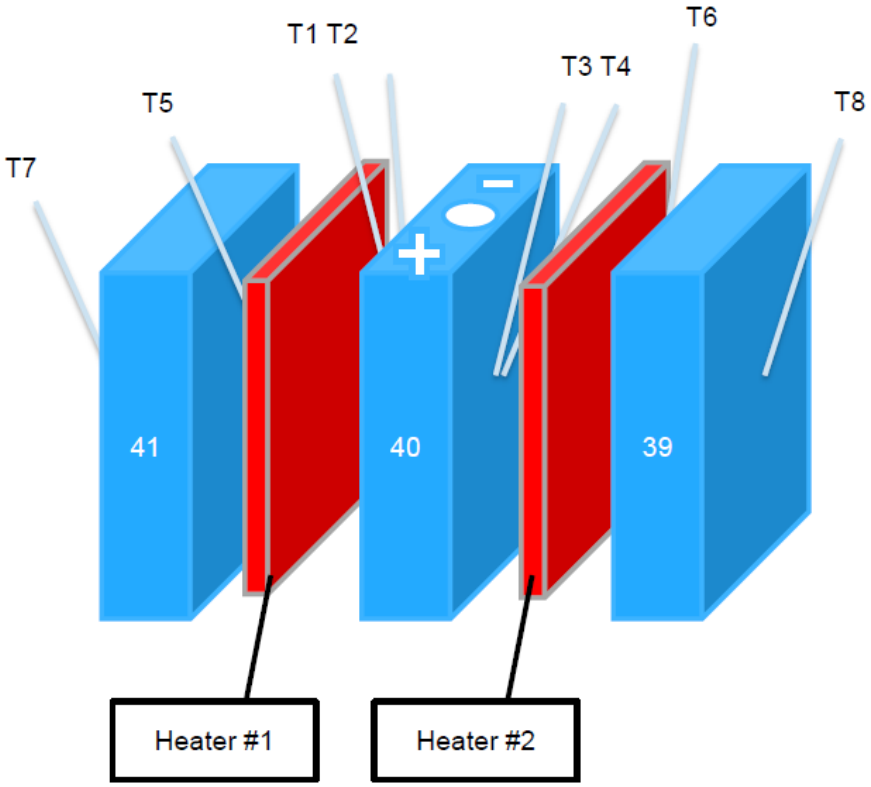


Figure 3. Cell numbering, heater location and thermocouples (no. xx) locations inside the sub-module

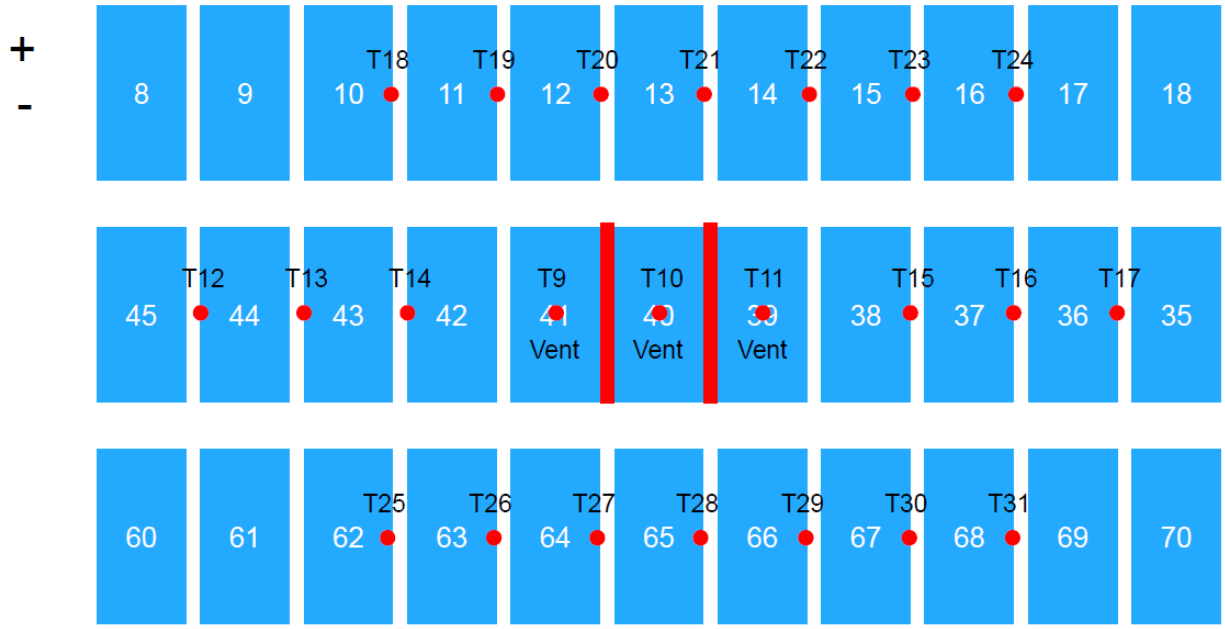
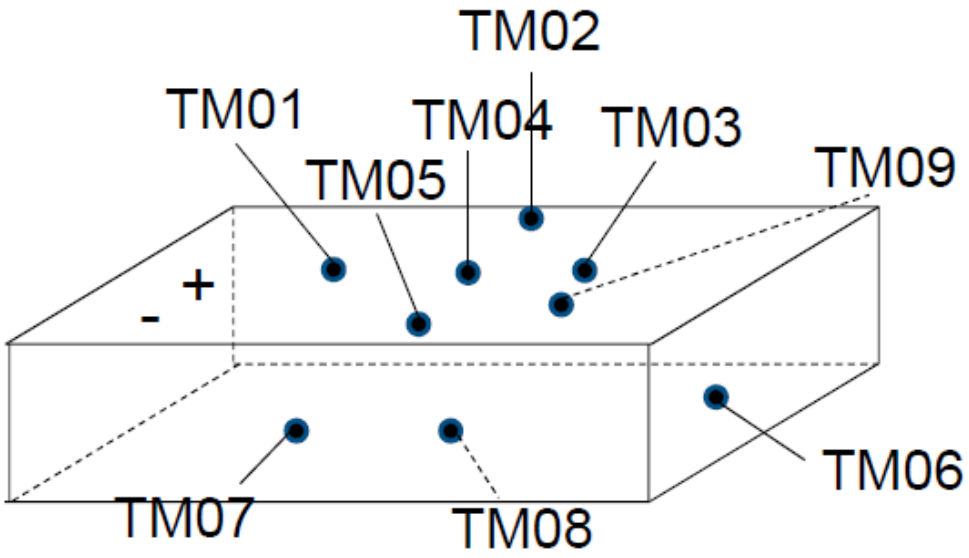


Figure 4. Thermocouples' locations outside module



ANSI/CAN/UL 9540A:2019			
Clause	Requirement + Test	Result - Remark	Verdict
CONSTRUCTION			--
5	**General**		--
5.1	**Cell**		P
5.1.1	The cells associated with the BESS that were tested shall be documented in the test report	Accepted test report by TUV Rheinland, test report: CN243TAR 001	P
5.1.2	The cell documentation included in the test report shall indicate if the cells associated with the BESS comply with UL 1973		P
5.1.3	Refer to 7.6.1 for further details		N/A
5.2	**Module**		P
5.2.1	The modules associated with the BESS that were tested shall be documented in the test report	See Product Specification on Page 8	P
5.2.2	The module documentation included in the test report shall indicate if the modules associated with the BESS comply with UL 1973	Test with unit	N/A
5.2.3	Refer to 8.3 for further details	See 8.3	P
5.3	**Battery energy storage system unit**	Not applicable for module level product.	N/A
5.3.1	The BESS unit documentation included in the test report shall indicate the units that comply with UL 9540		N/A
5.3.2	For BESS units for which UL 9540 compliance cannot be determined,		N/A
5.3.3	If applicable, the details of any fire detection and suppression systems that are an integral part of the BESS shall be noted in the test report		N/A
5.3.4	Refer to 9.7, 10.4 and 10.7 for further details		N/A
5.4	**Flow Batteries**	Not applicable for lithium product.	N/A
5.4.1	For flow batteries, the report will cover the chemistry, as well as the electrical rating in capacity and nominal voltage of the cell stack		N/A
5.4.2	The flow battery documentation included in the test report shall indicate if the flow battery system complies with UL 1973		N/A
5.4.3	See 7.6.2 for further details		N/A
PERFORMANCE			--
6	**General**		--

ANSI/CAN/UL 9540A:2019			
Clause	Requirement + Test	Result - Remark	Verdict
6.1	The tests in this standard are extreme abuse conditions conducted on electrochemical energy storage devices that can result in fires, explosions, smoke, off gassing of flammable and toxic materials, exposure to toxic and corrosive liquids, and potential exposure to hazardous voltages and electrical energy. See Annex B for recommended testing practices.		P
6.2	At the conclusion of testing, samples shall be discharged in accordance with the manufacturer's specifications		P
8	**Module Level**		--
8.1	**Sample**		P
8.1.1	Module samples shall be conditioned, prior to testing, through charge and discharge cycles for a minimum of 2 cycles, using a manufacturer specified methodology	See Attachment A for profiles	P
8.1.2	The module to be tested shall be charged to 100% SOC and allowed to rest a maximum of 8 h before the start of the test	Stablize 2 hours	P
8.1.3	Electronics and software controls such as the battery management system (BMS) are not relied upon for this testing.	Module BMS constructed but not operated during the test.	P
8.2	**Test method**		P
8.2.1	Ambient indoor laboratory conditions shall be 25 ±5°C (77 ±9°F) and 50 ±25% RH at the initiation of the test.	See Attachment B	P
8.2.2	The test shall be conducted under a smoke collection hood	Smoke collection hood used	P
8.2.3	The weight of the module shall be recorded before and after testing	See Attachment B	P
8.2.4	The number of cells within the module that are forced into thermal runaway can be one or multiple cells	See Figure 2 Three cells forced into thermal runaway.	P
8.2.5	The methodology used for initiating thermal runaway pursuant to 7.2 shall be used	Two external film heaters used	P
8.2.6	With reference to 8.2.5, occurrence of thermal runaway shall be verified by sustained temperature above the cell surface temperature		P
8.2.7	The module shall be placed on top of a noncombustible horizontal surface		P
8.2.8	The chemical heat release rate of the module in thermal runaway shall be measured with oxygen consumption calorimetry.		P
8.2.9	The chemical heat release rate shall be measured for the duration of the test. See 8.2.10.		P
8.2.10	The chemical heat release rate shall be measured by a measurement system consisting of a paramagnetic oxygen analyzer		P

ANSI/CAN/UL 9540A:2019			
Clause	Requirement + Test	Result - Remark	Verdict
8.2.11	With reference to 8.2.10, calculate the chemical heat release rate at each of the flows as follows: $HRR_1 = \left[E \times \varphi - (E_{co} - E) \times \frac{1-\varphi}{2} \times \frac{X_{co}}{X_{O_2}}\right] \times \frac{\dot{m}_e}{1+\varphi \times (\alpha - 1)} \times \frac{M_{O_2}}{M_a} \times (1 - X^o_{H_2O}) \times X^o_{O_2}$		P
8.2.12	Vent gas composition shall be measured using a Fourier-Transform Infrared Spectrometer or equivalent gas analyzer		P
8.2.13	The hydrocarbon content of the vent gas shall be measure using flame ionization detection		P
8.2.14	The light transmission in the exhaust duct of the heat release rate calorimeter shall be measured using a white light source and photo detector for the duration of the test		P
8.2.15	Smoke release rate shall be calculated as follows: $SRR = 2.303\left(\frac{V}{D}\right) Log_{10}\left(\frac{I_o}{I}\right)$		P
8.3	**Module level test report**		P
8.3.1	The report on module level testing shall include the following:		P
	a) Module manufacturer and model number; b) Number of cells in module; c) Module configuration;	See Test Item Description in beginning of this report.	P
	d) Module construction features;	See Page 10 Module Construction	P
	e) Module voltage corresponding to the tested SOC;	See Attachment B	P
	f) Thermal runaway initiation method used;	See Figure 2	P
	g) Heat release rate versus time data;	See Attachment D	P
	h) Flammable gas generation and composition data;	See Attachment E	P
	i) Peak smoke release rate and total smoke release data.	See Attachment D	P
	j) Observation(s) of flying debris or explosive	See Attachment B	P
	k) Observation(s) of sparks, electrical arcs, or other electrical events;	See Attachment B	P
	l) Identification/location of cells(s) that exhibited thermal runaway within the module;	See Figure 2	P
	m) Locations and visual estimations of flame extension and duration from the module shall be documented;	See Attachment B	P
	n) Module weight loss based on measurements per 8.2.3; and	See Attachment B	P
	o) Video of the test.	Recorded	P
8.4	**Performance at module level testing**		N/A
8.4.1	Unit level testing in Section 9 is not required if the following performance conditions are met during the module level test:	Unit level testing required.	N/A

ANSI/CAN/UL 9540A:2019			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Thermal runaway is contained by module design; and		P
	b) Cell vent gas is nonflammable as determined by the cell level test.	See test report by TUV Rheinland, test report: CN243TAR 001	F

-- End of this report --

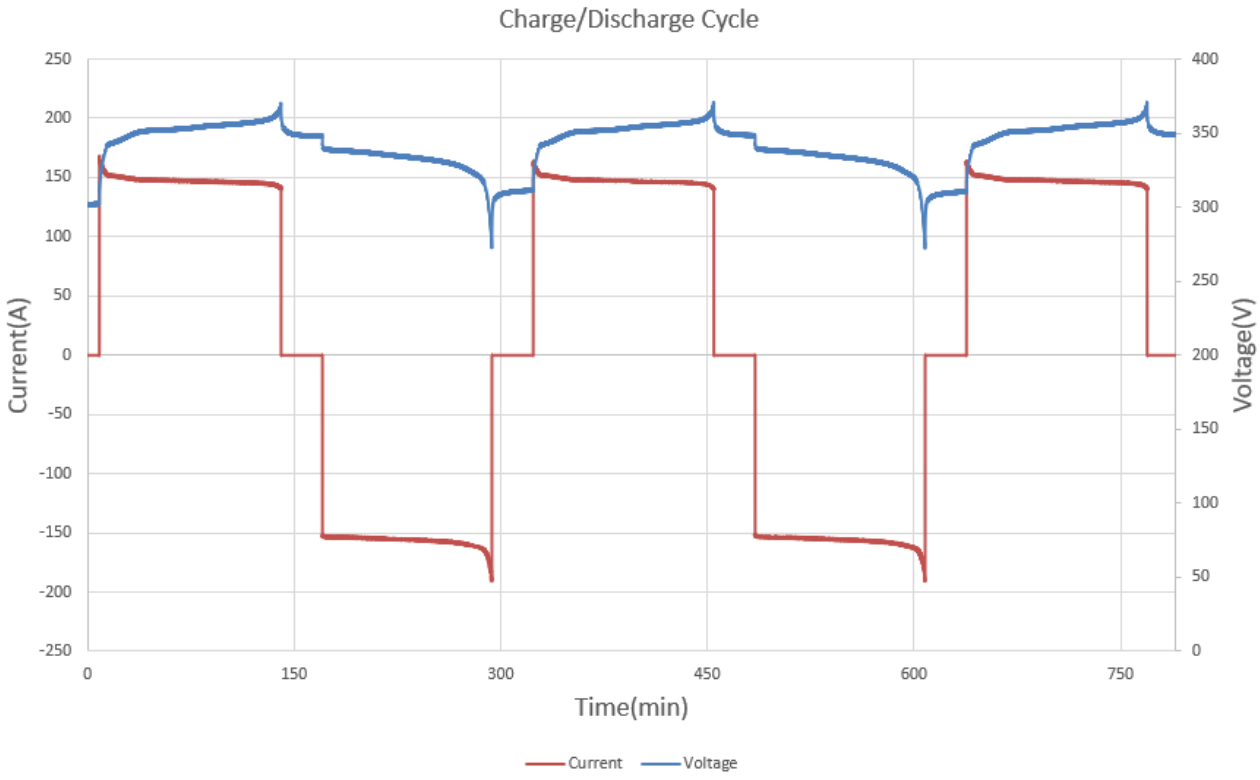
Attachment A: Module Conditioning (Charge/Discharge) Profiles

Module sample was conditioned, prior to testing, through charge and discharge cycles of 2 cycles to verify that the module was functional.

Each cycle was defined as a charge to 100% SOC and allowed to rest several minutes and then discharged to an end of discharge voltage (EODV) determined by the manufacturer. Refer to General product information for charge and discharge profile.

The module sample was put in a climate chamber during charge and discharge. The ambient is kept at 25°C±5°C and 50%± 25% R.H.

Figure 5. Module charge and discharge voltage/current profiles



Attachment B: Observations and Records

Test initiation details	
Ambient conditions at the initiation of the test. :	21.2°C, 44.8% R.H.
Sample number ..... :	#2025011901
Open circuit voltage before test (V)..... :	349.4
Weight before test (kg) ..... :	681.5 (with thermocouples)
Open circuit voltage after test (V)..... :	330.2
Weight after test (kg) ..... :	671.0 (with thermocouples)
Weight loss (kg)..... :	10.5

Test overview timeline		
Locations (Cell #)	**Event**	**Time**
-	Test start	13:55
40	Vent	14:42
41	Vent	14:43
39	Vent	14:50
40	Thermal runaway	14:51
41	Thermal runaway	14:55
39	Thermal runaway	14:56
42	Vent	14:58
38	Vent	14:59
42	Thermal runaway	15:01
38	Thermal runaway	15:02
37	Vent	15:32
43	Vent	15:34

Note:

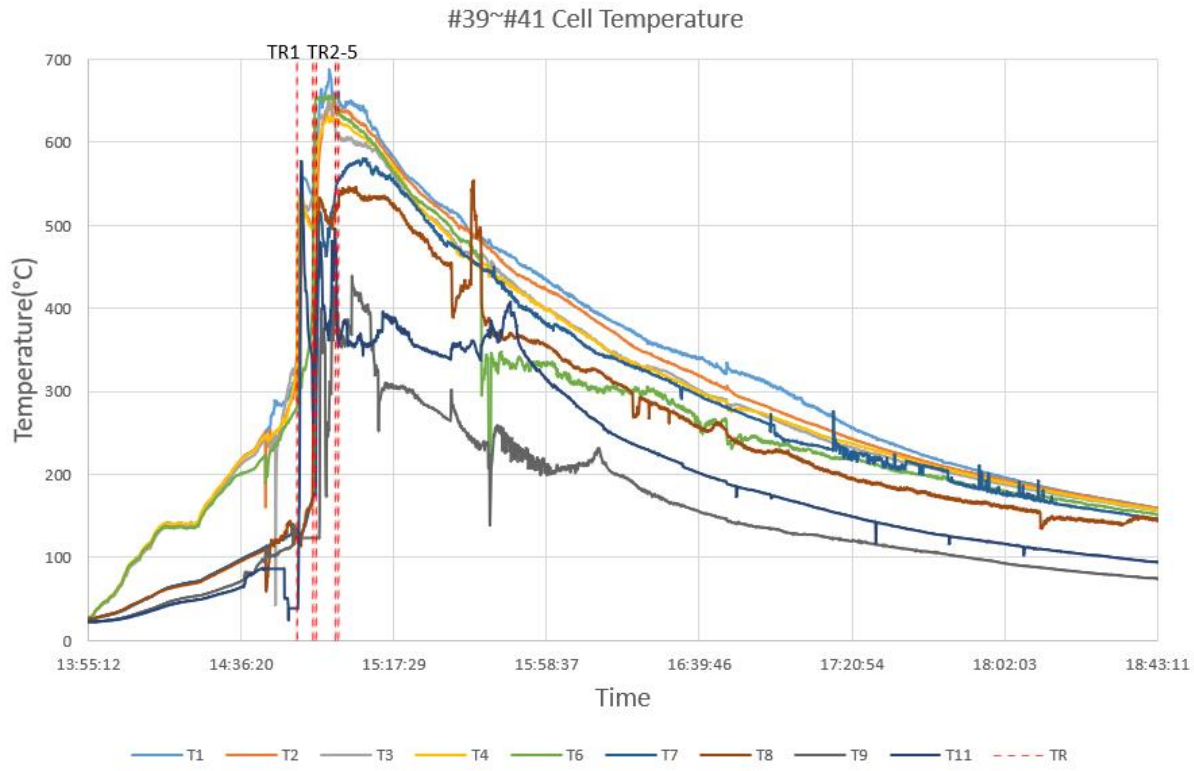
1) No flying debris or explosive discharge of gases during test.

2) No sparks, electrical arcs, or other electrical events during test.

3) No flaming observed.

Attachment C: Module and Initiating Cell(s) Temperature Profiles During Testing

Figure 6. Temperatures of cell #39~#41



Note: Thermocouples T5 and T10 were damaged during the test.

Figure 7. Temperatures of cell #36~#38 and #42~#44

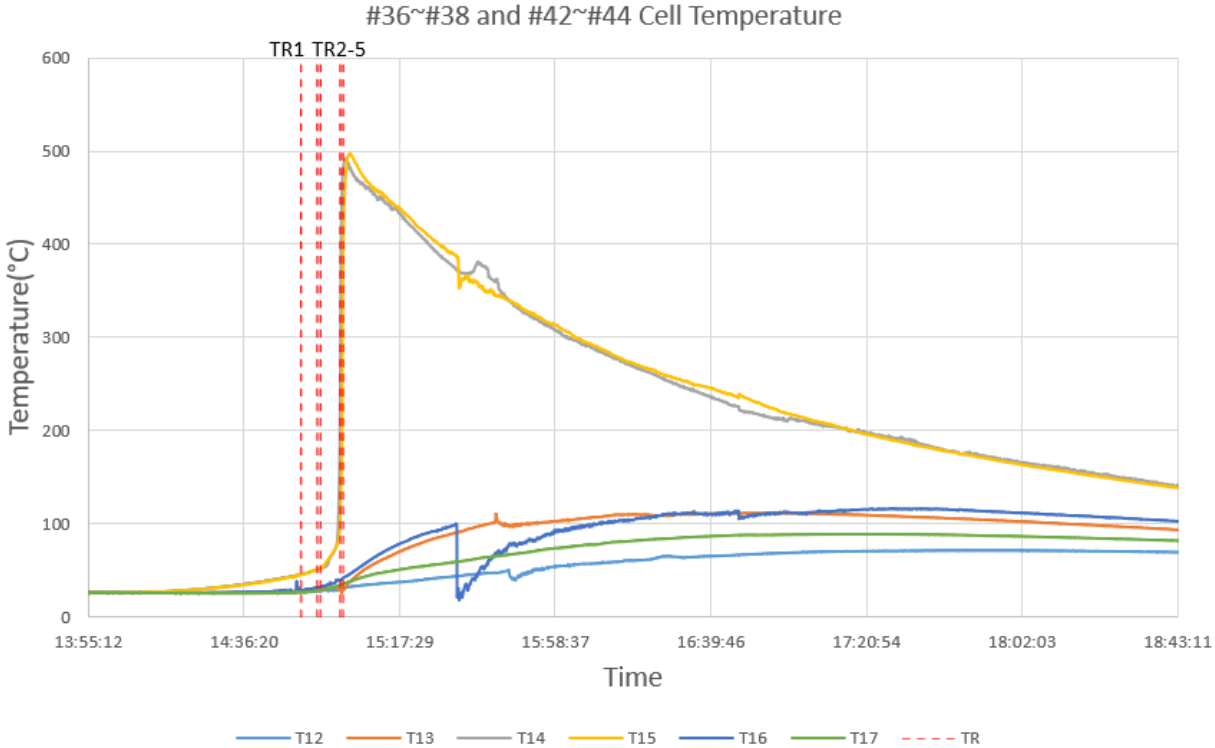


Figure 8. Temperatures of cell #10~#16

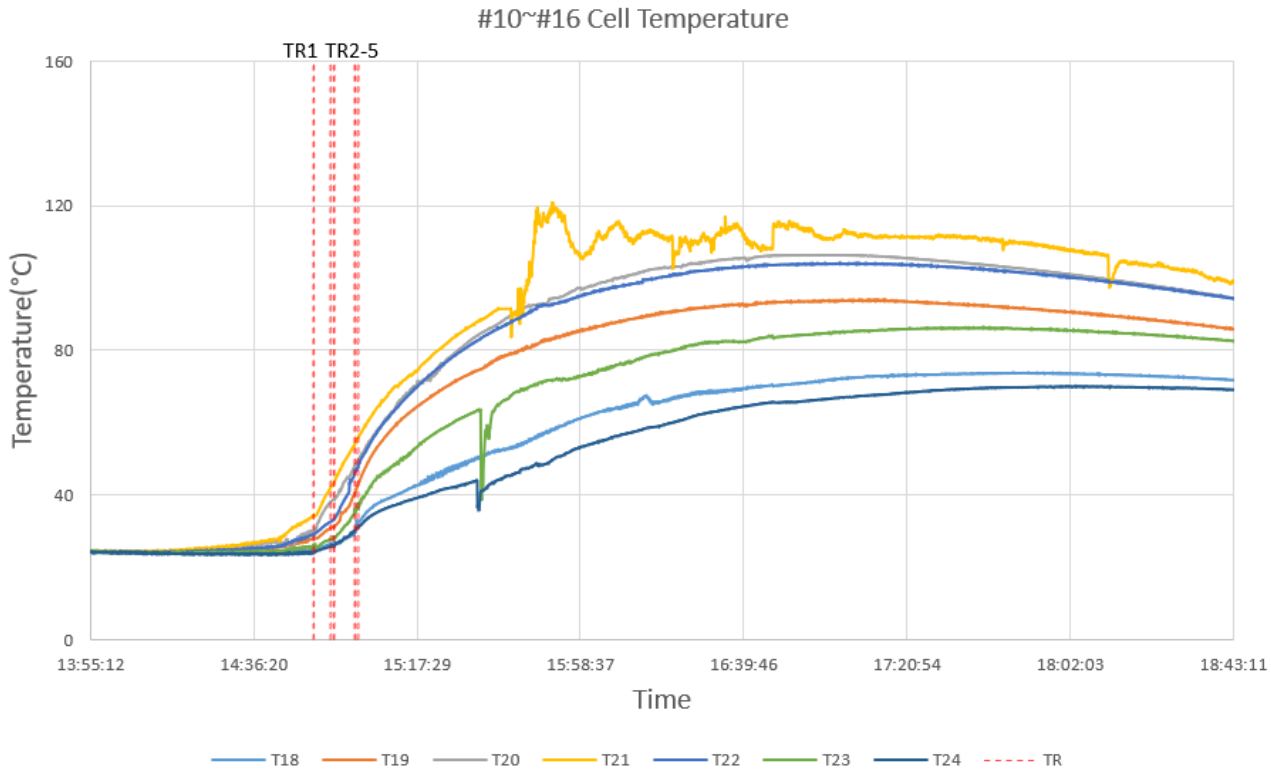


Figure 9. Temperatures of cell #62~#68

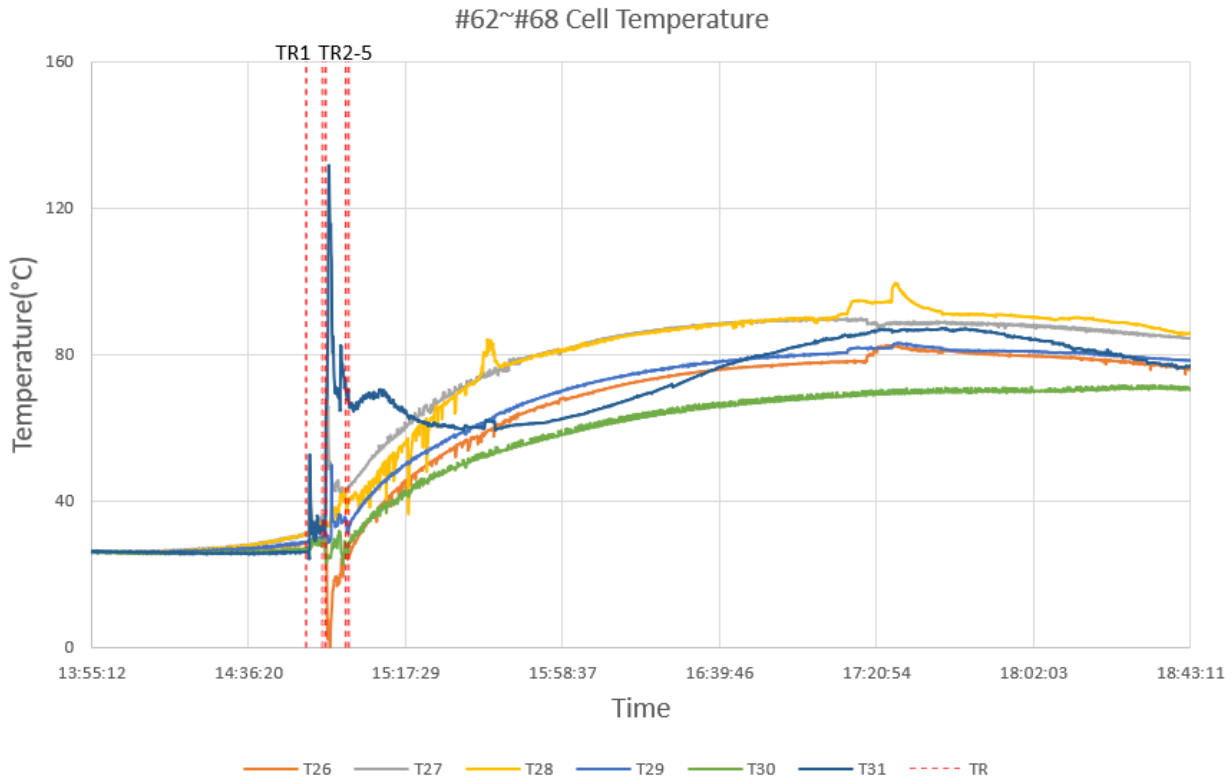


Figure 10. Temperatures of module surface

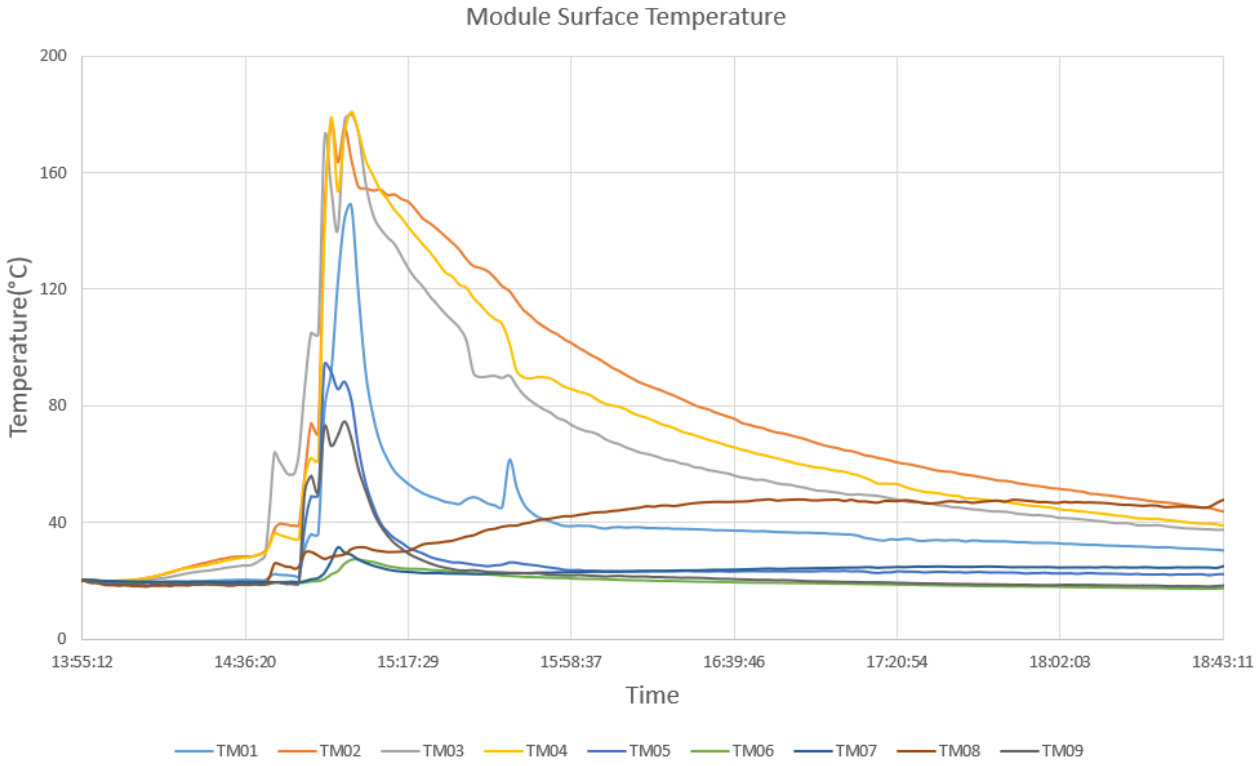
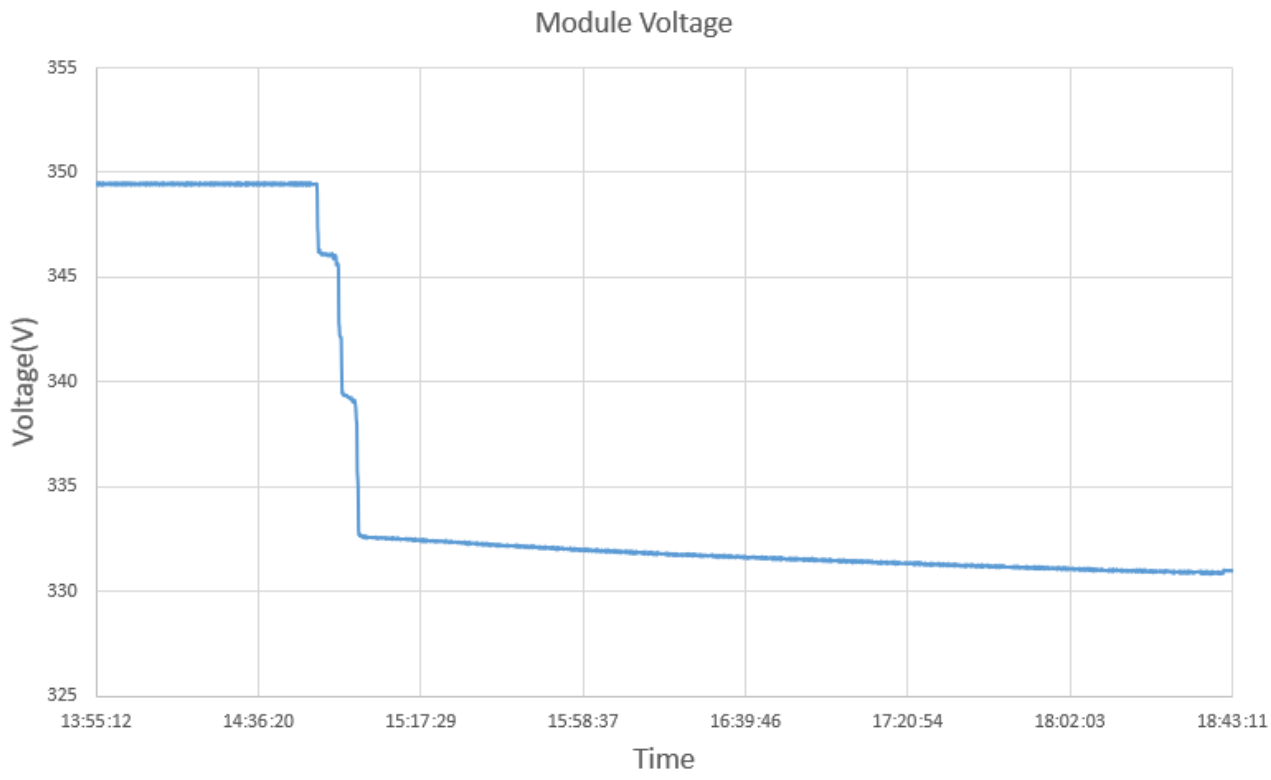


Figure 11. Module Voltage



Attachment D: Module Chemical Heat Release Rate and Smoke Release Rate

Smoke and Heat Release Rate		
Smoke Release Rate (SRR)	Maximum SRR(m^2/s)	1.020
	Total Smoke Released(m^2)	314.482
Heat Release Rate (HRR)	Peak Chemical HRR(kW)	No flaming observed
	Total Heat Release(MJ)	No flaming observed

Figure 12. SRR curve

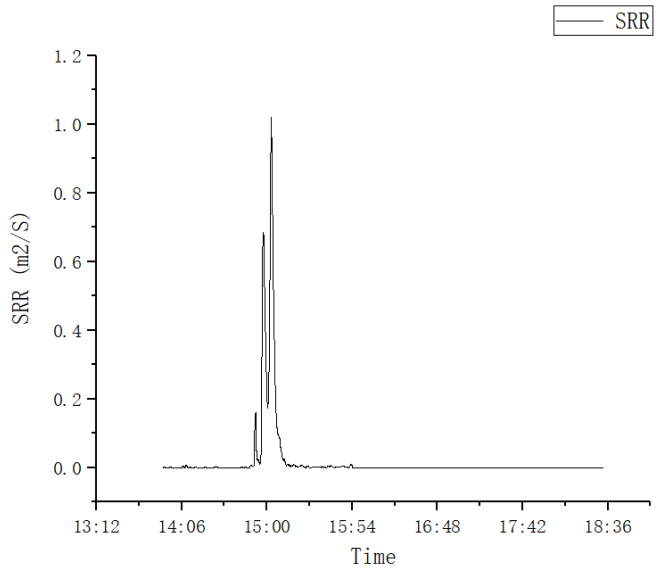
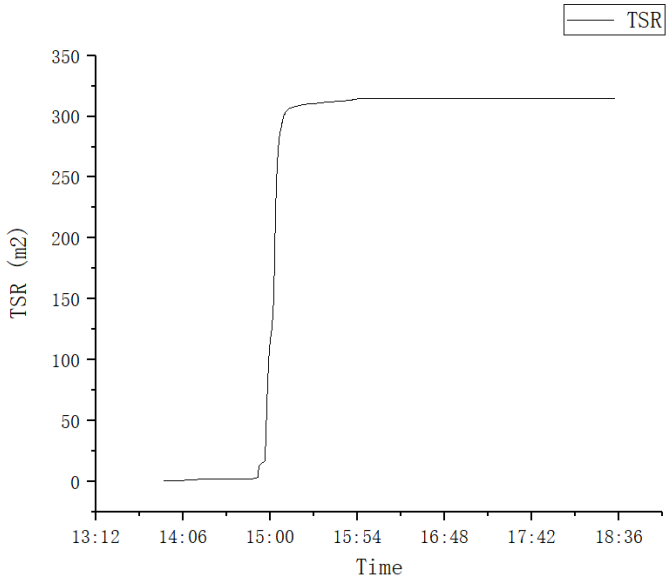


Figure 13. TSR curve



Attachment E: Flammable Gas Generation and Composition Data

Measurement Method	Gas Compound	Gas Type	Pre-Flaming (L)	Post-Flaming (L)
Flame ionization detection	Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	406.43	No flaming
Fourier-Transform infrared Spectrometer	Carbon Monoxide	Carbon Containing	103.79	No flaming
	Carbon Dioxide	Carbon Containing	445.65	No flaming
Solid-state Hydrogen Sensor	Hydrogen	Hydrogen	236.51	No flaming
Note: 1) The collection time is from 13:55 to 18:30.				

Measurement Method	Gas components		Total volume of gas (L)	
			Pre-Flaming	Post-Flaming
Fourier-Transform infrared Spectrometer	Methane	CH_4	88.34	No flaming
	Ethylene	C_2H_4	65.61	No flaming
	Ethane	C_2H_6	25.10	No flaming
	Propylene	C_3H_6	93.42	No flaming
	Propane	C_3H_8	22.66	No flaming
Note: 1) The collection time is from 13:55 to 18:30.				

Figure 14. Total Hydrocarbons

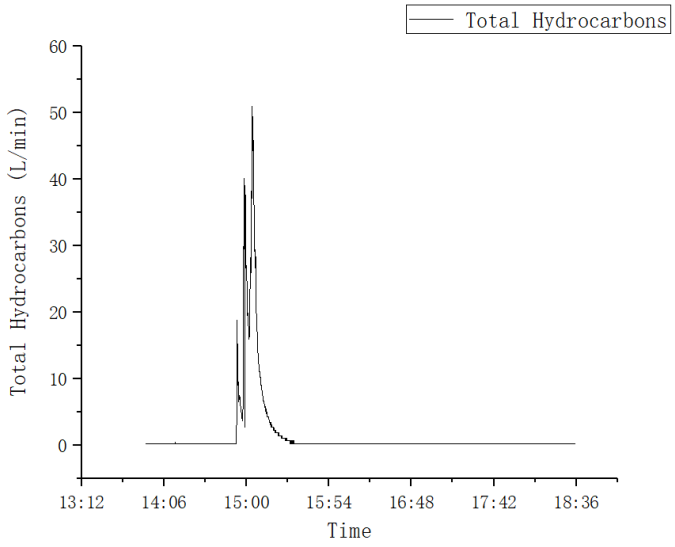


Figure 15. CO, CO_2 concentration

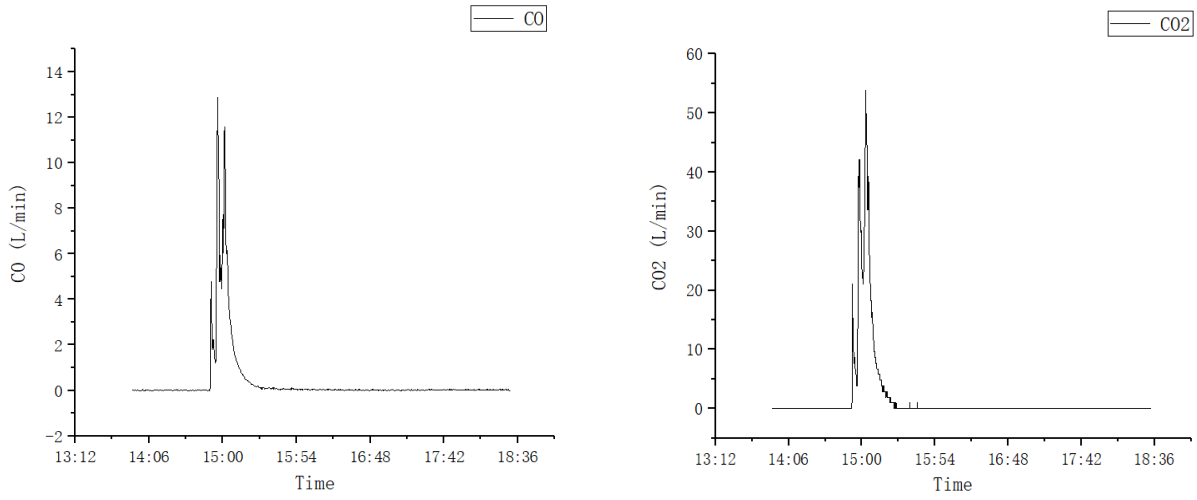


Figure 16. Hydrogen concentration

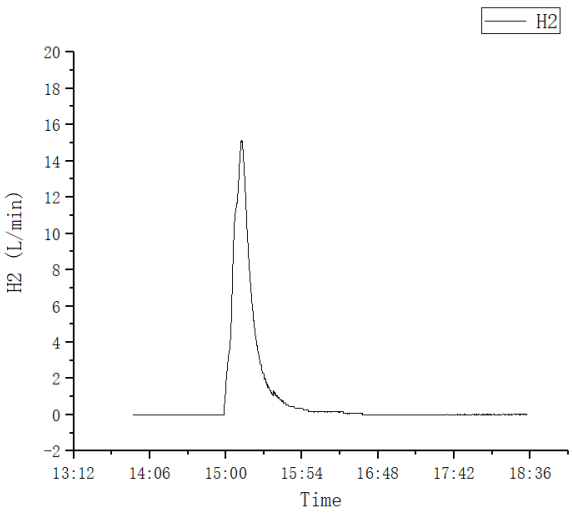
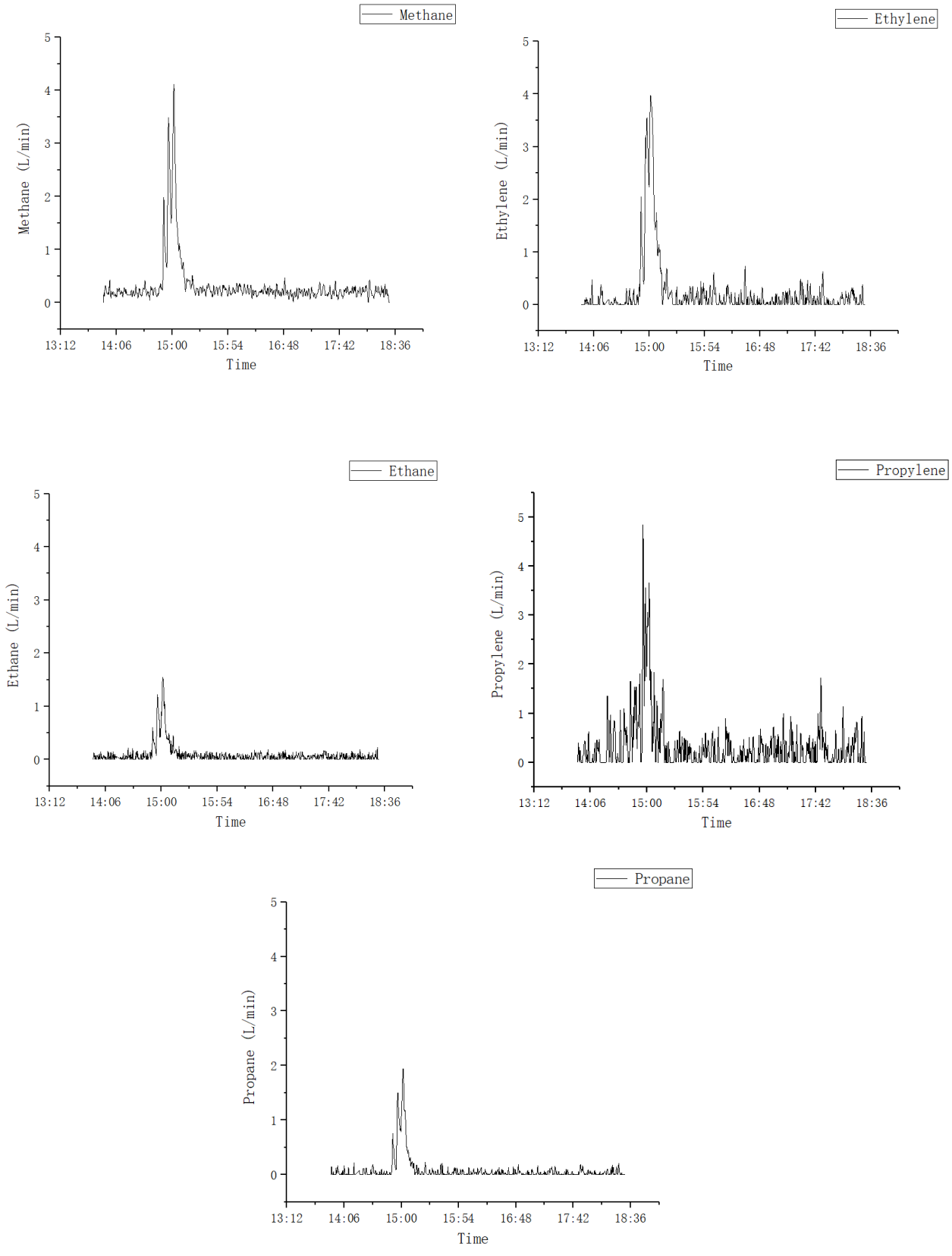


Figure 17. Hydrocarbon species



Attachment F: Sample Photos and Test Photos

Figure 18. Sample before test



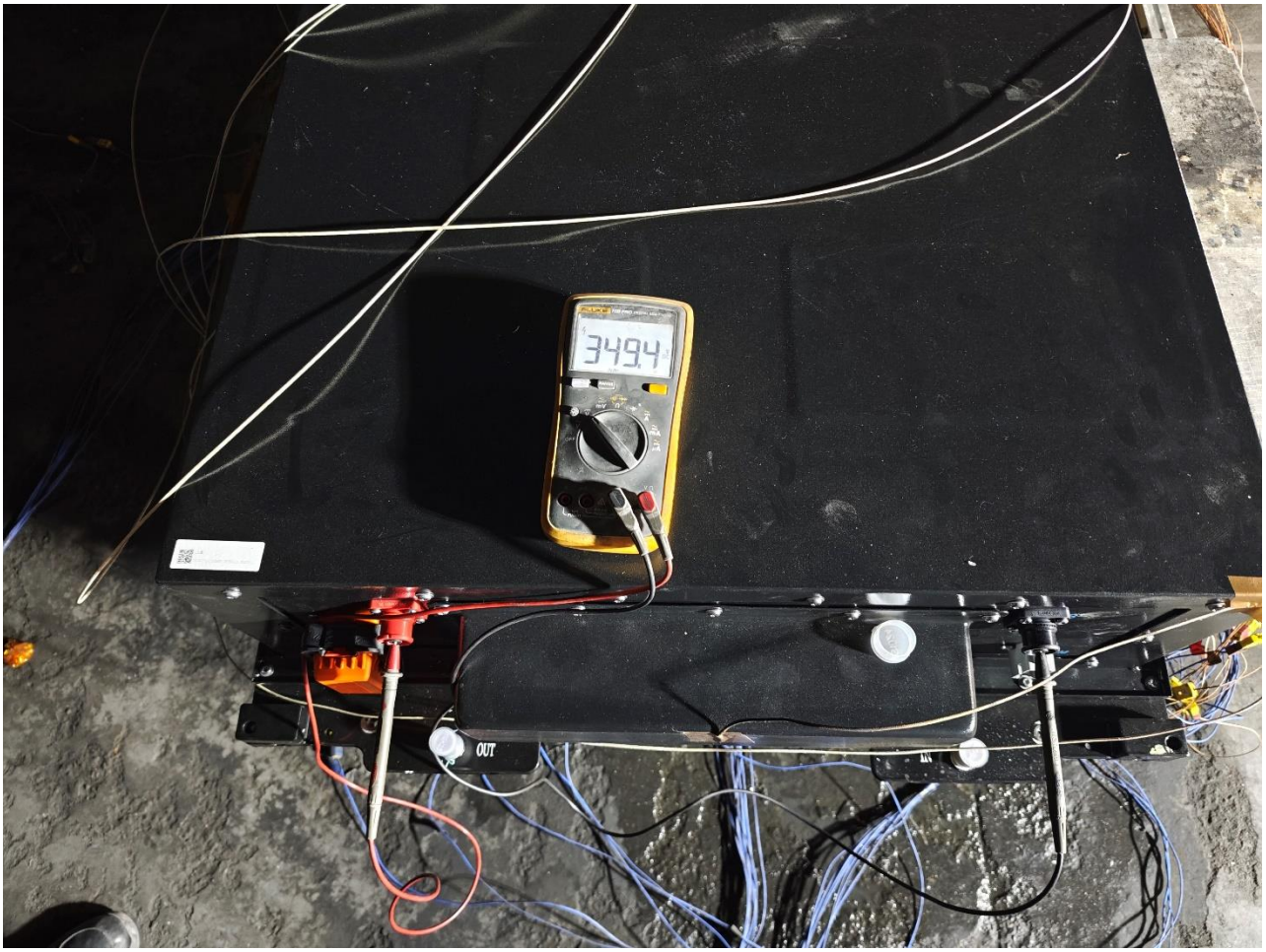
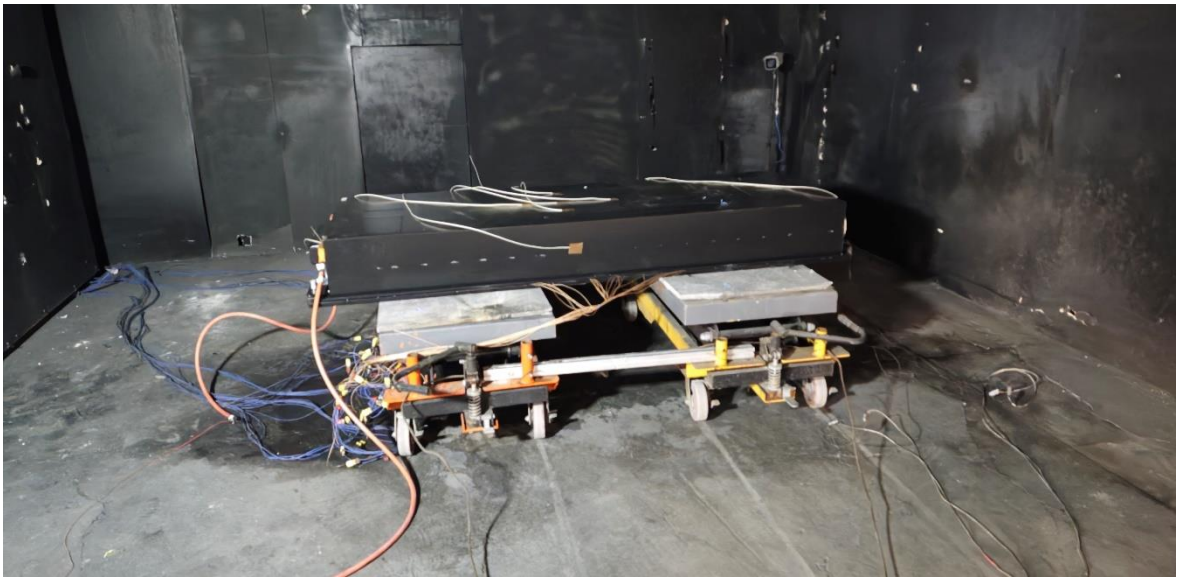


Figure 19. Test setup



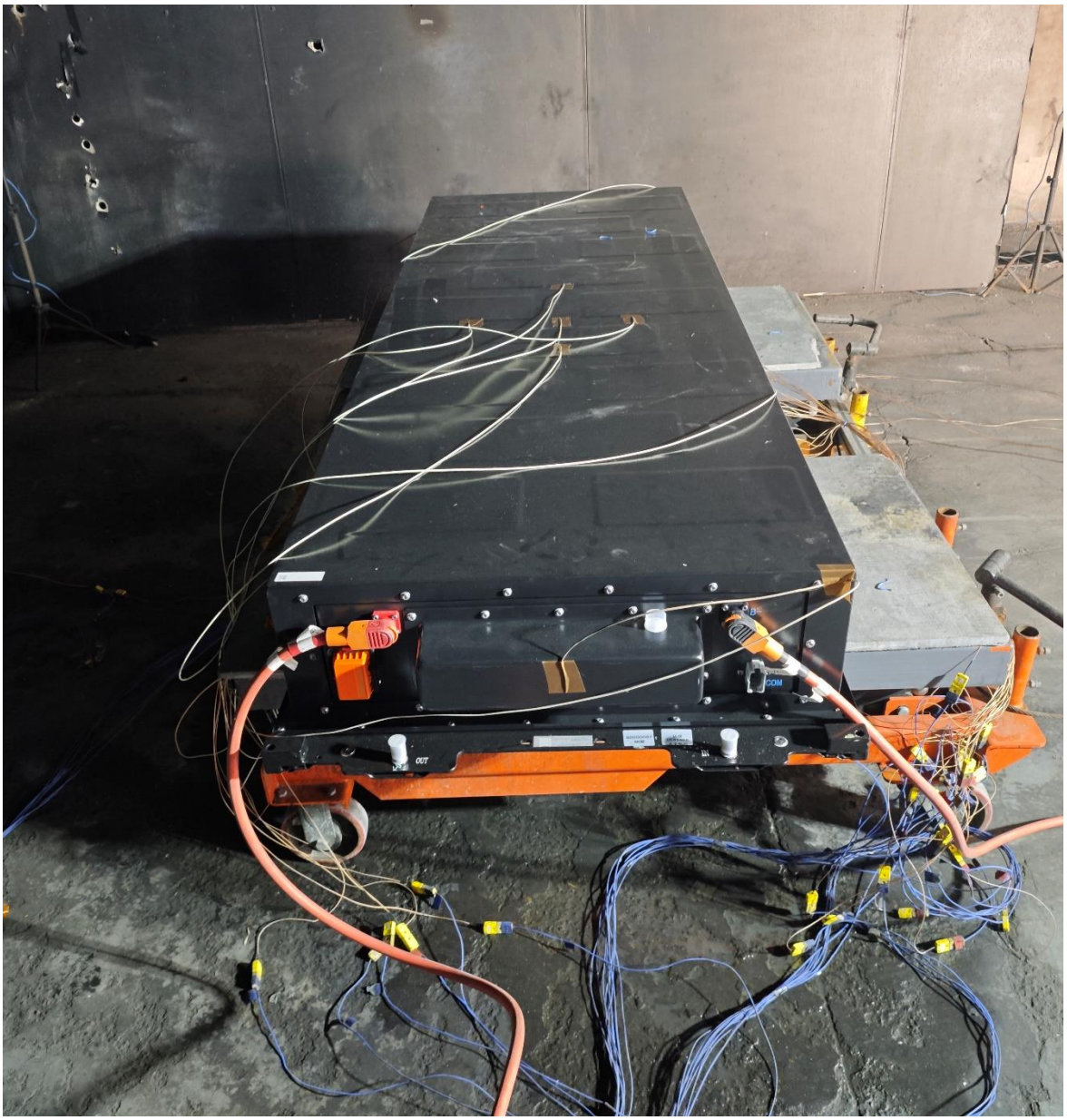
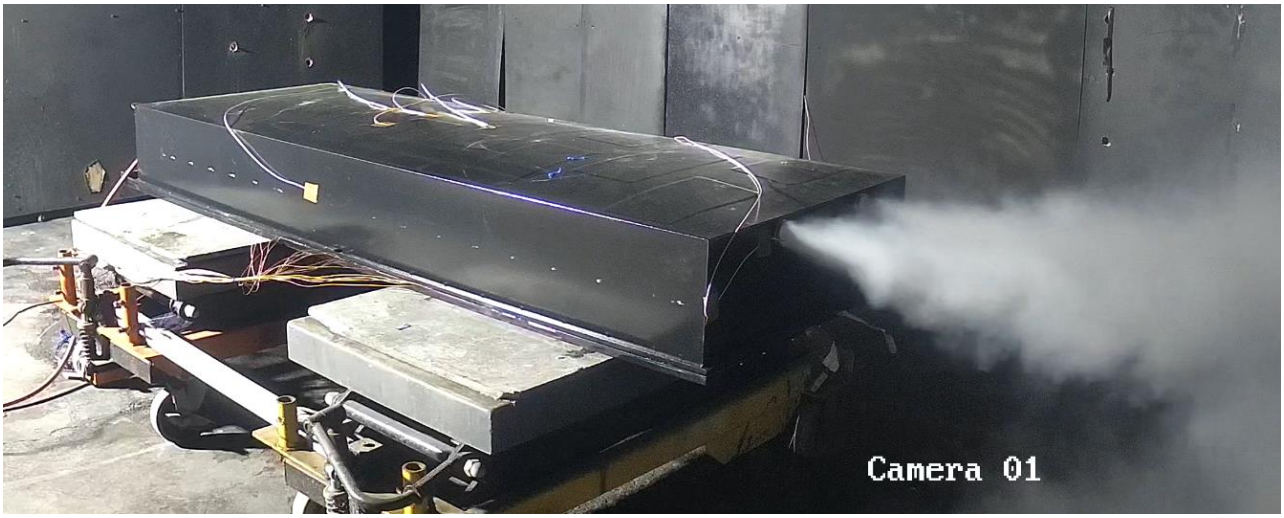
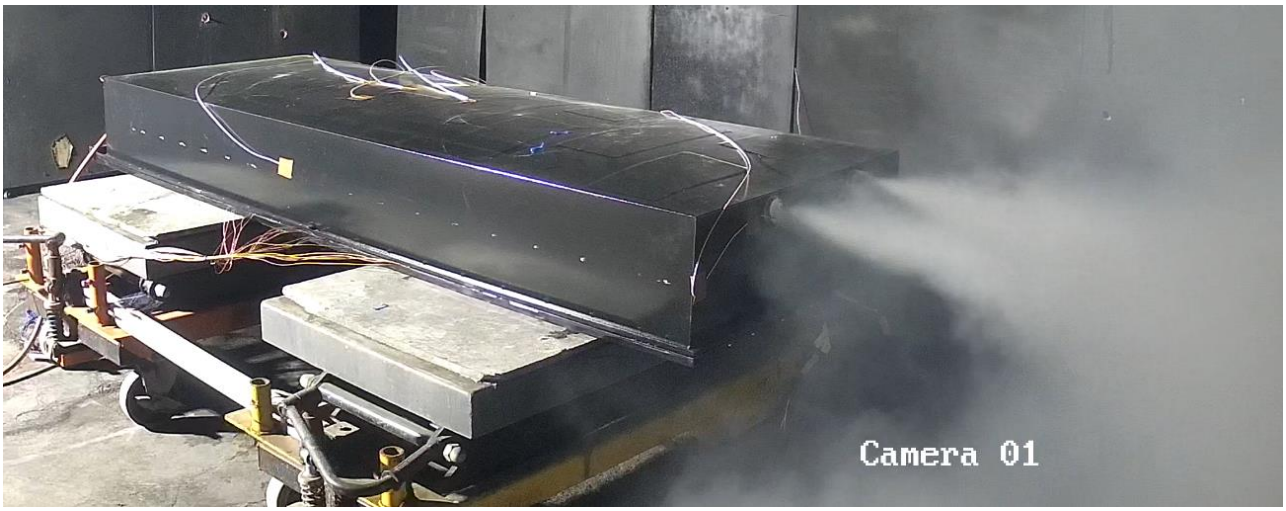


Figure 20. Smoke release during test





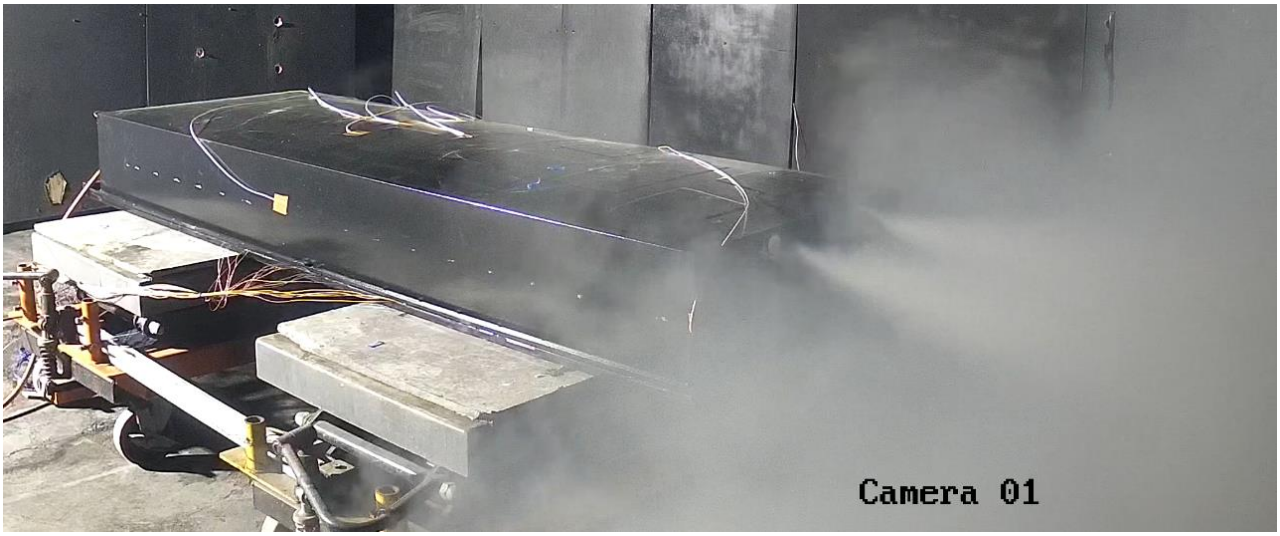
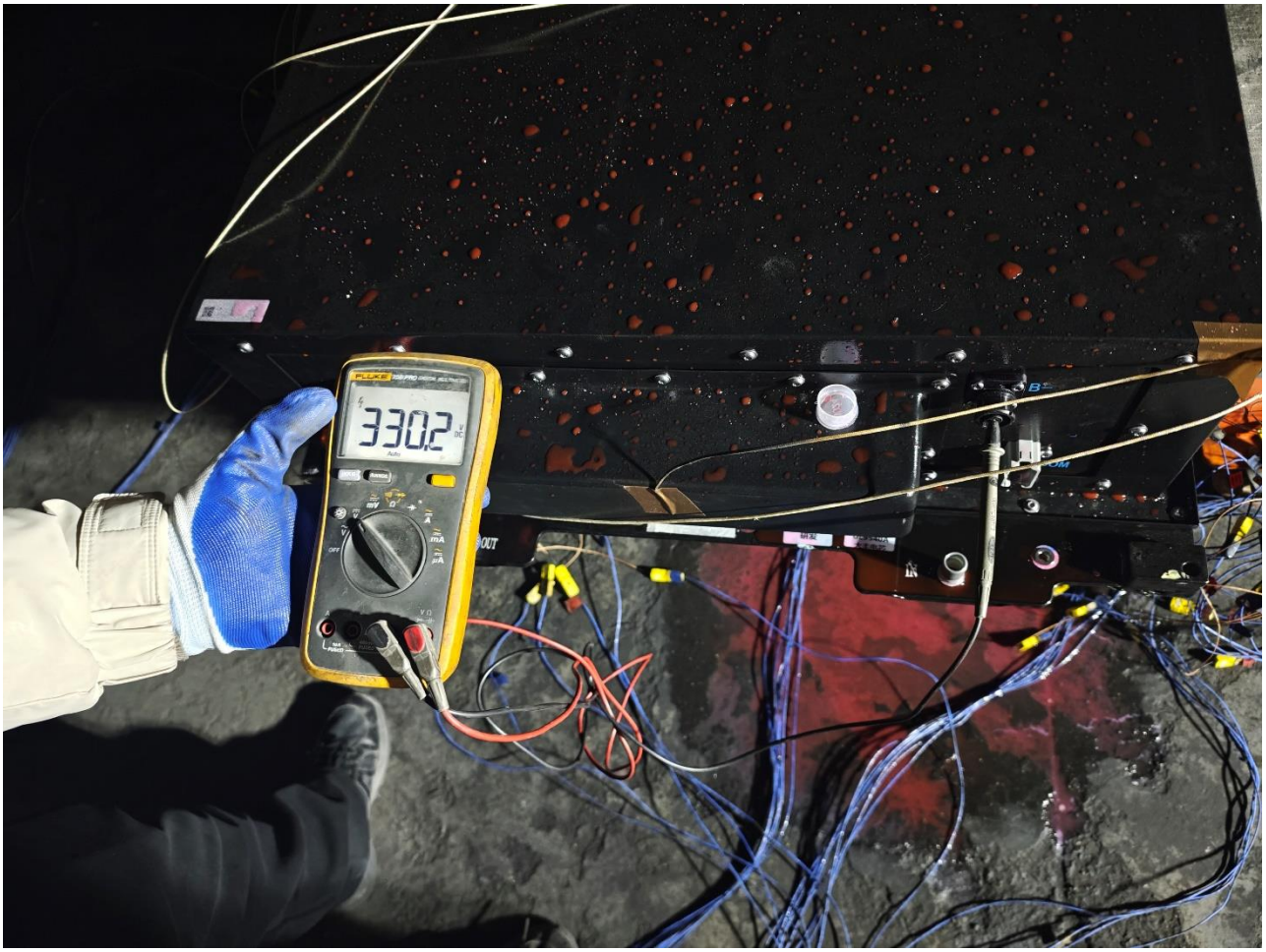


Figure 21. Sample after test













Attachment G: List of Test and Measurement Instruments

No.	Equipment	Model	Rating	Inventory no.	Cal. expire date
1	Ambient temperature and humidity	HWP01-10S	-30℃~50℃, 20%RH~100%RH	12005577	2025.2.2
2	Data acquisition equipment	DAQ970A	3-slot cardcage with 6½ digit (22 bit) internal DMM 0.004%, accuracy 0.06% Vac	TY2020000138	2025.2.2
3	Data acquisition equipment	TP700	Measuring range-60 ℃ to 1372 ℃ Measurement accuracy ± (0.05% rdg.+0.5℃) Display resolution0.01℃	TY2211000716-2	2025.2.2
4	Data acquisition equipment	TP700	Measuring range-60 ℃ to 1372 ℃ Measurement accuracy ± (0.05% rdg.+0.5℃) Display resolution0.01℃	TY2020000217	2025.2.2
5	Electronic scale	CHAOOU C1	0-500KG	65960494169	2025.2.2
6	Paramagnetic oxygen analyser	SERVOMEX4100	O2: paramagnetic sensor, range 0-25%, accuracy 0.02%, response time T90 < 7S	ZY2020000018-1	2025.2.6
7	Velocity probe	2671-25L-D-11-G2-E-N	4-20mA output, range 0-250pa, accuracy ± 1% F.S	ZY2020000018-2	2025.2.6
8	Photo detector	PDA36A2	Thorlabs optical receiver, wavelength range (350-1000) mm, gain adjustable, voltage output (0-10) V, instability < 0.1%	ZY2020000018-3	2025.2.2
9	Fourier-Transform Infrared Spectrometer	atmosFIR	Spectral scanning range: 485 - 7500cm-1; Spectral repeatability: < 0.1cm-1	ZY2020000018-5	2025.3.9

10	Non-dispersive infrared carbon dioxide and carbon monoxide sensor	SERVOMEX4100	CO2: infrared sensor, measuring range 0-10%, accuracy 1% F.S, response time T90 < 7S Co: infrared sensor, measuring range 0-1%, accuracy 1% F.S, response time T90 < 8s	ZY2020000018-4	2025.2.6
11	Palladium-nickel thin-film solid state sensor	MODEL 2000	Range: 0-2000ppm, temperature less than 100 C, -90~110kPa	ZY2021000210	2025.2.2
12	Flame ionization detector	3010	Accuracy: 2.0%	19937	2025.3.9
13	Heat flux measurement equipment	MW88-JTC08C	0 ~ ± 99999 w / m2, - 250 ~ 980 ℃, accuracy 5%, response time less than 0.1s,	ZY2020000010	2025.2.2
14	Thermopile	RS-WD-HW-1	0-200 ℃, 4-20mA, response speed < 0.15s	28348141942	2025.2.2

Attachment I: Revision Information

N/A

Prüfbericht-Nr.: *Test report no.*:	**CN25DK3S 001**	**Auftrags-Nr.:** *Order no.*:	326096320	Seite 1 von 46 *Page 1 of 46*
Kunden-Referenz-Nr.: *Client reference no.*:	2371109	**Auftragsdatum:** *Order date:*	2025-02-21	
Auftraggeber: *Client*:	CSI Energy Storage Co., Ltd. No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China			
Prüfgegenstand: *Test item*:	LFP Lithium Ion Energy Storage System			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	CSI-SolBank-R-418-2h-A, CSI-SolBank-R-418-4h-A			
Auftrags-Inhalt: *Order content*:	Test report			
Prüfgrundlage: *Test specification*:	UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems			

Wareneingangsdatum: *Date of sample receipt*:	2025-01-20
Prüfmuster-Nr.: *Test sample no:*	#2025012001
Prüfzeitraum: *Testing period*:	2025-01-21 - 2025-01-26
Ort der Prüfung: *Place of testing*:	See page 6 of main report
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result**:	See main report



geprüft von:
tested by: Minhao Hu

Datum:
Date: 2025-03-28

Minhao Hu

genehmigt von:
authorized by: Simon Wang

Ausstellungsdatum:
Issue date: 2025-03-28

Stellung / Position:	Project Engineer	**Stellung** / Position:	Authorizer

Sonstiges /
Other:

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery: Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Anforderungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditione n, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

TEST REPORT

ANSI/CAN/UL 9540A:2019
Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems

Report Number. .....:	CN25DK3S 001
Date of issue .....:	See cover page
Total number of pages.....:	See cover page
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.** No. 177, Lane 777, West Guangzhong Road, Jing'an District, Shanghai 200072, P. R. China
Applicant's name .....:	**CSI Energy Storage Co., Ltd.**
Address .....:	No. 348 Lushan Road, SND, Suzhou City, 215000 Jiangsu, P.R. China
Test specification:	
Standard.....:	ANSI/CAN/UL 9540A:2019
Test procedure .....:	TÜV Rheinland Test Report
Non-standard test method .....:	N/A
Test Report Form No. .....:	UL 9540A-C01
Test Report Form(s) Originator ....:	TÜV Rheinland (Shanghai) Co., Ltd.
Master TRF.....:	Dated 2023-12-25

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the TÜV Rheinland (Shanghai) Co., Ltd., responsible for this Test Report.

Other / Scope:

This report presents the result of unit level tests of UL 9540A: 2019.

All tests were conducted at TUV Rheinland (Shanghai) Co., Ltd. and TUV Rheinland's partner labs that were under supervision of TÜV Rheinland's engineer.

All tests were under supervision of TÜV Rheinland's engineer.

List of Attachments：

Attachment A: Diagrams of Setup for Unit Level Testing

Attachment B: Module Conditioning (Charge/Discharge) Profiles

Attachment C: Observations and Records

Attachment D: Module and Initiating Cell(s) Temperature Profiles during Testing

Attachment E: Smoke Release Rate, Chemical Heat Release Rate, Convective Heat Release Rate and Heat Flux

Attachment F: Flammable Gas Generation and Composition Data

Attachment G: Sample Photos and Test Photos

Attachment H: List of Test and Measurement Instruments

Attachment I: Revision Information

Summary of testing:

Model No. :	CSI-SolBank-R-418-2h-A
Ratings (Vdc, kWh) :	1331.2V, 418kWh
Cells in series/parallel :	(1P104S)4S
BESS dimensions (L x W x H (mm)) :	2180(L)×790(W)×248(H)×4
BESS weight (kg) :	2640
Maximum Target BESS Temperature (°C) :	21.3
Maximum Wall Surface Temperature (°C) :	70.7
BESS enclosure material :	No enclosure provided for BESS unit, racks are directly mounted on the container frames
BESS Intended Installation: **Non-residential:** outdoor ground mounted, indoor floor mounted, outdoor wall mounted, indoor wall mounted, roof top, open garage **Residential:** Outdoor ground mounted, indoor floor mounted, outdoor wall mounted, indoor wall mounted	Non-residential: indoor floor mounted in a container. For a container system BESS including those intended for outdoor installation only, the unit level test shall be in accordance with the indoor floor mounted unit level test using the battery system racks as the test units and with the test installation set up in accordance with the installation layout within the container. According to 9.1.2.1 from the CRD, it should be treated as indoor floor mounted application
Total number of cell(s) went into thermal runaway:	5
Thermal Runaway and Propagation :	3 initiating cells went into thermal runaway and propagated to 2 adjacent cells
Maximum Smoke Release Rate (m^2/s) :	0.89
Total Smoke Released (m^2) :	312.06
Total smoke released duration :	13:51 to 18:40
Peak Chemical Heat Release Rate (kW) :	No flaming occurred
Peak Convective Heat Release Rate (kW) :	No flaming occurred

Total Heat Release(kJ) :	No flaming occurred
External Flaming :	No external flaming occurred
Location(s) of Flame Venting :	No flaming occurred
Flying Debris :	No flying debris occurred
Re-ignitions :	No further re-ignitions were observed during post test observation

Summary of Unit level test Gas Analysis Data:

Gas Analysis:

Flame ionization detection	☒
Fourier-Transform infrared Spectrometer	☒
Hydrogen Sensor (palladium-nickel, thin-film solid state sensor)	☒
White light source with photo detector (smoke release rate)	☒

Unit level Gas Composition & Volume for Each Compound (Pre-flaming and After flame):

Gas Compound	Gas Type	Pre-Flaming(L)	Post-Flaming(L)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	449.50	No flaming
Carbon Monoxide	Carbon Containing	113.02	No flaming
Carbon Dioxide	Carbon Containing	482.91	No flaming
Hydrogen	Hydrogen	262.54	No flaming
Note: 1) The collection time is from 13:51 to 18:40. 2) See Attachment F for detail gas analysis data.			

Summary of BESS Unit Test Results

Performance Criteria in accordance with Table 9.1 for Indoor Floor Mounted non-residential unit

Flaming outside the initiating BESS unit was not observed;	☒
Surface temperatures of modules within the target BESS units adjacent to the initiating BESS unit did not exceed the temperature at which thermally initiated cell venting occurs, as determined in 7.3.1.8;	☒
For BESS units intended for installation in locations with combustible constructions, surface temperature measurements on wall surfaces did not exceed 97°C (175°F) of temperature rise above ambient per 9.2.15;	☒
Explosion hazards were not observed, including deflagration, detonation; and	☒
Heat flux in the center of the accessible means of egress did not exceed 1.3 kW/m^2.	☒

Necessity for an Installation level test

The performance criteria of the unit level test as indicated in Table 9.1 of UL 9540A 4th edition has not been met, therefore an installation level testing in accordance with UL 9540A will need to be conducted on the representative the installation with this unit installed.	☐
The performance criteria of the unit level tests as indicated in Table 9.1 of UL 9540A 4th edition has been met, therefore an installation level testing in accordance with UL 9540A need not be conducted	☒

Tests performed (name of test and test clause): UL 9540A cl 9. Unit Level	**Testing location:** HangZhou ZhongChuan Fire Quitpment Co., Ltd. No.8, Village 006, Quantou Village, Lankao County, Kaifeng city, Henan Province

Possible test case verdicts:

- test case does not apply to the test object ... : N/A

- test object does meet the requirement ..... : P (Pass)

- test object does not meet the requirement ... : F (Fail)

Testing:

Date of receipt of test item ..... : 2025-01-20

Date (s) of performance of tests..... : 2025-01-21~2025-01-26

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Name and address of factory (ies)..... : Same as applicant

Other:
N/A

UL 9540A testing information:

Cell level information	
Manufacturer :	CSI Energy Storage Co., Ltd.
Model number :	CSI314
Chemistry :	$LiFePO_4$
Physical configuration :	Prismatic
Electrical rating :	Rated capacity: 314 Ah
	Nominal voltage: 3.2 V
Compliance with UL1973 ..... :	☒ Yes Report No. CN24XEVJ 001 Cert. No. CU 72405509 0001 ☐ No
UL 9540A cell test report number ..... :	CN243TAR 001
Average cell surface temperature at gas venting :	167.4 °C
Average cell surface temperature at thermal runaway :	238.5 °C
Gas Volume:	180.7 L
Lower flammability limit (LFL), % volume in air at the ambient temperature:	8.3%
Lower flammability limits (LFL), % volume in air at the venting temperature:	7.3%
Burning velocity (Su):	0.973 m/s
Maximum pressure (Pmax):	0.760 MPa

Cell level Gas Composition:

Gas component		Concentration % (v/v)
Methane	CH_4	4.495
Acetylene	C_2H_2	0.157
Ethylene	C_2H_4	2.299
Ethane	C_2H_6	0.729
Propyne	C_3H_4	0.012
Propylene	C_3H_6	0.952
Propane	C_3H_8	0.211
Butylene	C_4H_8	0.616
Butane	C_4H_{10}	0.080

Hydrogen	H_2	49.725
Carbon Monoxide	CO	13.898
Carbon Dioxide	CO_2	26.826
Total	-	100

Module Level Information	
Model No:	CSI-SolBank-P-104.5-2h-A
Ratings (Vdc, kWh) :	332.8V, 104.5kWh
Cells in series/parallel:	1P104S
Module dimensions (W x D x H (mm)) :	2180±5mm(L)×790±3mm(W)×248±5mm(H)
Module weight (kgs) :	670±15kg
Module enclosure material:	Metal enclosure with metal cover
UL 9540A module test report:	CN25HYJ6 001
Total number of cell(s) went into thermal runaway:	5
Thermal Runaway Propagation:	3 initiating cells went into thermal runaway and propagated to 2 adjacent cells
Maximum Smoke Release Rate (m^2/s)	1.020
Total Smoke Released: (m^2)	314.482
Peak Chemical Heat Release Rate: (kW):	No flaming occurred
External Flaming:	No external flaming occurred
Location(s) of Flame Venting:	No flaming occurred
Flying Debris:	No flying debris occurred
Re-ignitions:	No further re-ignitions were observed during post test observation

Gas Composition & Volume for Each Compound (Pre-flaming and After flame):

Gas Compound	Gas Type	Pre-Flaming (L)	Post-Flaming (L)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	406.43	No flaming
Carbon Monoxide	Carbon Containing	103.79	No flaming
Carbon Dioxide	Carbon Containing	445.65	No flaming
Hydrogen	Hydrogen	236.51	No flaming

General product information

Photo of Battery system:

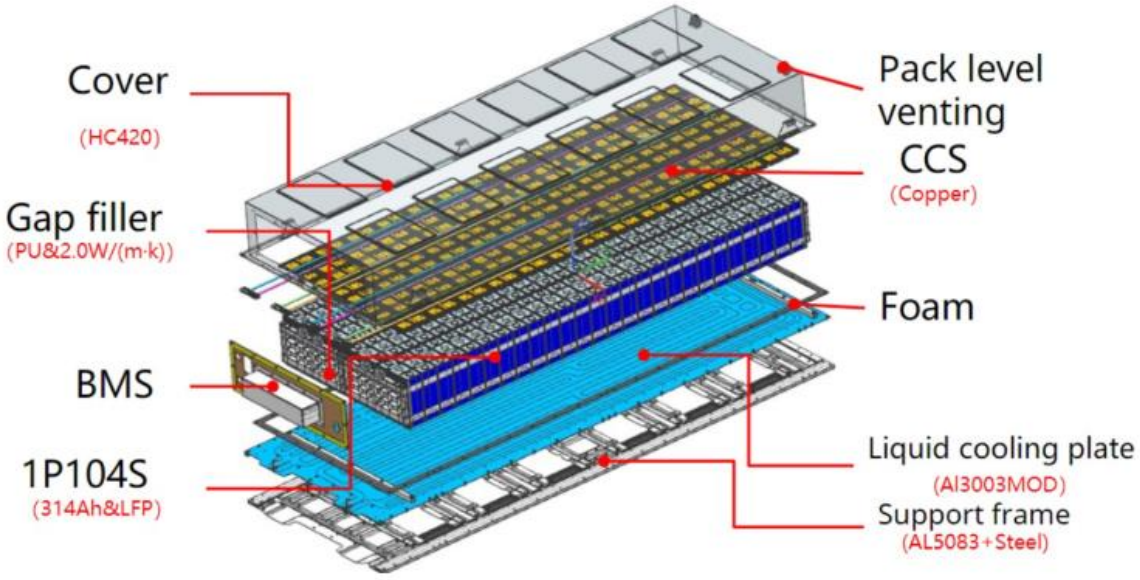


	Battery rack	Battery rack
Product	LFP Lithium Ion Energy Storage System	LFP Lithium Ion Energy Storage System
Type/model	CSI-SolBank-R-418-2h-A	CSI-SolBank-R-418-4h-A
Cell Capacity [Ah]	314	314
Cell Quantity	416	416
Battery structure	(104)4S	(104)4S

Nominal voltage [V]	1331.2	1331.2
Rated capacity [kWh]	418	418
Upper limit charging voltage [V]	1497.6	1497.6
Maximum charging power[kW]	208	104
Maximum discharging power[kW]	208	104
Over charge protective voltage [V]	1518.4	1518.4
Cut-off voltage [V]	1060.8	1060.8
Temperature range for charging [°C]	0°C to 55°C (Environment)	0°C to 55°C (Environment)
Temperature range for discharging [°C]	0°C to 55°C (Environment)	0°C to 55°C (Environment)
Temperature threshold for protection	Low temperature of battery:5°C High temperature of battery:45°C Battery temperature difference: 15°C	Low temperature of battery:5°C High temperature of battery:45°C Battery temperature difference: 15°C
Recommend charging method by manufacturer	208 kW CP 2h	104 kW CP 4h
Dimension [mm]	2180(L)×790(W)×248(H)×4	2180(L)×790(W)×248(H)×4
Weight [kg]	2640	2640
Cooling type	Liquid cooling and liquid heating for cell	Liquid cooling and liquid heating for cell
Altitude	3000m	3000m

Module Construction

Figure 1. Layout of the battery system contents



Diagrams of setup for battery system testing

Figure 2. Thermocouples (no. xx) locations of initiating cell

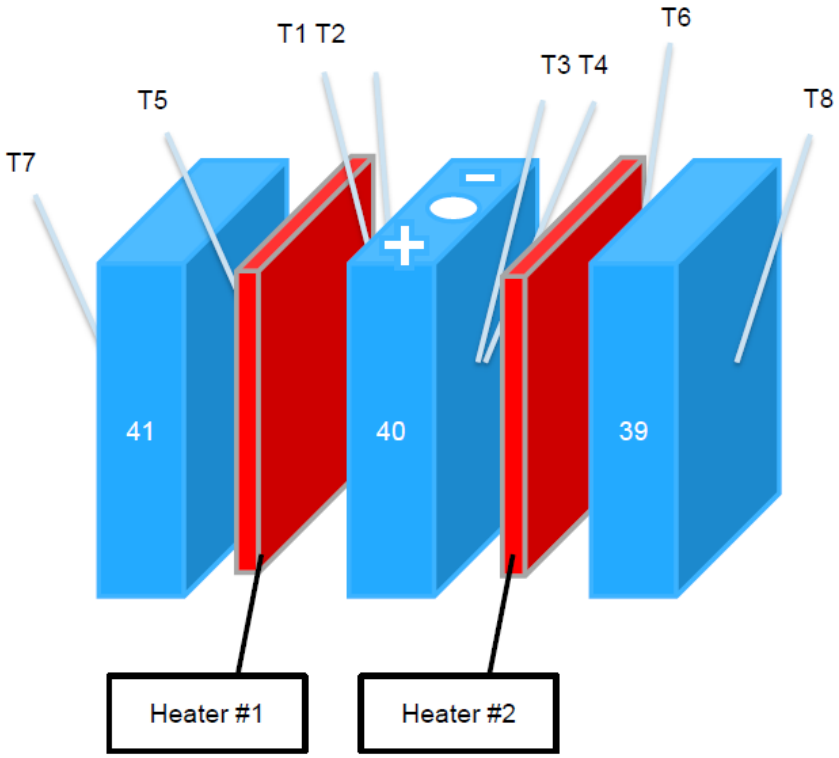


Figure 3. Cell numbering, heater location and thermocouples (no. xx) locations inside the sub-module

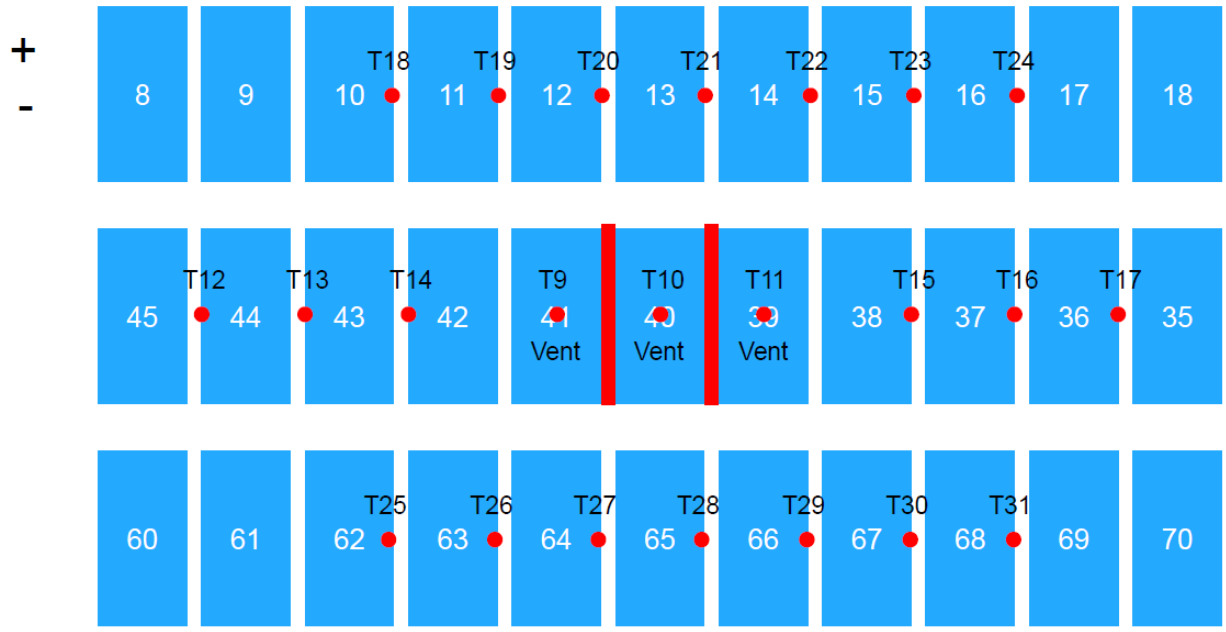
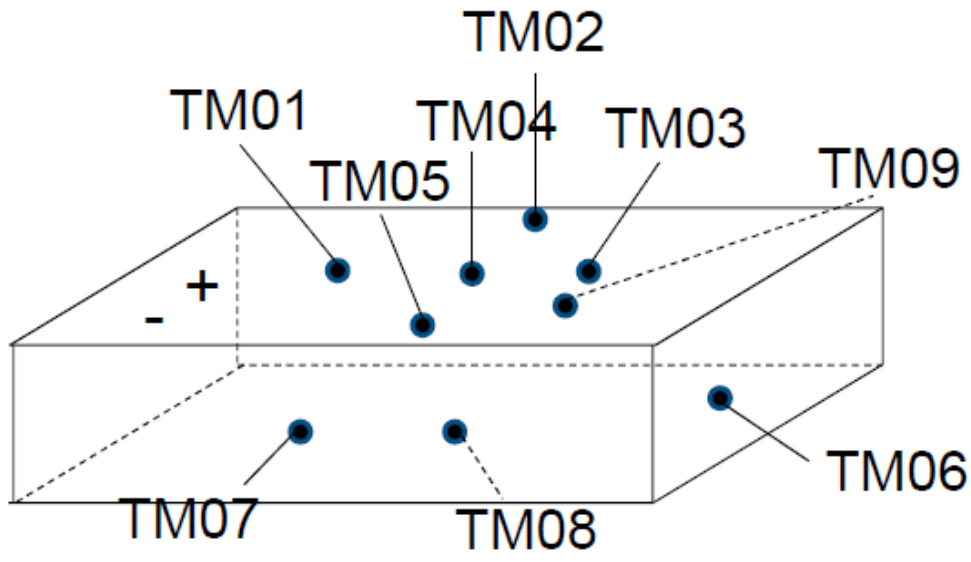


Figure 4. Thermocouples' locations outside module



ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
CONSTRUCTION			--
5	**General**		--
5.1	**Cell**		P
5.1.1	The cells associated with the BESS that were tested shall be documented in the test report	Accepted test report by TUV Rheinland, test report: CN243TAR 001	P
5.1.2	The cell documentation included in the test report shall indicate if the cells associated with the BESS comply with UL 1973		P
5.1.3	Refer to 7.6.1 for further details		N/A
5.2	**Module**		P
5.2.1	The modules associated with the BESS that were tested shall be documented in the test report	See Product Specification on Page 8	P
5.2.2	The module documentation included in the test report shall indicate if the modules associated with the BESS comply with UL 1973	Test with unit	N/A
5.2.3	Refer to 8.3 for further details		N/A
5.3	**Battery energy storage system unit**	DUT complied with UL1973	P
5.3.1	The BESS unit documentation included in the test report shall indicate the units that comply with UL 9540		N/A
5.3.2	For BESS units for which UL 9540 compliance cannot be determined, the documentation included in the test report shall include the number of modules in the BESS, electrical configuration of the module, and physical layout of the modules in the BESS, battery management system (BMS) and other major components of the BESS. It shall be documented as to whether the battery system complies with UL 1973 in addition to the overall BESS compliance to UL 9540.	DUT complied with UL1973	P
5.3.3	If applicable, the details of any fire detection and suppression systems that are an integral part of the BESS shall be noted in the test report		N/A
5.3.4	Refer to 9.7 for further details		P
5.4	**Flow Batteries**	Not applicable for lithium product.	N/A
5.4.1	For flow batteries, the report will cover the chemistry, as well as the electrical rating in capacity and nominal voltage of the cell stack		N/A
5.4.2	The flow battery documentation included in the test report shall indicate if the flow battery system complies with UL 1973		N/A
5.4.3	See 7.6.2 for further details		N/A
PERFORMANCE			--

ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
6	**General**		--
6.1	The tests in this standard are extreme abuse conditions conducted on electrochemical energy storage devices that can result in fires, explosions, smoke, off gassing of flammable and toxic materials, exposure to toxic and corrosive liquids, and potential exposure to hazardous voltages and electrical energy. See Annex B for recommended testing practices.		P
6.2	At the conclusion of testing, samples shall be discharged in accordance with the manufacturer's specifications		P
9	**Unit Level**		--
9.1	**Sample and test configuration**		P
9.1.1	The unit level test shall be conducted with BESS units installed as described in the manufacturer's instructions and this section. Test configurations include the following:	Applied a). Indoor floor mounted unit level for the outdoor ground mounted non-residential use BESS.	P
	a) Indoor floor mounted non-residential use BESS; b) Indoor floor mounted residential use BESS; c) Outdoor ground mounted non-residential use BESS; d) Outdoor ground mounted residential use BESS; e) Indoor wall mounted non-residential use BESS; f) Indoor wall mounted residential use BESS; g) Outdoor wall mounted non-residential use BESS; h) Outdoor wall mounted residential use BESS; and i) Rooftop and open garage non-residential use BESS installations.	For a container system BESS including those intended for outdoor installation only, the unit level test shall be in accordance with the indoor floor mounted unit level test using the battery system racks as the test units and with the test installation set up in accordance with the installation layout within the container.	P
9.1.2	The unit level test requires one initiating BESS unit in which an internal fire condition in accordance with the module level test is initiated and target adjacent BESS units representative of an installation	See figure 5-11 for test installations	P
	Exception: Testing can be conducted outdoors for outdoor only installations if there are the following controls and environmental conditions in place:	Indoor floor mounted unit level testing method	N/A
	a) Wind screens are utilized with a maximum wind speed maintained at ≤ 12 mph; b) The temperature range is within 10°C to 40°C (50°F to 104°F); c) The humidity is < 90% RH; d) There is sufficient light to observe the testing; e) There is no precipitation during the testing; f) There is control of vegetation and combustibles in the test area to prevent any impact on the testing and to prevent inadvertent fire spread from the test area; g) There are protection mechanisms in place to prevent inadvertent access by unauthorized persons in the test area and to prevent exposure of persons to any hazards as a result of testing.		N/A

ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
9.1.3	Depending upon the configuration and design of the BESS (e.g. the BESS is composed of multiple separate parts within separate enclosures), this testing to determine fire characterization can be done at the battery system level	Testing at battery rack level	P
9.1.4	The initiating BESS unit shall contain components representative of a BESS unit in a complete installation.		P
9.1.5	Target BESS units shall include the outer cabinet (if part of the design), racking, module enclosures, and components		P
9.1.6	The initiating BESS unit shall be at the maximum operating state of charge (MOSOC),	100% SOC	P
9.1.7	If a BESS unit includes an integral fire suppression system, there is an option of providing this with the DUT	No integral fire suppression system	N/A
9.1.8	Electronics and software controls such as the battery management system (BMS) in the BESS are not relied upon for this testing.		P
9.2	**Test method – Indoor floor mounted BESS units**		P
9.2.1	Samples and test configurations are in accordance with 9.1.	Indoor floor mounted	P
9.2.2	Any access door(s) or panels on the initiating BESS unit and adjacent target BESS units shall be closed,		P
9.2.3	The initiating BESS unit shall be positioned adjacent to two instrumented wall sections	See figure 5	P
9.2.4	Instrumented wall sections shall extend not less than 0.49 m (1.6 ft) horizontally beyond the exterior of the target BESS units.		P
9.2.5	Instrumented wall sections shall be at least 0.61-m (2-ft) taller than the BESS unit height		P
9.2.6	The surface of the instrumented wall sections shall be covered with 16-mm (5/8-in) gypsum wall board and painted flat black		P
9.2.7	The initiating BESS unit shall be centered underneath an appropriately sized smoke collection hood of an oxygen consumption calorimeter		P
9.2.8	The light transmission in the calorimeter's exhaust duct shall be measured using a white light source and photo detector for the duration of the test		P
9.2.9	The chemical and convective heat release rates shall be measured for the duration of the test, using the methodologies specified in 8.2.11 and 9.2.12, respectively	See attachment E	P
9.2.10	With reference to 9.2.9, the heat release rate measurement system shall be calibrated	See attachment E	P
9.2.11	With reference to 9.2.9, the convective heat release rate shall be measured using thermopile	See attachment E	P
9.2.12	With reference to 9.2.9, the convective heat release rate shall be calculated using the following equation: $HRR_c = V_e A \frac{353.22}{T_e} \int_{T_o}^{T} C_p dT$		P

ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
9.2.13	The physical spacing between BESS units (both initiating and target) and adjacent walls shall be representative of the intended installation	The test installation set up in accordance with the installation layout within the container.	P
9.2.14	Separation distances shall be specified by the manufacturer for distance between:		P
	a) The BESS units and the instrumented wall sections; and b) Adjacent BESS units.	See figure 5	P
9.2.15	Wall surface temperature measurements shall be collected for BESS intended for installation in locations with combustible construction.		P
9.2.16	Wall surface temperatures shall be measured in vertical array(s) at 152-mm (6-in) intervals for the full height of the instrumented wall sections using No. 24-gauge or smaller,		P
9.2.17	Thermocouples shall be secured to gypsum surfaces by the use of staples placed over the insulated portion of the wires		P
9.2.18	Heat flux shall be measured with the sensing element of at least two water-cooled Schmidt-Boelter gauges at the surface of each instrumented wall:		P
	a) Both are collinear with the vertical thermocouple array;		P
	b) One is positioned at the elevation estimated to receive the greatest heat flux due to the thermal runaway of the initiating module; and		P
	c) One is positioned at the elevation estimated to receive the greatest heat flux during potential propagation of thermal runaway within the initiating BESS unit.		P
9.2.19	Heat flux shall be measured with the sensing element of at least two water-cooled Schmidt-Boelter gauges at the surface of each adjacent target BESS unit that faces the initiating BESS unit:		P
	a) One is positioned at the elevation estimated to receive the greatest heat flux due to the thermal runaway of the initiating module within the initiating BESS; and		P
	b) One is positioned at the elevation estimated to receive the greatest surface heat flux due to the thermal runaway of the initiating BESS.		P
9.2.20	For non-residential use BESS, heat flux shall be measured with the sensing element of at least one water-cooled Schmidt-Boelter gauge		P
9.2.21	No. 24-gauge or smaller, Type-K exposed junction thermocouples shall be installed to measure the temperature of the surface		P
9.2.22	For residential use BESS, the DUT shall be covered with a single layer of cheese cloth	Non-residential	N/A
9.2.23	An internal fire condition in accordance with the module level test shall be created within a single module in the initiating BESS unit:		P

ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	a) The position of the module shall be selected to present the greatest thermal exposure		P
	b) The setup (i.e. type, quantity and positioning) of equipment for initiating thermal runaway in the module shall be the same as that used to initiate and propagate thermal runaway within the module level test	Same as module level test	P
9.2.24	The composition, velocity and temperature of the initiating BESS unit vent gases shall be measured within the calorimeter's exhaust duct		P
9.2.25	The hydrocarbon content of the vent gas shall be measured using flame ionization detection		P
9.2.26	The test shall be terminated if:		P
	a) Temperatures measured inside each module within the initiating BESS unit return to ambient temperature;	Applicable	P
	b) The fire propagates to adjacent units or to adjacent walls; or		N/A
	c) A condition hazardous to test staff or the test facility requires mitigation		N/A
9.2.27	For residential use systems, the gas collection data gathered in 9.2 shall be compared to the smallest room installation	Non-residential	N/A
9.3	**Test method – Outdoor ground mounted units**		N/A
9.4	**Test Method – Indoor wall mounted units**		N/A
9.5	**Test Method – Outdoor wall mounted units**		N/A
9.6	**Rooftop and open garage installations**		N/A
9.7	**Unit level test report**		P
9.7.1	The report on the unit level testing shall identify the type of installation being tested, as follows:		P
	a) Indoor floor mounted non-residential use BESS; b) Indoor floor mounted residential use BESS; c) Outdoor ground mounted non-residential use BESS; d) Outdoor ground mounted residential use BESS; e) Indoor wall mounted non-residential use BESS f) Indoor wall mounted residential use BESS; g) Outdoor wall mounted non-residential use BESS; h) Outdoor wall mounted residential use BESS; i) Rooftop installed non-residential use BESS; or j) Open garage installed non-residential use BESS.	Indoor floor mounted non-residential use BESS.	P
9.7.2	With reference to 9.7.1, if testing is intended to represent more than one installation type, this shall be noted in the report	One installation type	N/A
9.7.3	The report shall include the following, as applicable:		P
	a) Unit manufacturer name and model number (and whether UL 9540 compliant);	See the summary of this report	P
	b) Number of modules in the initiating BESS unit;	See figure 6	P
	c) The construction of the initiating BESS unit per 5.3;	See figure 6	P

ANSI/CAN/UL 9540A:2019			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	d) Fire protection features/detection/suppression systems within unit;		N/A
	e) Module voltage(s) corresponding to the tested SOC;	See Attachment C	P
	f) The thermal runaway initiation method used;	External heater	P
	g) Location of the initiating module within the BESS unit;	See figure 6	P
	h) Diagram and dimensions of the test setup including mounting location of the initiating and target BESS units, and the locations of walls, ceilings, and soffits;	See figure 5	P
	i) Observation of any flaming outside the initiating BESS enclosure and the maximum flame extension;	See Attachment C	P
	j) Chemical and convective heat release rate versus time data;	See Attachment E	P
	k) Separation distances from the initiating BESS unit to target walls (e. g. distances A and C in Figure 9.1);	See figure 5	P
	l) Separation distances from the initiating BESS unit to target BESS units (e.g. distances D and H in Figure 9.1);	See figure 5	P
	m) The maximum wall surface and target BESS temperatures achieved during the test and the location of the measuring thermocouple;	See Attachment D	P
	n) The maximum ceiling or soffit surface temperatures achieved during the indoor or outdoor wall mounted test and the location of the measuring thermocouple;		N/A
	o) The maximum incident heat flux on target wall surfaces and target BESS units;	See Attachment E	P
	p) The maximum incident heat flux on target ceiling or soffit surfaces achieved during the indoor or outdoor wall mounted test;		N/A
	q) Gas generation and composition data;	See Attachment F	P
	r) Peak smoke release rate and total smoke release data;	See Attachment E	P
	s) Indication of the activation of integral fire protection systems and if activated the time into the test at which activation occurred;		N/A
	t) Observation of flying debris or explosive discharge of gases;	See Attachment C	P
	u) Observation of re-ignition(s) from thermal runaway events;	See Attachment C	P
	v) Observation(s) of sparks, electrical arcs, or other electrical events;	See Attachment C	P
	w) Observations of the damage to: 1) The initiating BESS unit; 2) Target BESS units; 3) Adjacent walls, ceilings, or soffits; and	See Attachment C	P
	x) Photos and video of the test.	Recorded	P
9.8	**Performance at unit level testing**		P

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
9.8.1	Installation level testing in Section 10 is not required if the following performance conditions outlined in Table 9.1 are met during the unit level test.	Installation level testing is not required according to the performance conditions.	P
	a) Flaming outside the initiating BESS unit is not observed;	No flaming observed	P
	b) Surface temperatures of modules within the target BESS units adjacent to the initiating BESS unit do not exceed the temperature at which thermally initiated cell venting occurs, as determined in 7.3.1.8;	Max. Temperature during the test: 21.3 °C Criteria Temperature: 167.4 °C	P
	c) For BESS units intended for installation in locations with combustible constructions, surface temperature measurements on wall surfaces do not exceed 97°C (175°F) of temperature rise above ambient per 9.2.15;	Max. Temperature during the test: 70.7 °C Criteria Temperature: 113.2 °C	P
	d) Explosion hazards are not observed, including deflagration, detonation or accumulation (to within the flammability limits in an amount that can cause a deflagration) of battery vent gases; and	No explosion observed	P
	e) Heat flux in the center of the accessible means of egress[2)] shall not exceed 1.3 kW/m2.		P

--End of report--

Attachment A: Diagrams of Setup for Unit Level Testing

Diagrams of setup for unit level testing

Figure 5. Test site setup diagram with separation distance. (Top view)

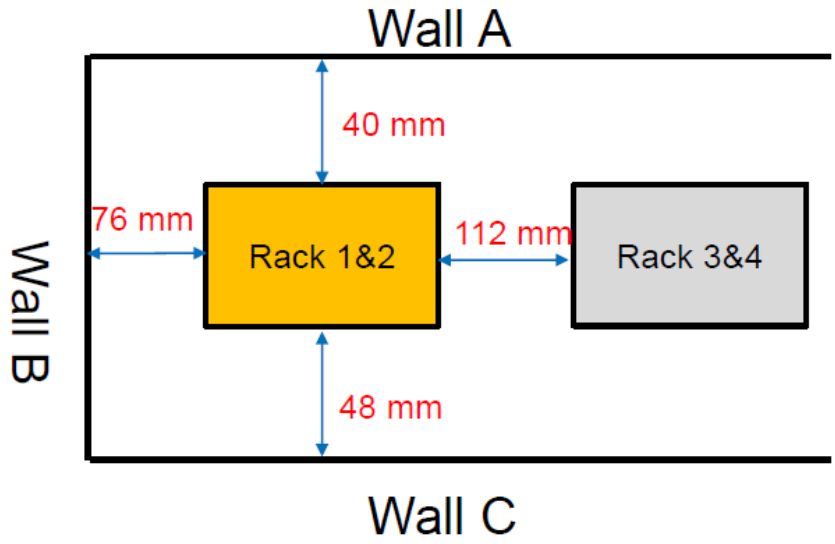


Figure 6. Module numbering in units

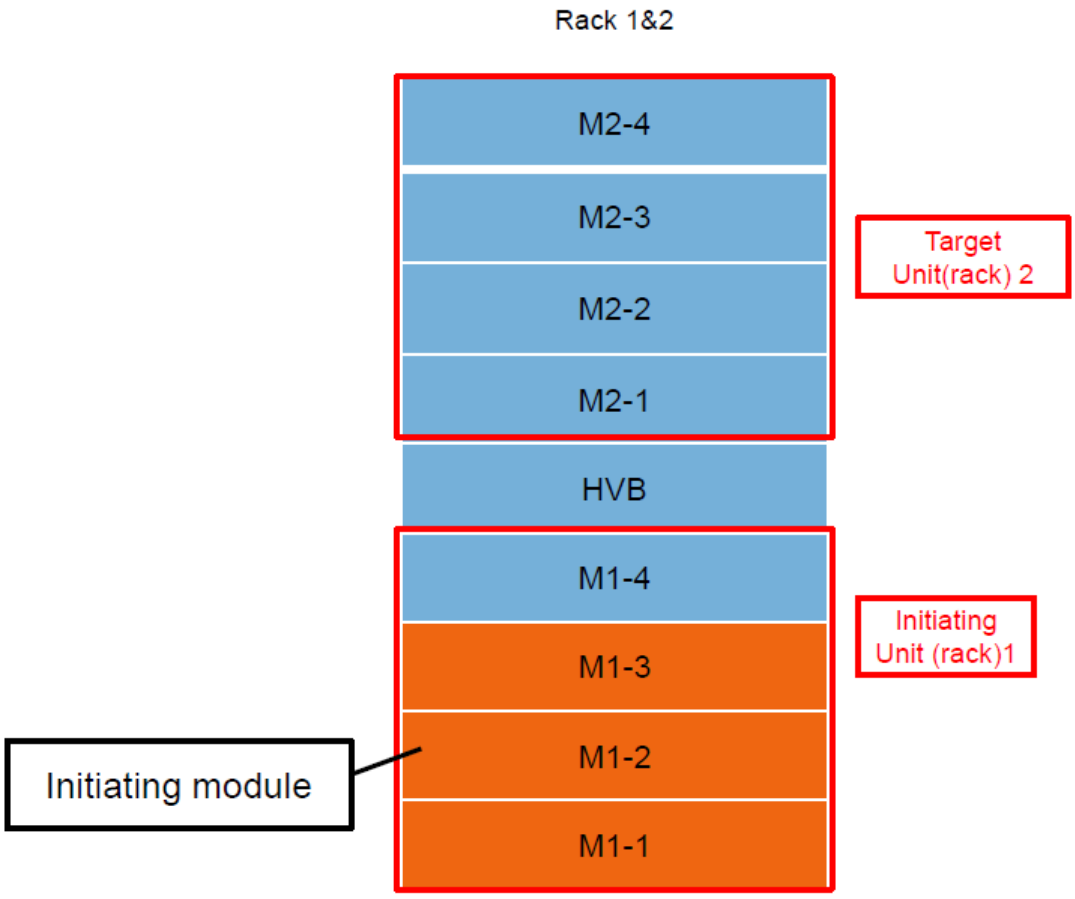
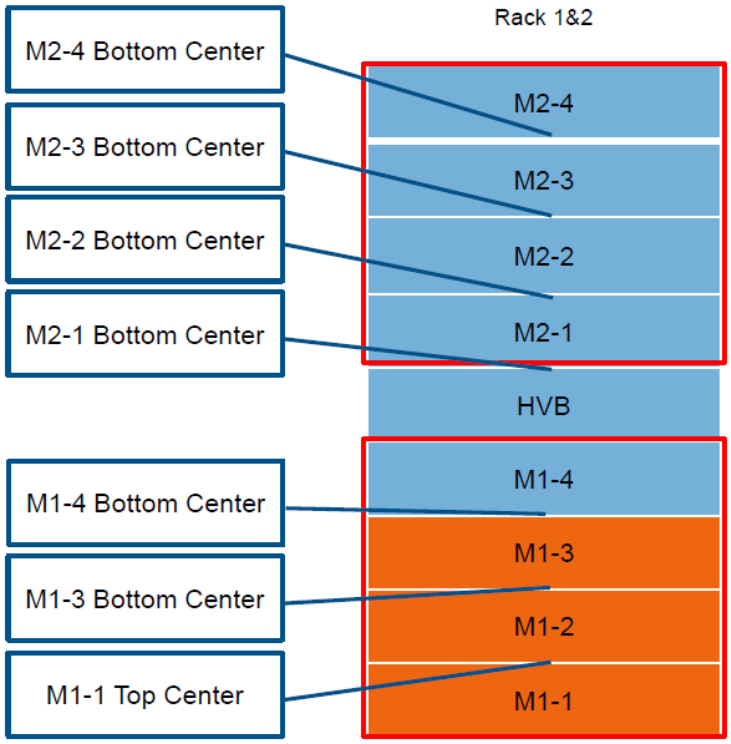
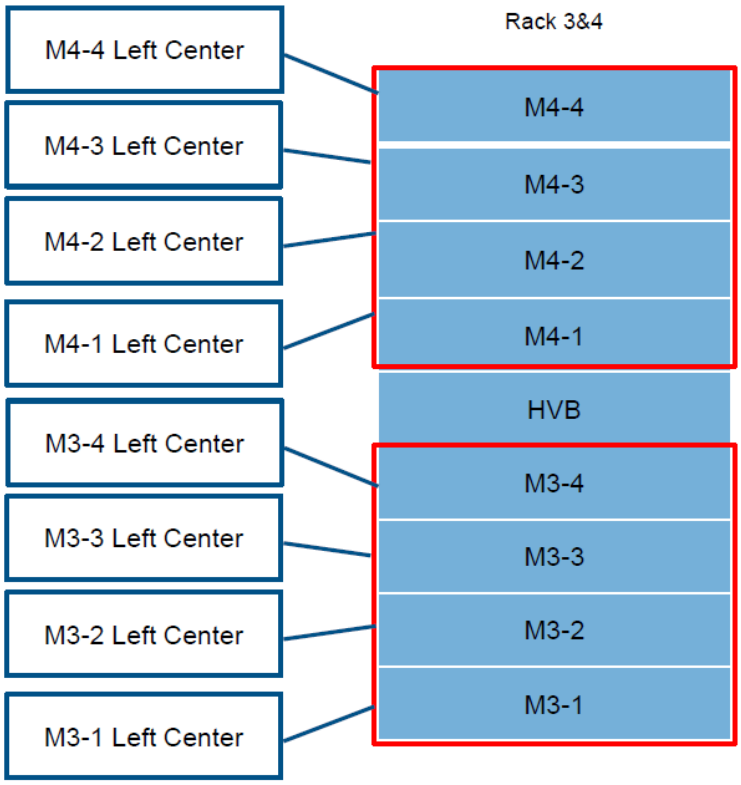


Figure 7. Thermocouple location on modules in initial rack 1



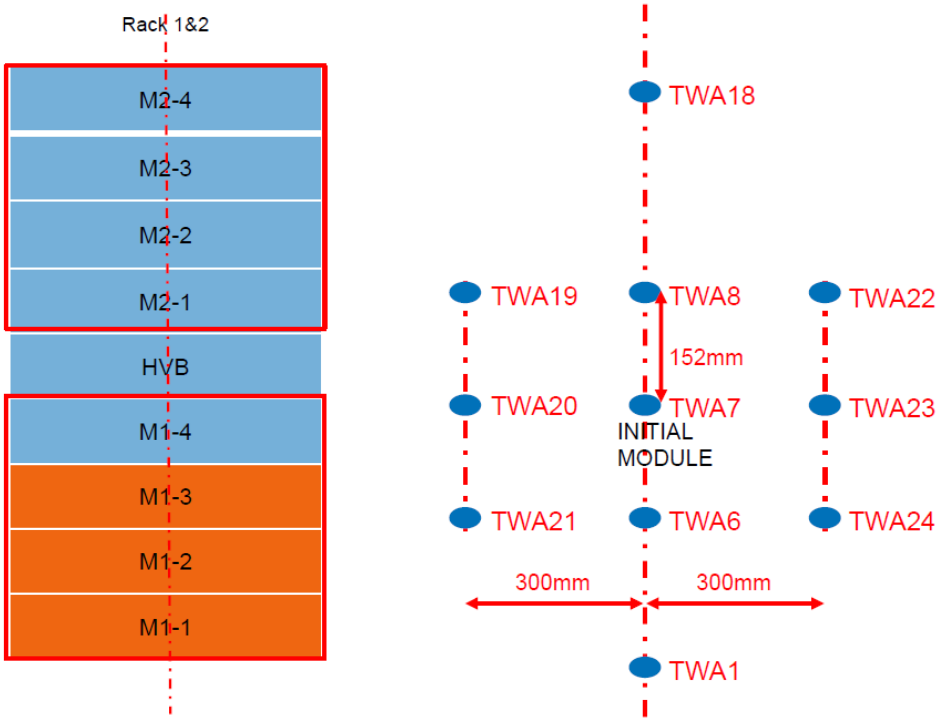
View direction: towards instrument wall A with reference to Figure 5

Figure 8. Thermocouple location on modules in target rack 2



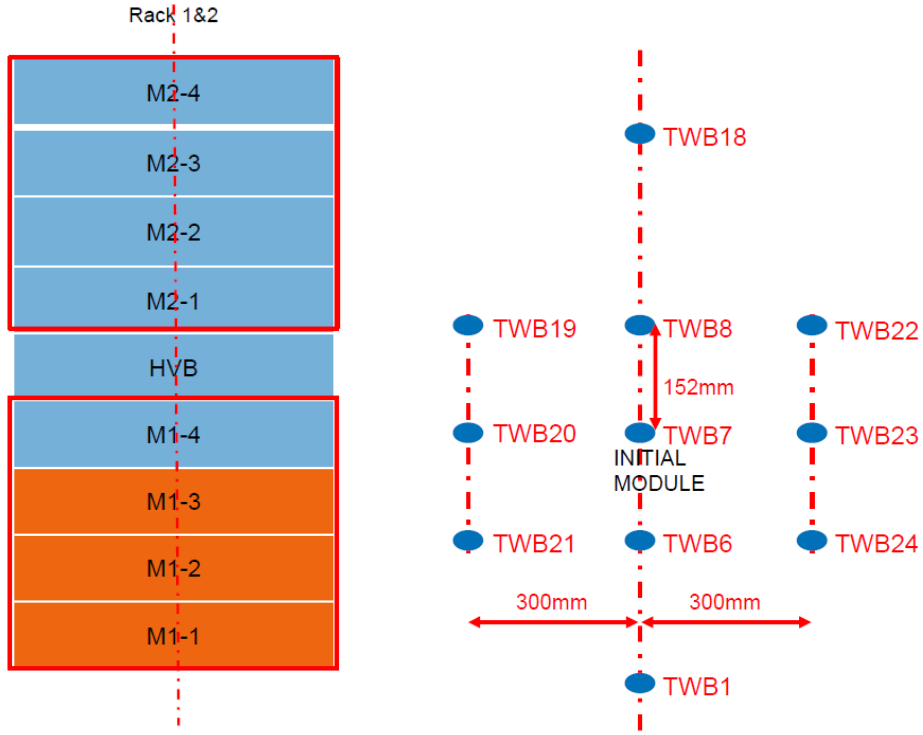
View direction: backward instrument wall A with reference to Figure 5

Figure 9. Vertical position of the thermocouples on the wall A



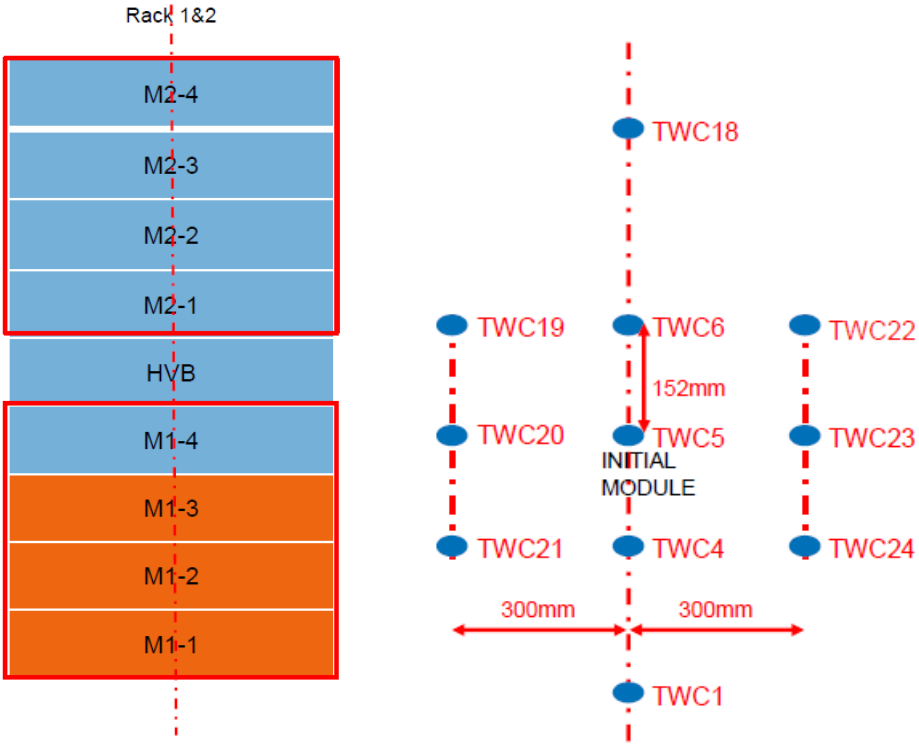
View direction: towards instrument wall A with reference to Figure 5

Figure 10. Vertical position of the thermocouples on the wall B



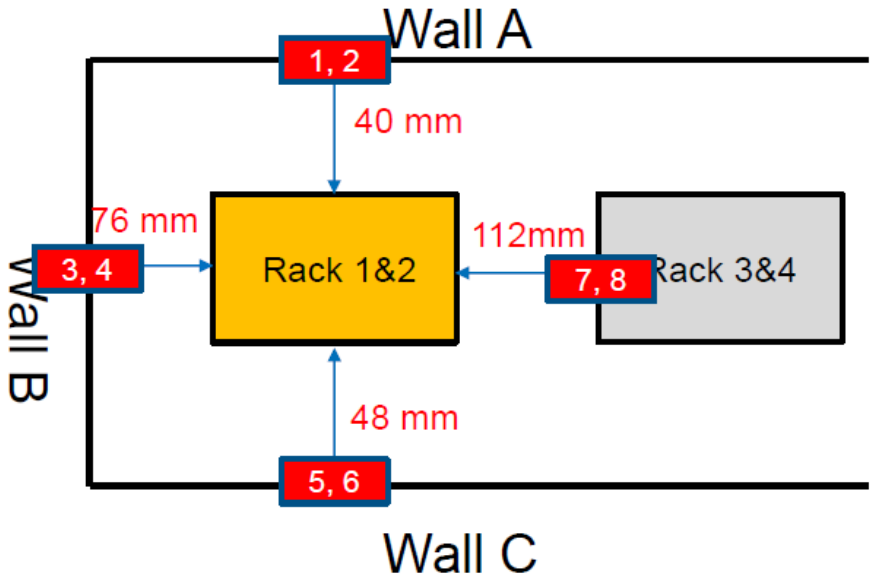
View direction: towards instrument wall B with reference to Figure 5

Figure 11. Vertical position of the thermocouples on the wall C



View direction: towards instrument wall C with reference to Figure 5

Figure 12. Heat flux sensor locations on instrument wall



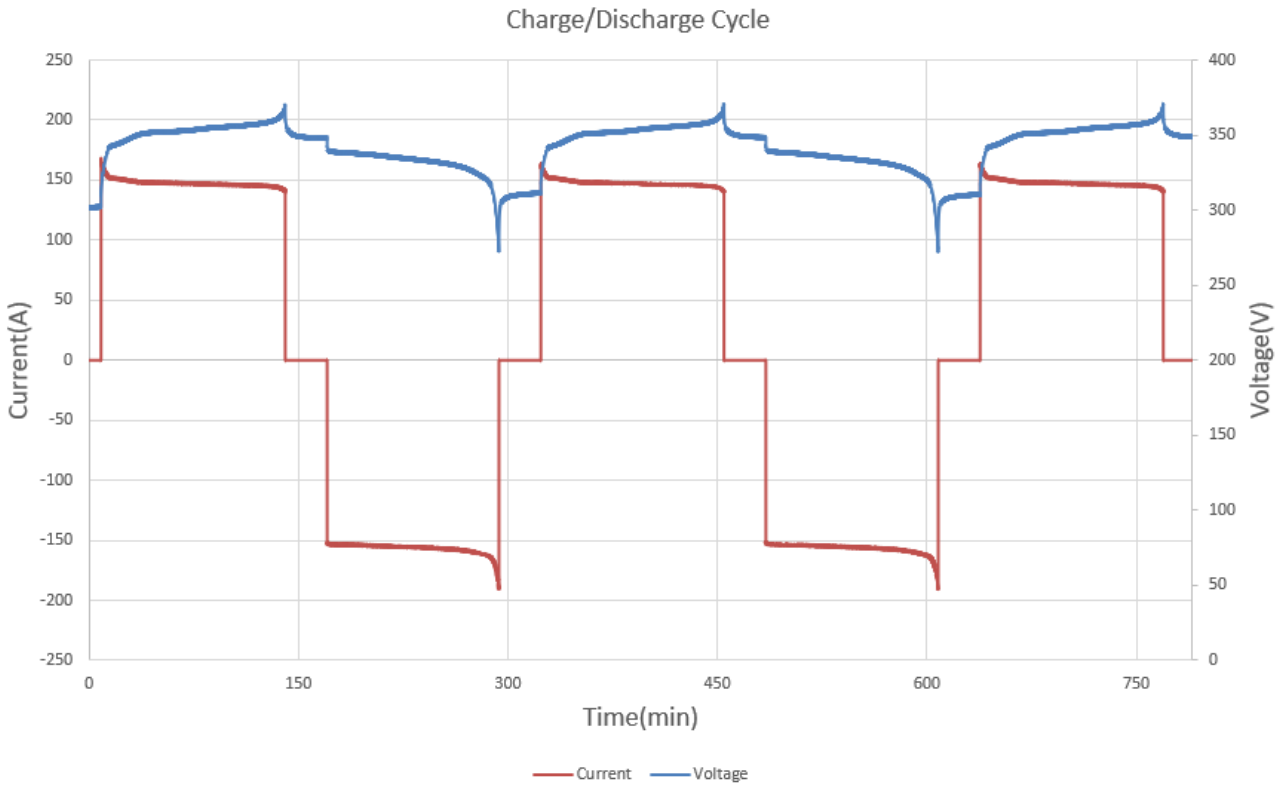
Attachment B: Module Conditioning (Charge/Discharge) Profiles

Module sample was conditioned, prior to testing, through charge and discharge cycles of 2 cycles to verify that the module was functional.

Each cycle was defined as a charge to 100% SOC and allowed to rest several minutes and then discharged to an end of discharge voltage (EODV) determined by the manufacturer. Refer to module information mentioned above for charge and discharge profile.

The module sample was put in a climate chamber during charge and discharge. The ambient is kept at 25°C±5°C and 50%± 25% R.H.

Figure 13. Module charge and discharge voltage/current profiles



Attachment C: Observations and Records

Test initiation details	
Ambient conditions at the initiation of the test. :	16.2°C, 43.3% R.H.
Sample number ..... :	#2025012001
Open circuit voltage before test (V)..... :	350.1
Weight before test (kg) ..... :	677.0 (with thermocouples)
Open circuit voltage after test (V)..... :	329.0
Weight after test (kg) ..... :	668.0 (with thermocouples)
Weight loss (kg)..... :	9.0

Test overview timeline		
Locations (Cell #)	**Event**	**Time**
-	Test start	13:51
40	Vent	14:38
41	Vent	14:51
39	Vent	14:51
40	Thermal runaway	14:53
41	Thermal runaway	14:57
39	Thermal runaway	14:58
42	Vent	14:59
38	Vent	15:00
42	Thermal runaway	15:03
38	Thermal runaway	15:04
43	Vent	15:31
37	Vent	15:34

Note:

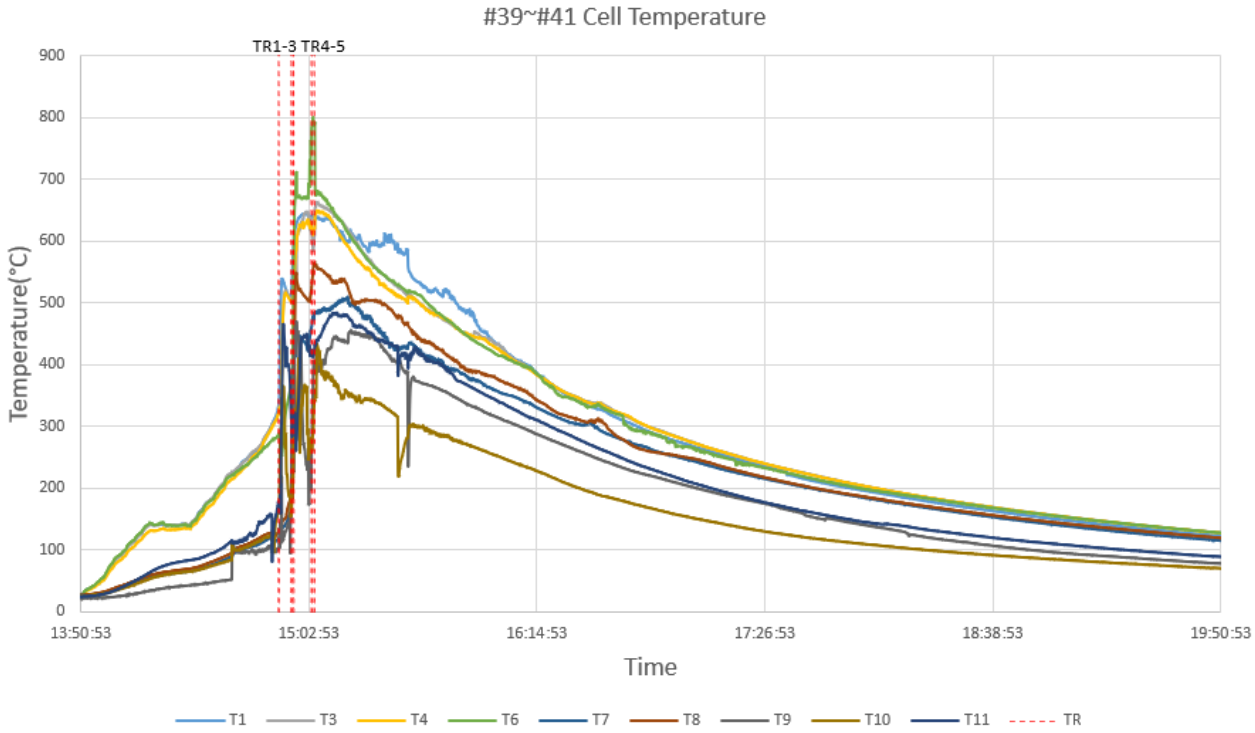
1) No flying debris or explosive discharge of gases during test.

2) No sparks, electrical arcs, or other electrical events during test.

3) No flaming observed.

Attachment D: Module and Initiating Cell(s) Temperature Profiles during Testing

Figure 14. Temperature of cell #39-#41



Note: Thermocouples T2 and T5 were damaged during the test.

Figure 15. Temperature of cell #36~38 and #42~#44

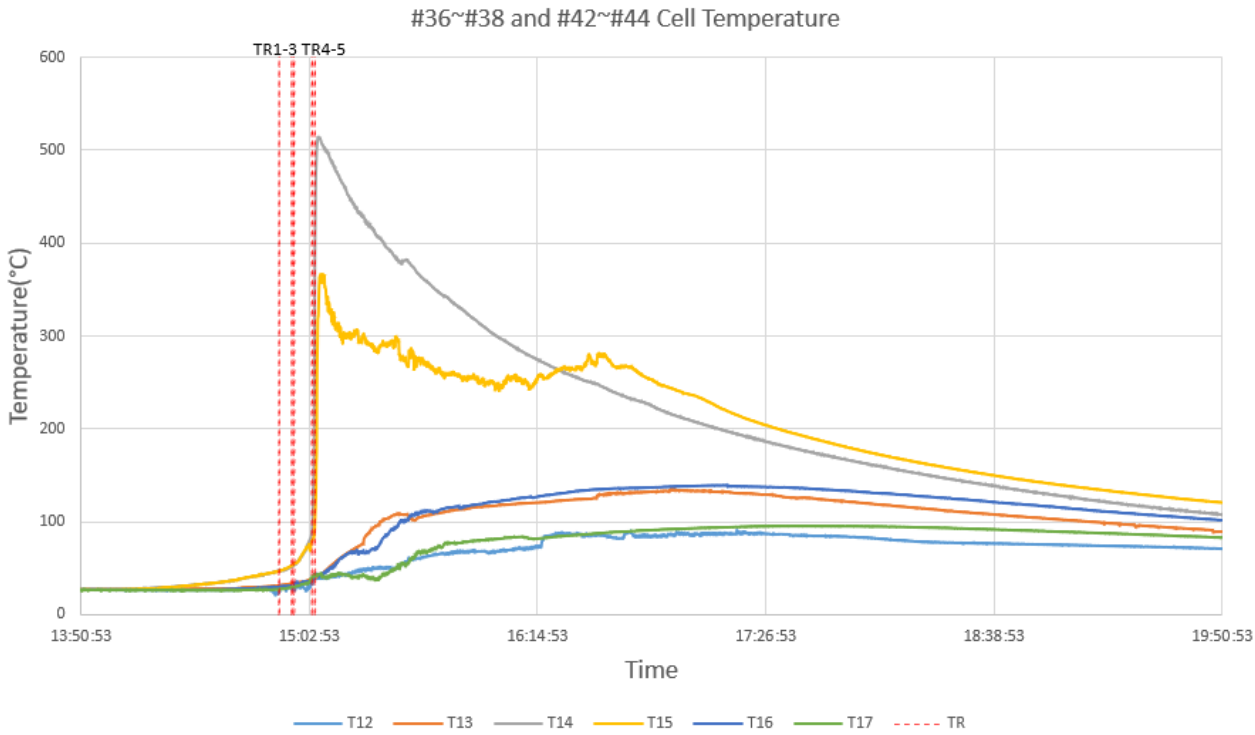


Figure 16. Temperature of cell #10~#16

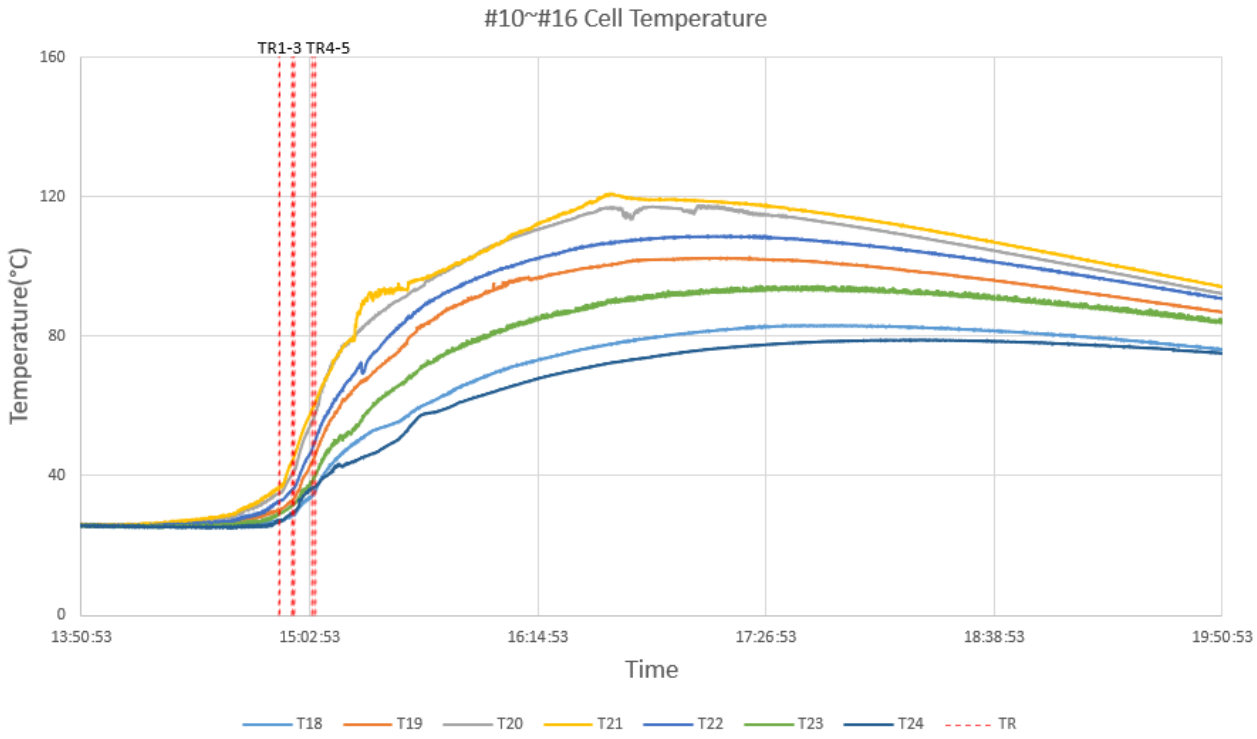
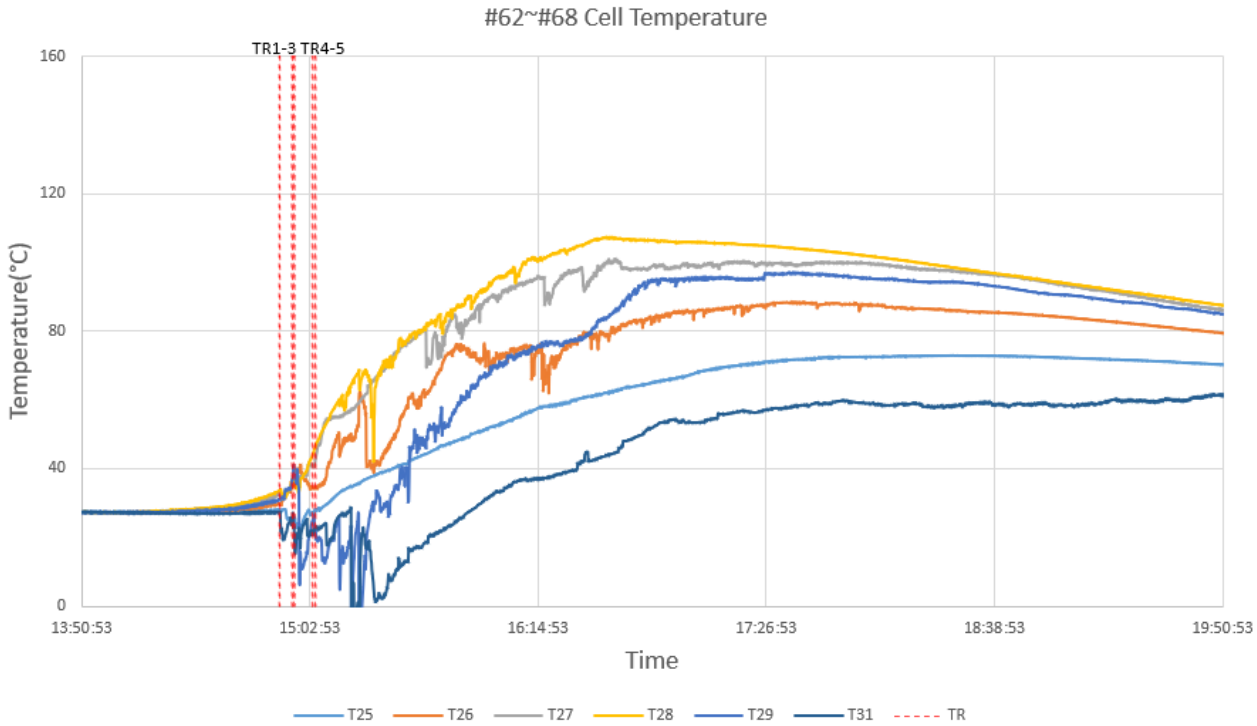


Figure 17. Temperatures of cell #62-#68



Note: Thermocouple T30 was damaged during the test.

Figure 18. Temperature of module surface

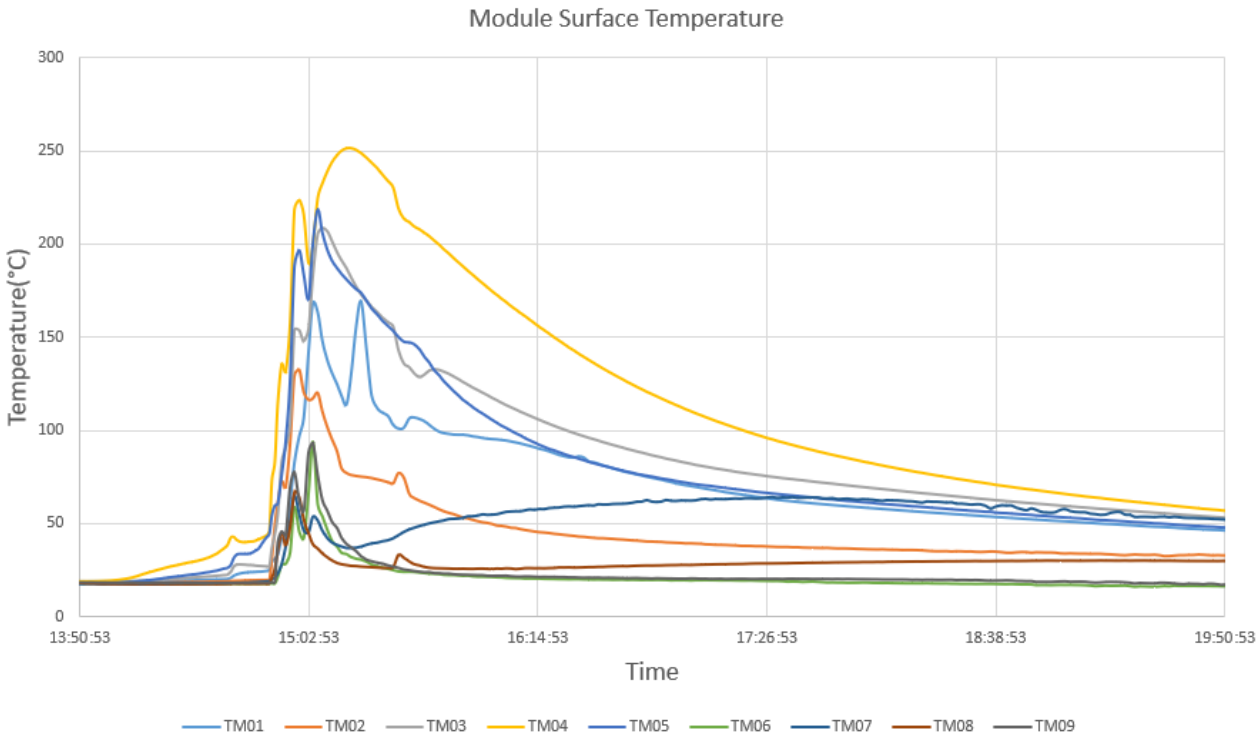


Figure 19. Surface temperatures of modules in initial unit 1 (refer to Figure 6)

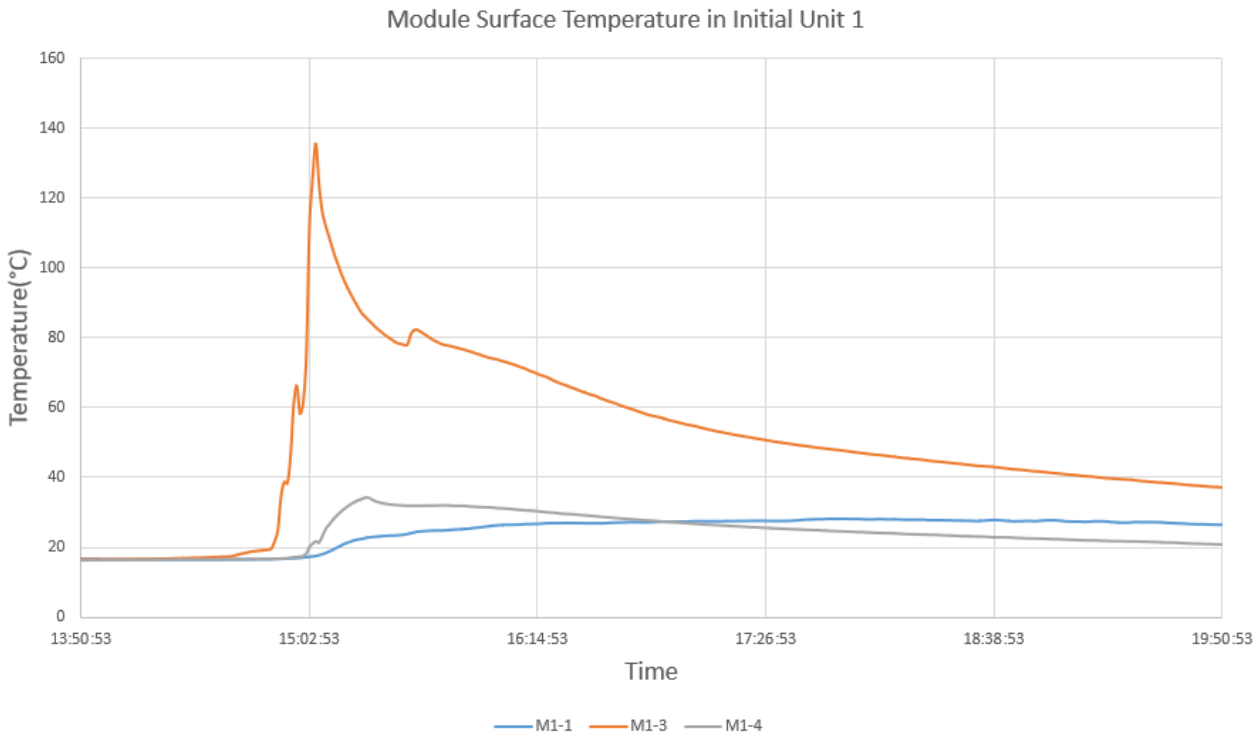


Figure 20. Surface temperatures of modules in target unit 2 (refer to Figure 6)

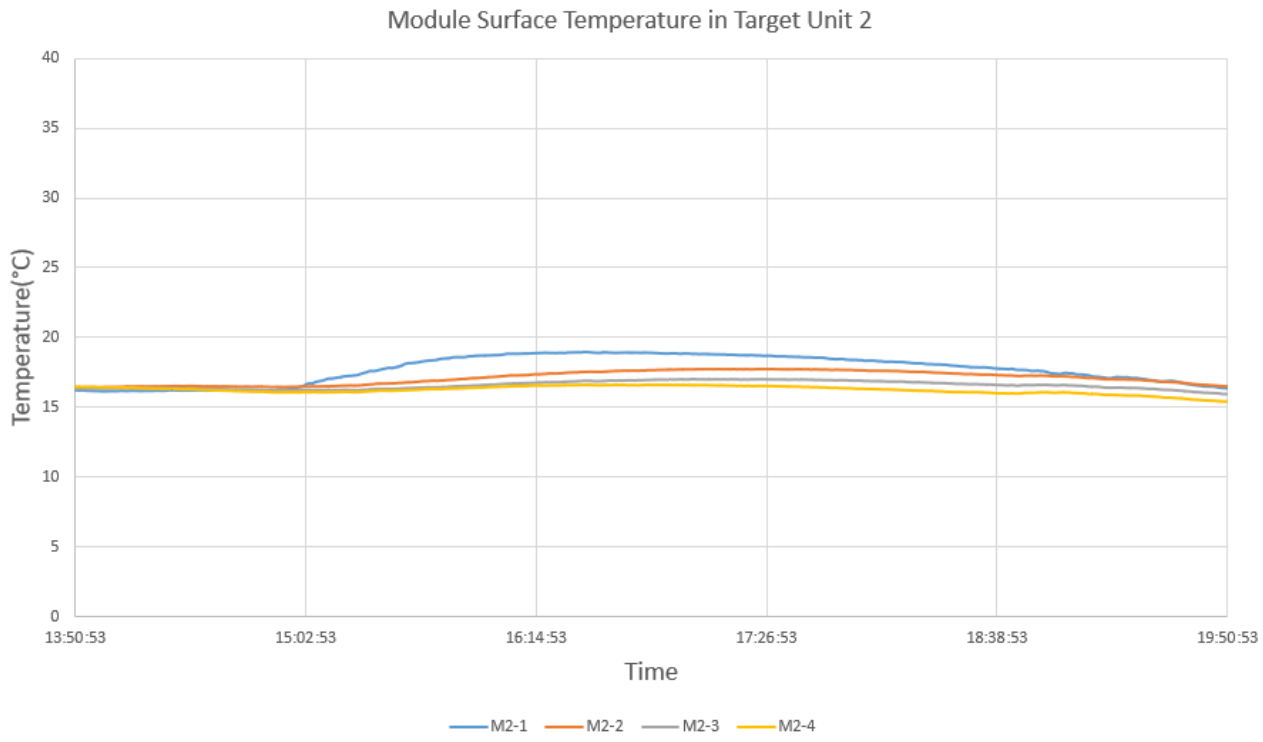


Figure 21. Surface temperatures of modules in target unit 3 (refer to Figure 7)

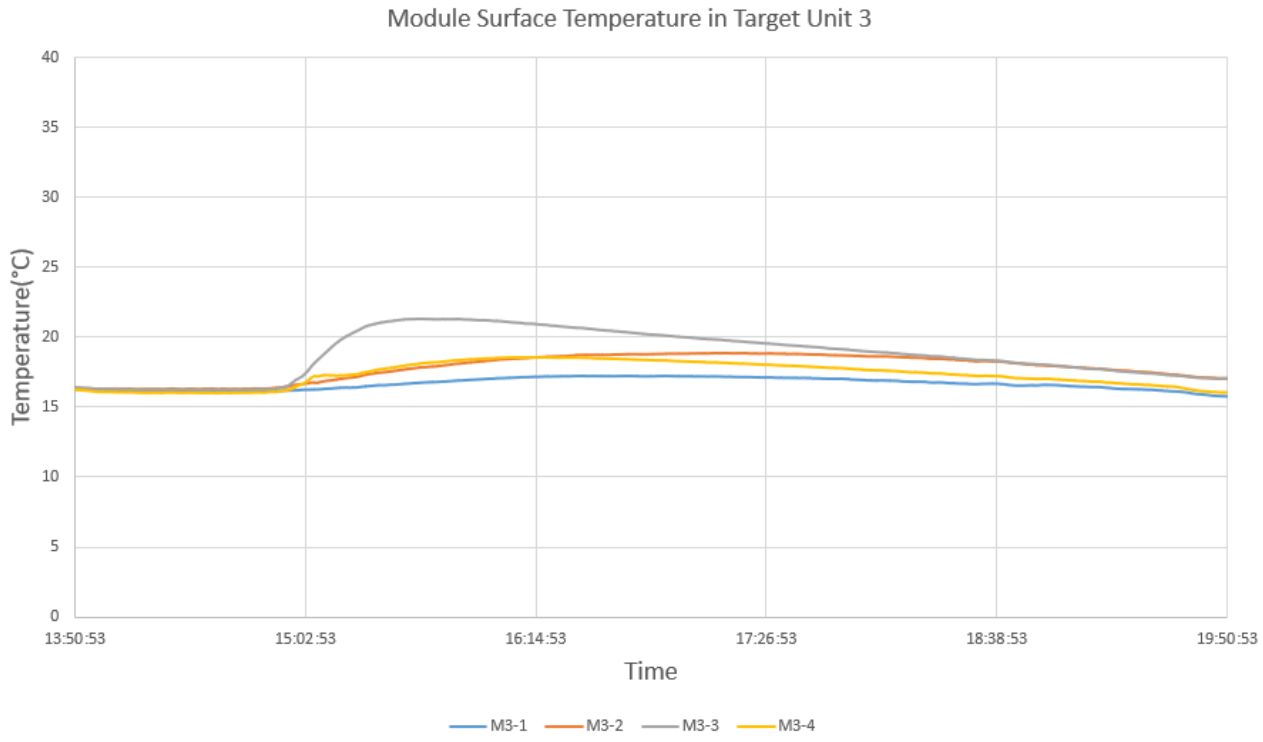
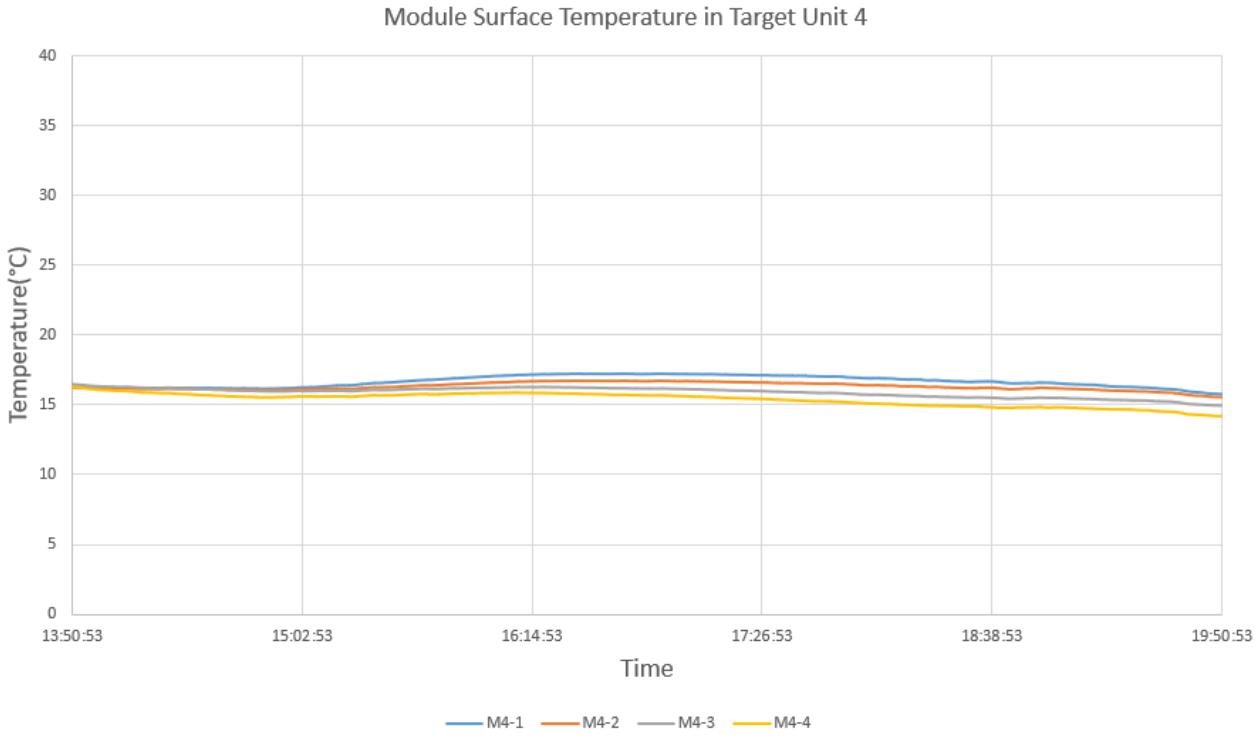


Figure 22. Surface temperatures of modules in target unit 4 (refer to Figure 7)



Maximum Temperatures in Target Units		
UL 9540A performance criteria, Cell Surface Temperature at Gas venting: 167.4 °C		
Location		Maximum Module Temperature (°C)
Surface temperatures of modules in target unit 2	M2-1	19.0
Surface temperatures of modules in target unit 3	M3-3	21.3
Surface temperatures of modules in target unit 4	M4-1	17.2

Figure 23. Temperature on instrument wall A

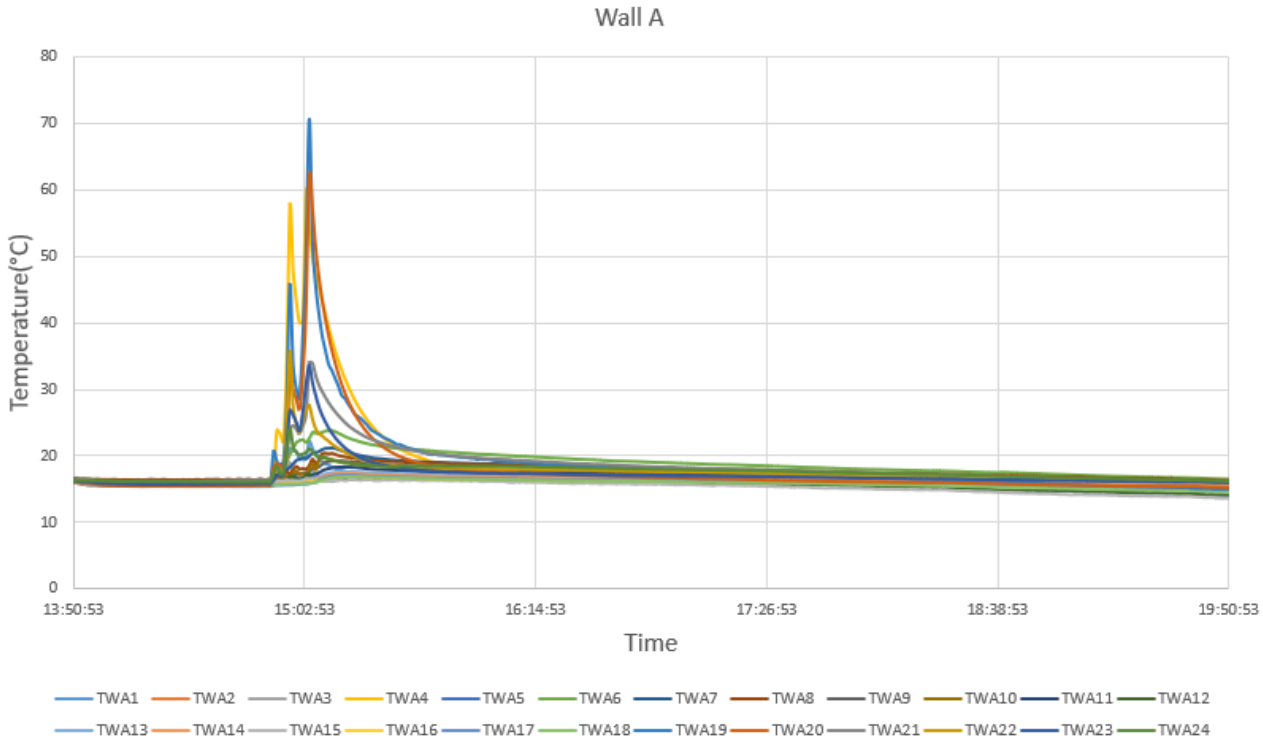


Figure 24. Temperature on instrument wall B

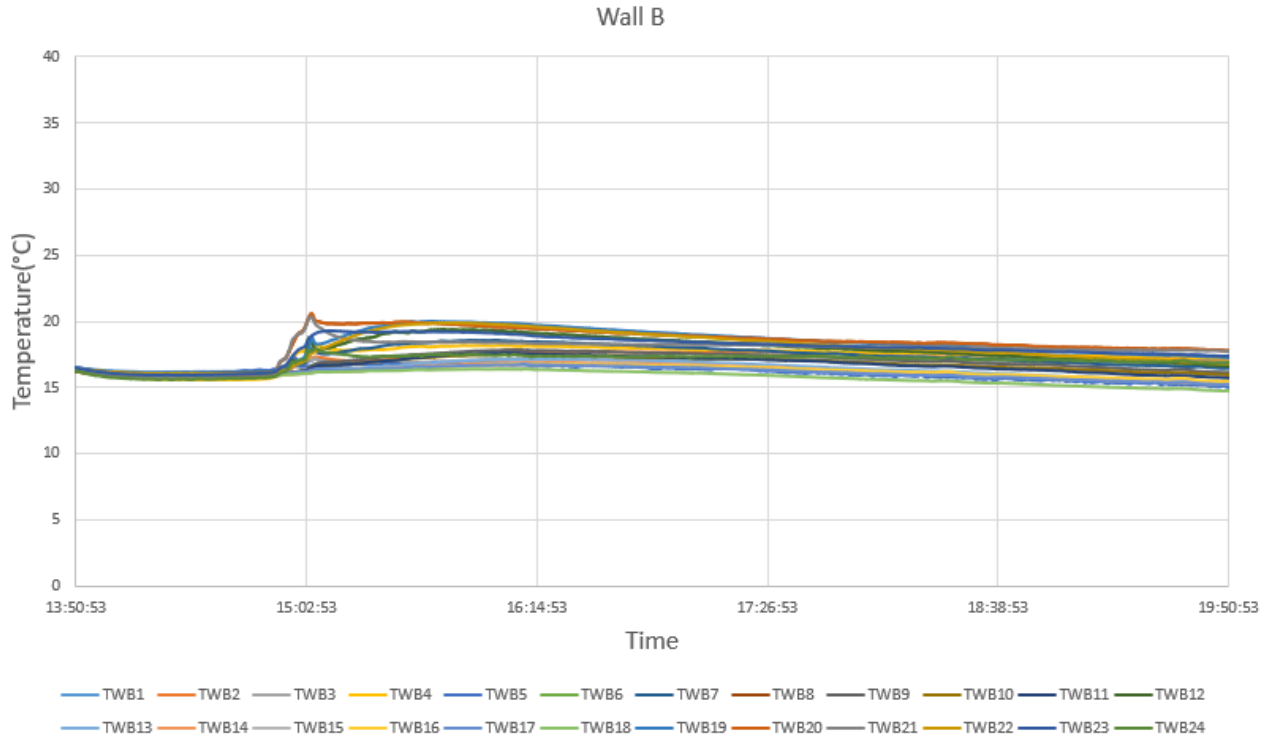
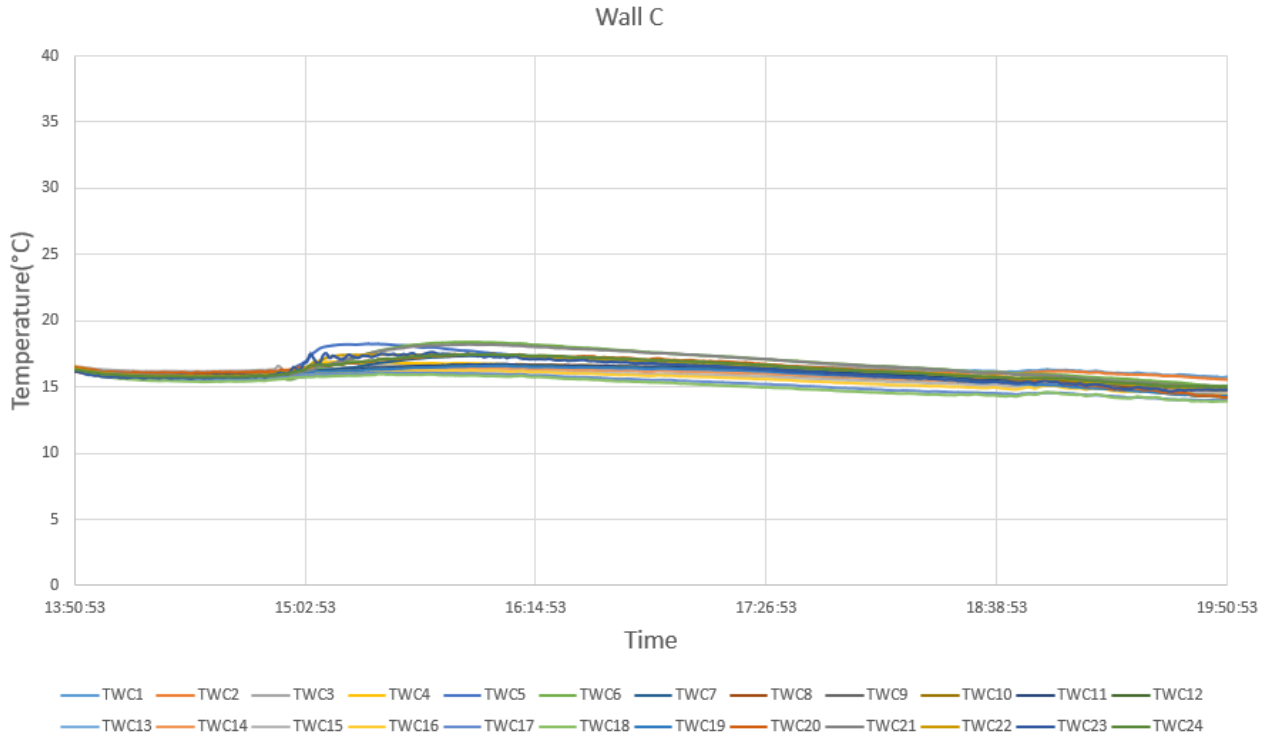
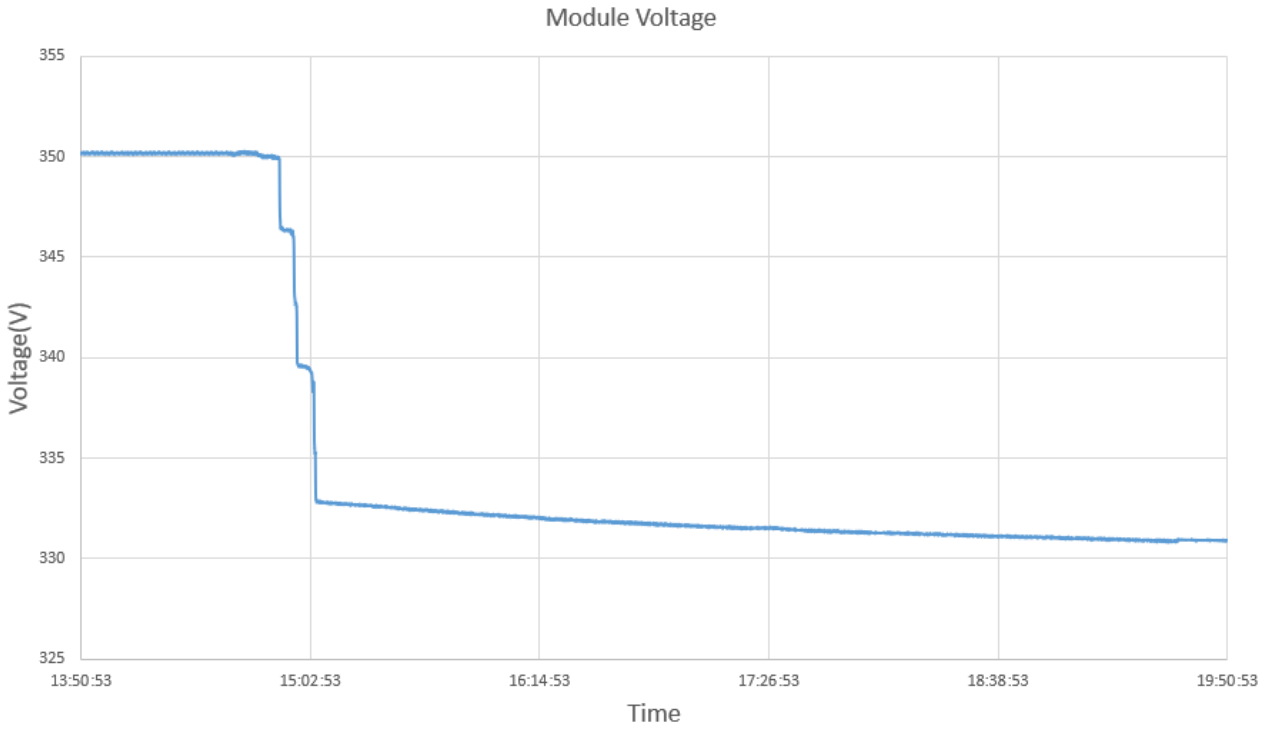


Figure 25. Temperature on instrument wall C



Maximum Temperatures on Instrument Wall		
Ambient Temperature: 16.2 °C		
UL 9540A performance criteria, Ambient + 97°C: 113.2 °C		
Location		Maximum Wall Temperature (°C)
Wall A	TWA19	70.7
Wall B	TWB20	20.6
Wall C	TWC6	18.4

Figure 26. Module Voltage



Attachment E: Smoke Release Rate, Chemical Heat Release Rate, Convective Heat Release Rate and Heat Flux

Smoke and Heat Release Rate		
Smoke Release Rate (SRR)	Maximum SRR(m^2/s)	0.89
	Total Smoke Released(m^2)	312.06
Heat Release Rate (HRR)	Peak Chemical HRR(kW)	No flaming observed
	Peak Convective HRR(kW)	No flaming observed
	Total Heat Release(MJ)	No flaming observed

Figure 27. SRR curve

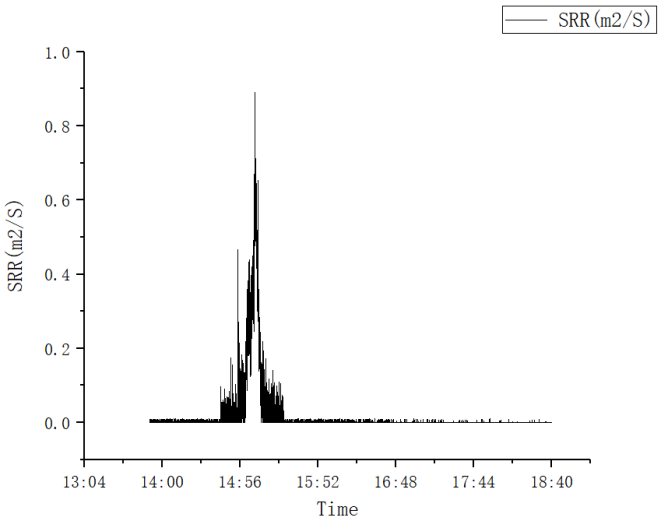


Figure 28. TSR curve

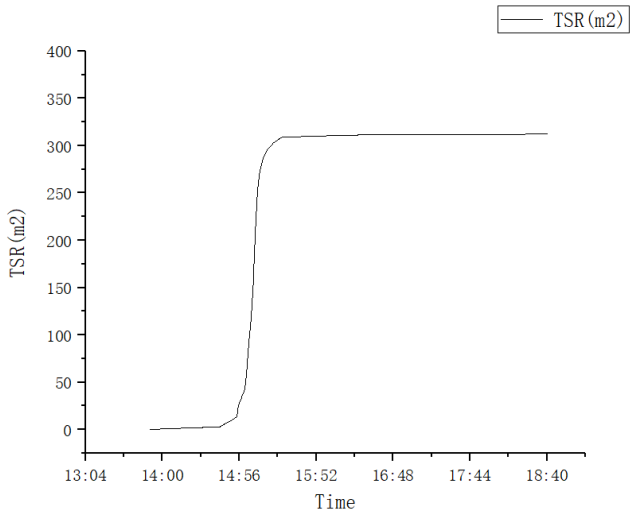
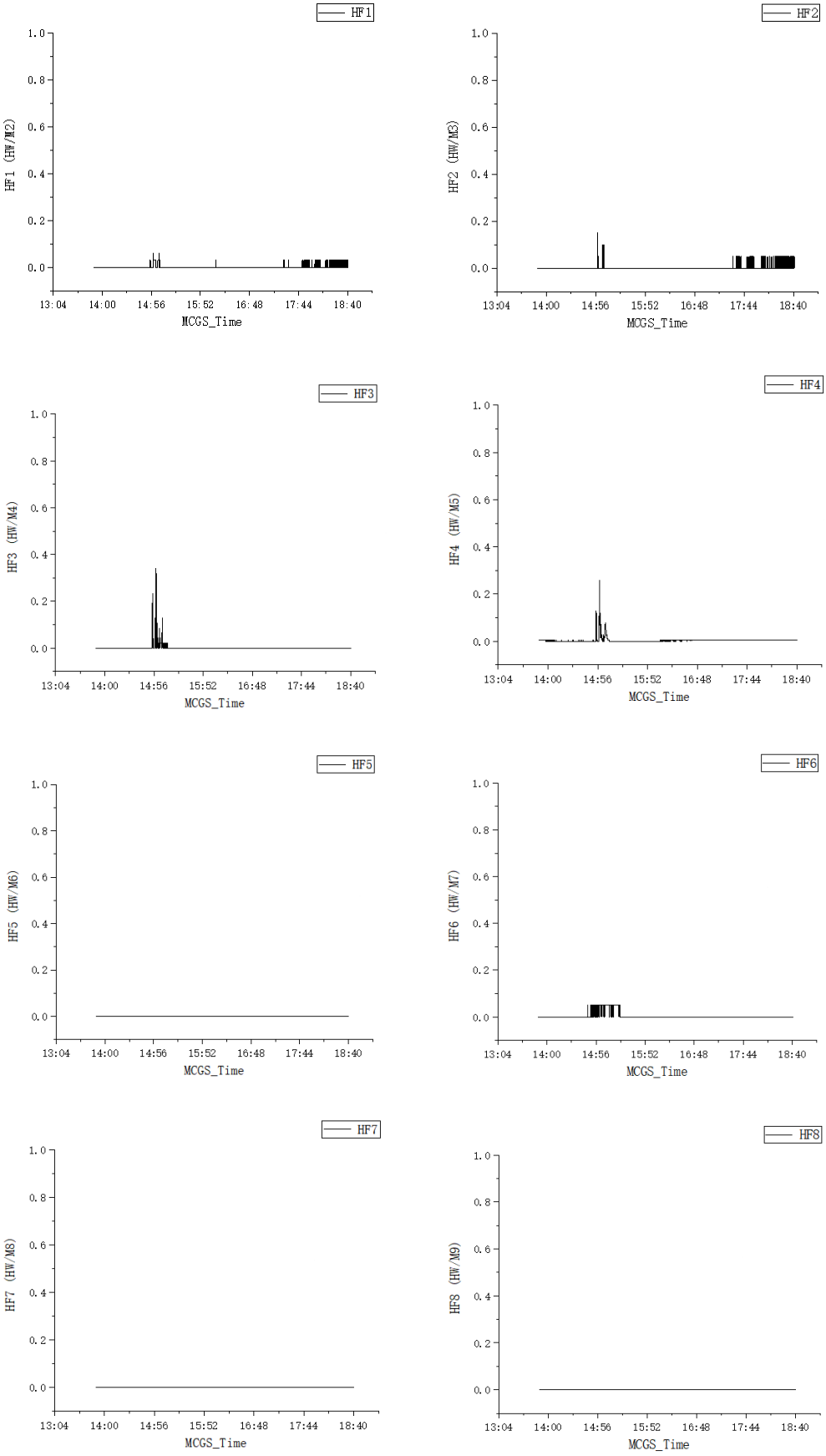


Figure 29. Heat Flux



Attachment F: Flammable Gas Generation and Composition Data

Measurement method	Gas compound	Gas type	Pre-Flaming(L)	Post-Flaming(L)
Flame ionization detection	Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	449.50	No flaming
Fourier-Transform infrared Spectrometer	Carbon Monoxide	Carbon Containing	113.02	No flaming
	Carbon Dioxide	Carbon Containing	482.91	No flaming
Solid-state Hydrogen Sensor	Hydrogen	Hydrogen	262.54	No flaming
Note: The collection time is from 13:51 to 18:40.				

Measurement method	Gas components		Total volume of gas (L)	
			Pre-Flaming	Post-Flaming
Fourier-Transform infrared Spectrometer	Methane	CH_4	87.97	No flaming
	Ethylene	C_2H_4	67.82	No flaming
	Ethane	C_2H_6	22.23	No flaming
	Propylene	C_3H_6	59.38	No flaming
	Propane	C_3H_8	21.16	No flaming
Note: The collection time is from 13:51 to 18:40.				

Figure 30. Total Hydrocarbons

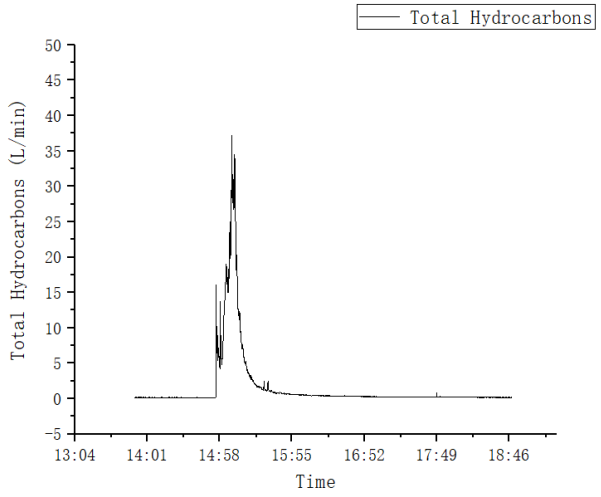


Figure 31. CO, CO_2 concentration

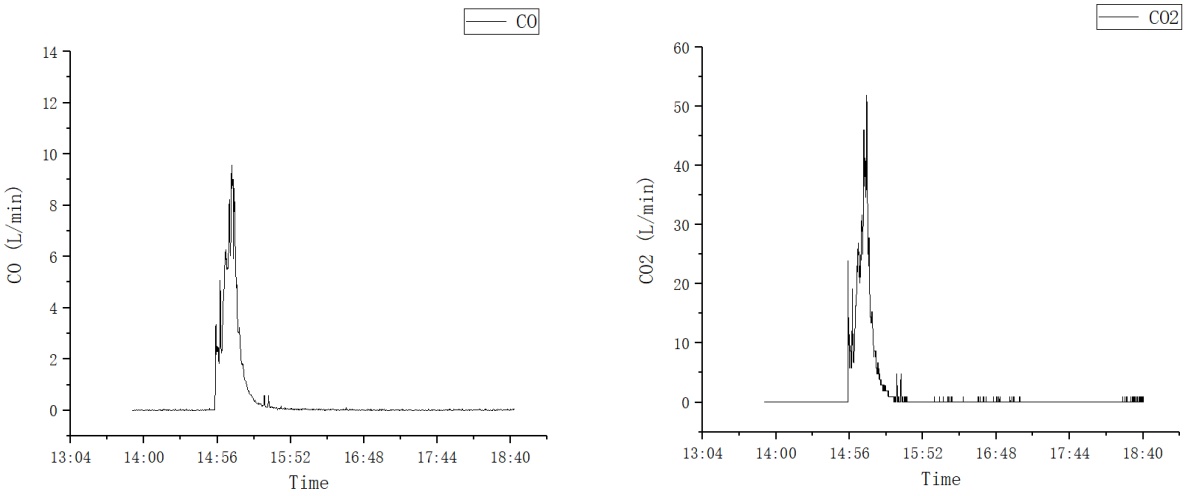


Figure 32. Hydrogen concentration

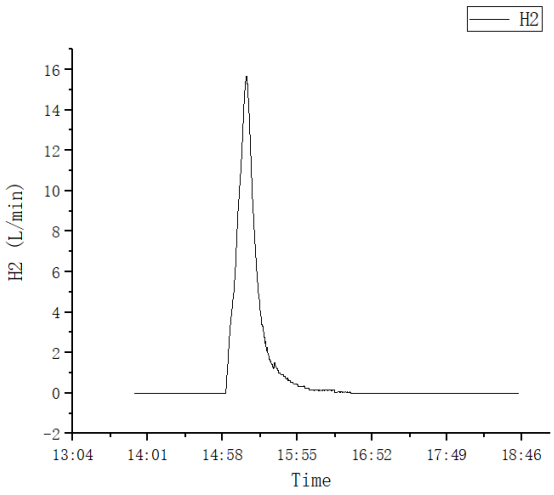
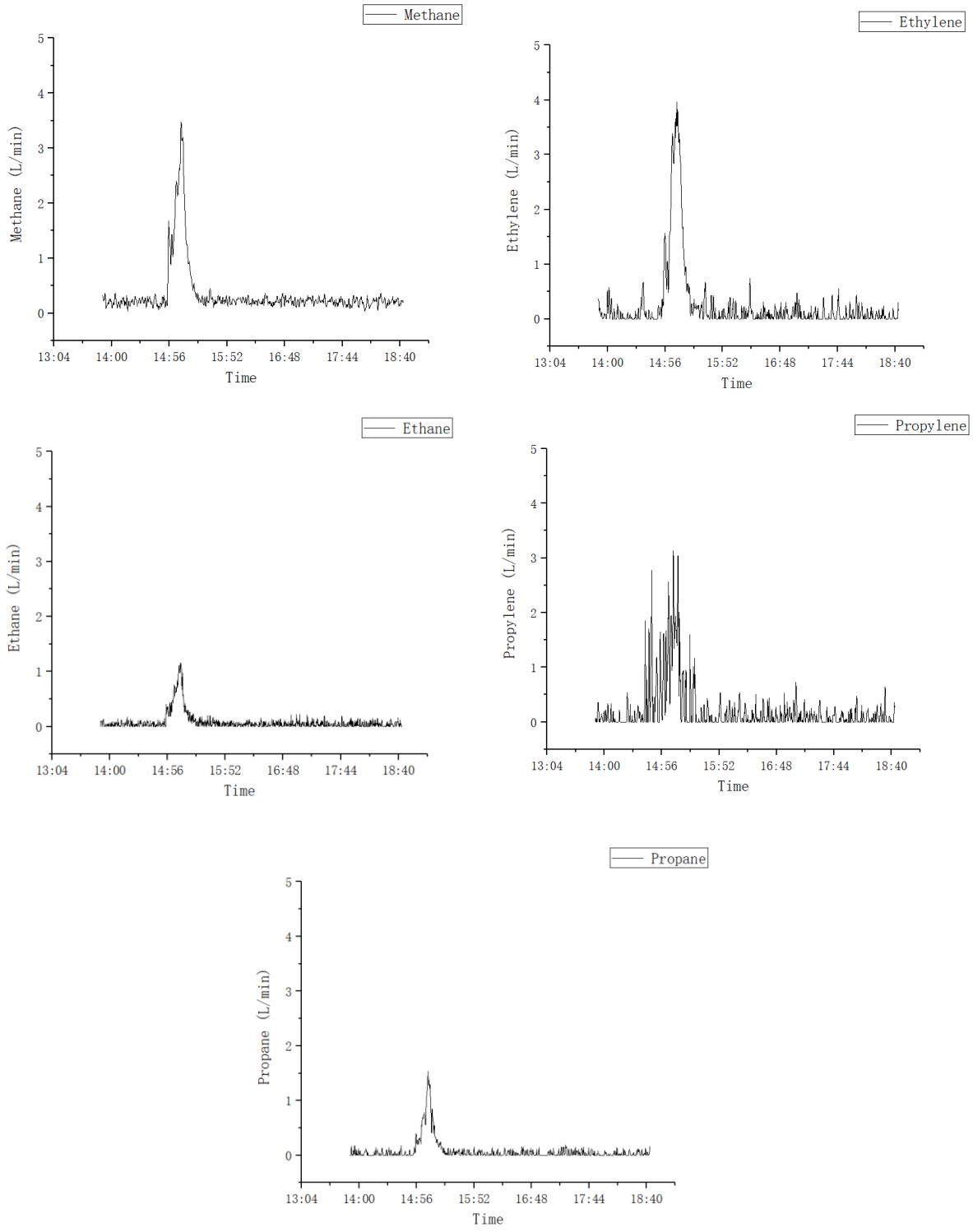


Figure 33. Hydrocarbon species



Attachment G: Sample Photos and Test Photos

Figure 34. Sample before test



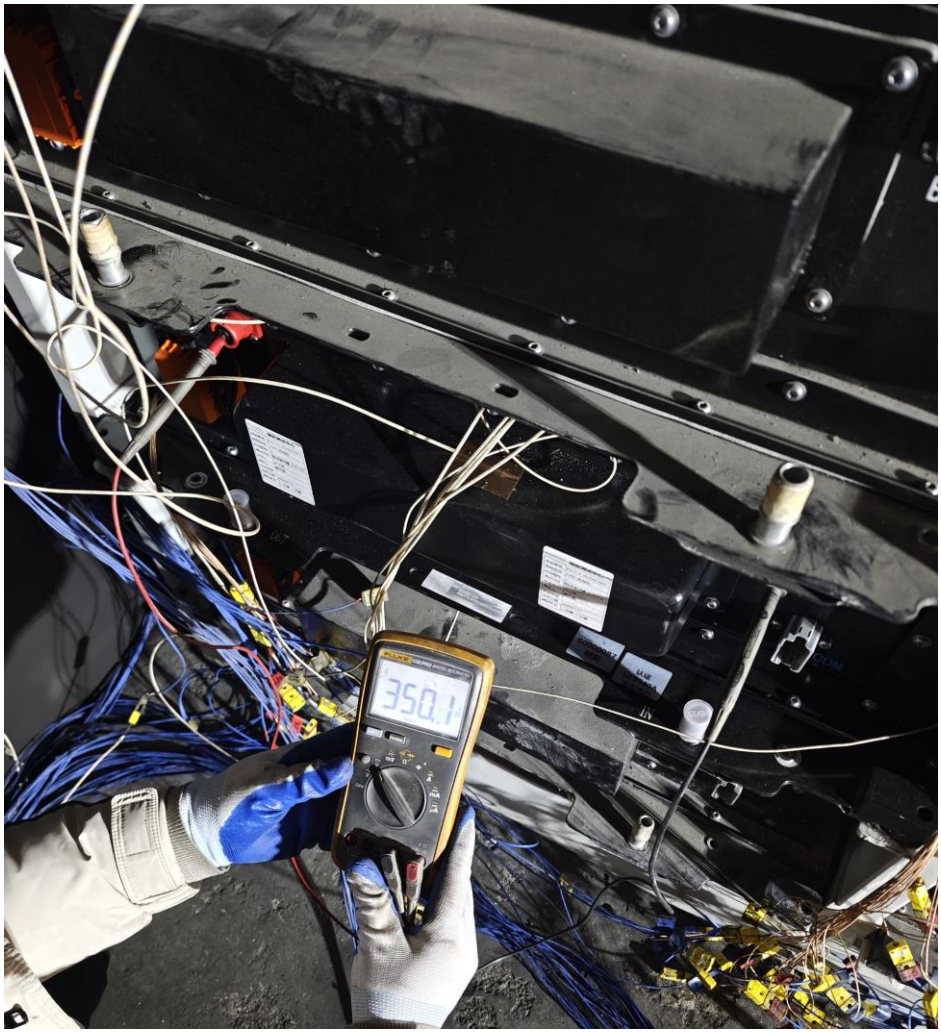


Figure 35. Test setup

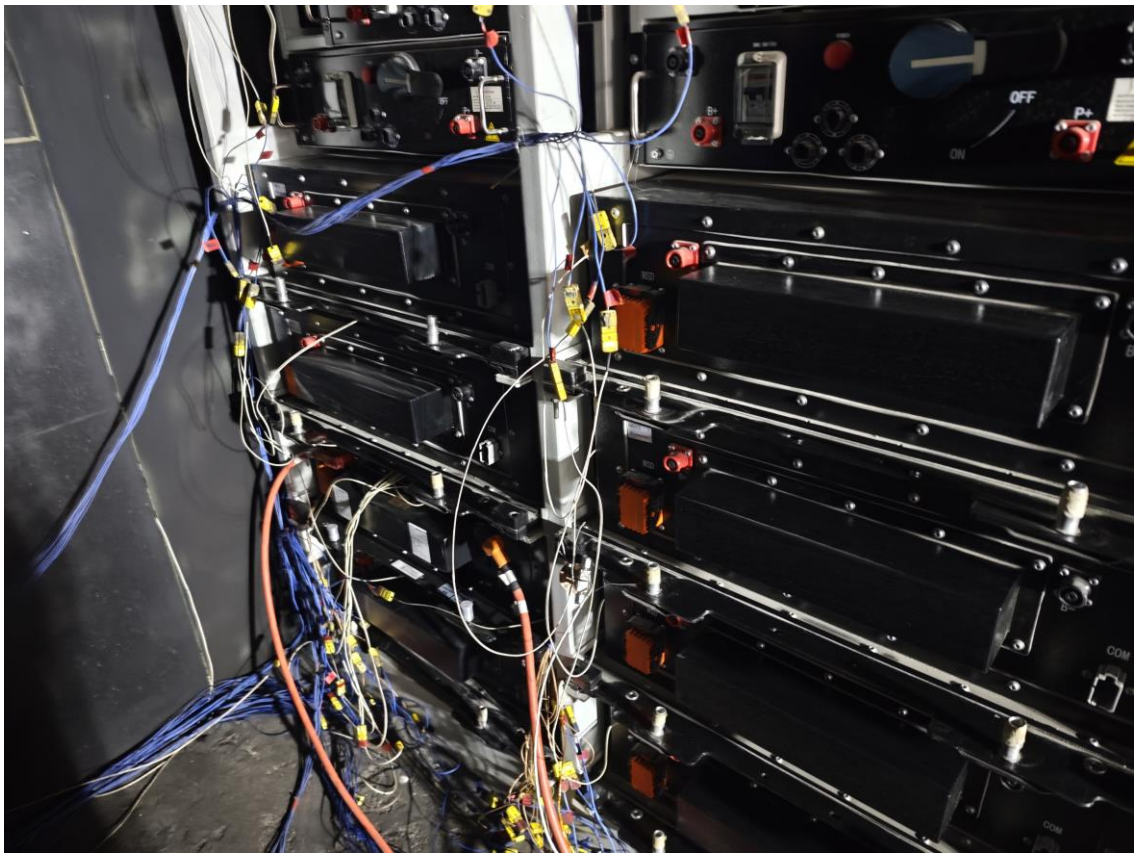




Figure 36. Smoke release during test

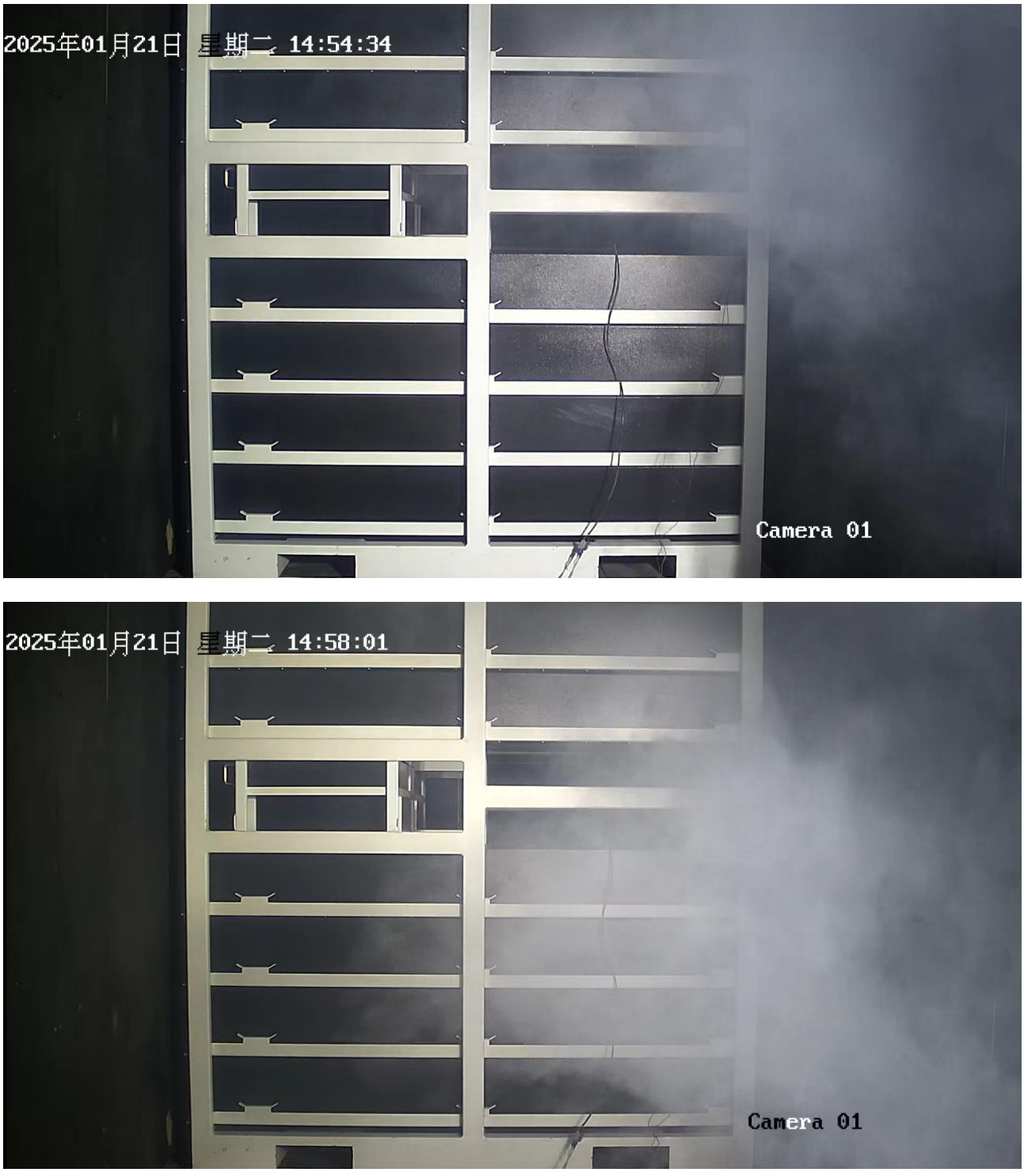


Figure 37. Photos after test









Attachment H: List of Test and Measurement Instruments

No.	Equipment	Model	Rating	Inventory no.	Cal. Expire Date
1	Ambient temperature and humidity	HWP01-10S	-30℃~50℃, 20%RH~100%RH	12005577	2025.2.2
2	Data acquisition equipment	DAQ970A	3-slot cardcage with 6½ digit (22 bit) internal DMM 0.004%, accuracy 0.06% Vac	TY2020000138	2025.2.2
3	Data acquisition equipment	TP700	Measuring range-60 ℃ to 1372 ℃ Measurement accuracy ± (0.05% rdg.+0.5℃) Display resolution0.01℃	TY2211000716-2	2025.2.2
4	Data acquisition equipment	TP700	Measuring range-60 ℃ to 1372 ℃ Measurement accuracy ± (0.05% rdg.+0.5℃) Display resolution0.01℃	TY2020000217	2025.2.2
5	Electronic scale	CHAOOUC 1	0-500KG	65960494169	2025.2.2
6	Paramagnetic oxygen analyser	SERVOMEX4100	O2: paramagnetic sensor, range 0-25%, accuracy 0.02%, response time T90 < 7S	ZY20200000018-1	2025.2.6
7	Velocity probe	2671-25L-D-11-G2-E-N	4-20mA output, range 0-250pa, accuracy ± 1% F.S	ZY20200000018-2	2025.2.6
8	Photo detector	PDA36A2	Thorlabs optical receiver, wavelength range (350-1000) mm, gain adjustable, voltage output (0-10) V, instability < 0.1%	ZY20200000018-3	2025.2.2
9	Fourier-Transform Infrared Spectrometer	atmosFIR	Spectral scanning range: 485 - 7500cm-1; Spectral repeatability: < 0.1cm-1	ZY2020000018-5	2025.3.9

10	Non-dispersive infrared carbon dioxide and carbon monoxide sensor	SERVOMEX4100	CO2: infrared sensor, measuring range 0-10%, accuracy 1% F.S, response time T90 < 7S Co: infrared sensor, measuring range 0-1%, accuracy 1% F.S, response time T90 < 8s	ZY2020000018-4	2025.2.6
11	Palladium-nickel thin-film solid state sensor	MODEL 2000	Range: 0-2000ppm, temperature less than 100 C, -90~110kPa	ZY2021000210	2025.2.2
12	Flame ionization detector	3010	Accuracy: 2.0%	19937	2025.3.9
13	Heat flux measurement equipment	MW88-JTC08C	0 ~ ± 99999 w / m2, - 250 ~ 980 ℃, accuracy 5%, response time less than 0.1s,	ZY2020000010	2025.2.2
14	Thermopile	RS-WD-HW-1	0-200 ℃, 4-20mA, response speed < 0.15s	28348141942	2025.2.2

Attachment I: Revision Information

N/A

Appendix B

SOLBANK 3.0 INSTALLATION MANUAL

e-STORAGE

A subsidiary of Canadian Solar

SolBank3.0

Installation Manual

V1.8

e-Storage Energy Storage Technologies Co., Ltd.

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1 Preface

1.1 Document Purpose and Scope

The purpose of this document is to provide an overview of the processes and procedures required to install the SolBank3.0 series(referring to all application models mentioned in Section 1.2, unless specifically stated otherwise, this will not be reiterated in the following text.) Energy Storage System (ESS) (1500V models only). The scope of this manual is limited to only those tasks applicable to installation of this product. Topics covered , pre- installation inspections and checks; equipment receiving, unloading, and inspections; equipment mechanical and electrical installation; and equipment cleaning and installation inspections.

This manual should be made available to all field personnel participating in the design and installation of the DC SolBank3.0 series energy storage system.

This manual is to be considered supplemental to project specific design and safety documentation. Please read and understand all aspects of this document prior to initiating SolBank3.0 series installation.

Should any questions arise, please contact e-STORAGE support:

- By telephone at +1-519-837-1881

1.2 Applicable Models

This manual covers the following models:

- CSI-SolBank-S-5016-2h-NA
- CSI-SolBank-S-5016-4h-NA
- CSI-SolBank-S-5016-2h-EU
- CSI-SolBank-S-5016-4h-EU
- CSI-SolBank-S-5016-2h-AUS
- CSI-SolBank-S-5016-4h-AUS
- CSI-SolBank-S-PL-5016-2h-NA
- CSI-SolBank-S-PL-5016-4h-NA
- CSI-SolBank-S-PL-5016-2h-EU
- CSI-SolBank-S-PL-5016-4h-EU
- CSI-SolBank-S-PL-5016-2h-AUS
- CSI-SolBank-S-PL-5016-4h-AUS

1.3 Reference Documents

The SolBank3.0 series Installation Manual exists as part of library of product specific documents. Please consult the following documents to ensure a comprehensive understanding of SolBank3.0 series attributes.

- *SolBank 3.0 Installation Manual*

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- *SolBank 3.0 User Manual*
- *SolBank 3.0 Safety Manual*
- *SolBank 3.0 Maintenance Manual*
- *SolBank 3.0 Commissioning Manual*
- *SolBank 3.0 Decommissioning Manual*
- *SolBank 3.0 Transportation Instruction Document*

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1.4 Version Control

This is the initial release of the DC SolBank3.0 series Installation manual. As part of e-STORAGE's continuous improvement process, e-STORAGE reserves the right to make technology and document changes. Please contact e-STORAGE support to verify this manual reflects the most recent release or to report omissions or inaccuracies.

Version	Description	Date of Issuance
SolBank 3.0 Installation Manual_V1.0	Initial publication date	2024.2.2
SolBank 3.0 Installation Manual_V1.1	1. Add String PCS Version related content; 2. Updated requirements of DC cables in table 11 at item 5.4.5	2024.8.9
SolBank 3.0 Installation Manual_V1.2	1. Add a table "list of Fire Safety System equipment" at item 3.2; 2.Updated the foundation height requirements; 3. Updated installation order at item 5.1.1; 4. Add installation order requirement of DC cables for string PCS version; 5. Updated the maximum wire diameter of the DC cable from 187.5kcmil ($95mm^2$) to 237kcmil ($120mm^2$) for the 0.25P centralized PCS version at table 12, item 5.4.5.	2024.10.16
SolBank 3.0 Installation Manual_V1.3	1. Updated the foundation height in the relevant drawings and change from 190~400mm to 150~400mm； 2. Updated the torque for Bridge locks at item 5.1.5; 3. Updated the location of the Shockaction indicator and Tilt sensor at item 5.5.3; 4. Updated wiring instructions at item 5.5.4. Updated the step of rack level power cable connection. Added the MSD installation instruction.	2024.11.12
SolBank 3.0 Installation Manual_V1.4	1. Updated the size of the left side wall of the cabinet is changed from 1700 to 1500mm at item 3.3.2; 2. Update Figure 10 to show the height of clamp at item 5.1.4; 3. Update the provider of twist lock in figure 11 at item 5.1.5; 4. Added the procedure description for removing the desiccants at item 5.2.3; 5. Delete the embedded ground bar at item 5.4.4; 6. The reasonable opening time of the exposure is added at item 5.2.1, 5.3.3, 5.4.5, 5.4.6, 5.5.4, 6.1.1;	2024.12.5

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	7. Added a chapter 7 to show the difference of String Solution; 8. Added description of black start solution at item 4.5.2;	
SolBank 3.0 Installation Manual_V1.5	1. Revise the typo in figure 3 at item 3.3.1; 2. Updated the aux power consumption table at item 4.5.2; 3. Accessories such as MSD, bridge lock, e.t are added in the box description at item 5.1.4; 4. Added the description of fire reserve power cable installation at item 5.3.3; 5. Change the grounding detail in figure 20 at item 5.4.4; 6. Added UPS battery wiring description at item 5.4.6; 7. Updated wiring instructions at item 5.5.4; 8. Added some spare parts in Installation Components List at item 8.1; 9. Add a reminder to reference to other documents "Transportation Instruction" and "SolBank Transportation & Storage SOP" when transporting at item 3.3.1. 10. Add fast stop input/output control logic in figure 26 at item 5.4.6	2025.1.22
SolBank 3.0 Installation Manual_V1.5.1	1. Change fast stop input/output control logic in figure 26 at item 5.4.6	2025.2.7
SolBank 3.0 Installation Manual_V1.5.2	1. Update Figure 10 to cancel the recommended value of the DC cable diameter at item 5.1.4; 2. Change the description of DC cable at item 5.4.5;	2025.2.26
SolBank 3.0 Installation Manual_V1.6	1. Update Figure 33 by removing the DC cable recommended values, change DMC copper busbar layout, and descriptions related to DC cable recommended values in the solution section and update Figure 34 at item 7; 2. Update Figures 2, 4-1 and 13, to remove the frame reserved for the ventilation fan in the figures; 3. Update Figure 11 to show the spare parts may be placed at item 5.1.4; 4. Update Figure 18 to show the fire reserve power cable installation at item 5.3.3; 5. Added SolBank3.0 series description. 6. Add certification description and reference document information to Section 3.3.2	2025.4.24

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	7. Adjust the ordering of Figure 19 (Process Flow Chart) in Section 5.4.1. 8. Three signs have been added in Section 1.5 .	
SolBank 3.0 Installation Manual_V1.7	1. In Section 5.4.5, add an explanation of the number of cables clamped by the cable clamp on the DC side of the DMC Busbar Cabinet. 2. Revise Section 5.1.4, Replace the label in Figure 10 to indicate the number of DC cables clamped by the cable clamp.	2025.6.12
SolBank 3.0 Installation Manual_V1.8	1. Update the flowchart content in Figure 7 of Chapter 5. 2. Update the content of the process flow diagram in Section 5.4.1. 3. Update the description in section 5.5.5. 4. Update Appendix 4 of Chapter 8 by adding IR test record items. 5. Update the flow chart in Section 5. 6. Update the flow chart in Section 5.4.1. 7. Section 5.5.4: Delete Figure 29-2 and remove the cable connection procedure. 8. Section 5.5.5: Delete the description of cable insertion 9. Section 5.1.4: Add notes for single and double busbar to Figure 10. 10. Section 3.3.1: Add a description of the cabinet drainage design.	2025.7.29

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1.5 Document Safety Notices

Throughout this manual the below indicated Danger, Warning, and Caution labels are used to convey hazards associated with specific tasks and procedures. These safety notices do not represent all hazards present when performing a given task. Installers and operators of the SolBank3.0 series should adhere to industry safety best practices; site specific Environment, Health and Safety plans; and local safety requirements and regulations. *Only properly trained and qualified personnel should be permitted to complete the installation procedures identified in this manual.*



"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is limited to the most extreme situations. DANGER indicators are not used for property damage hazards unless personal injury risk appropriate to these levels is also involved.



"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury. WARNING indicators are not used for property damage hazards unless personal injury risk appropriate to this level is also involved.



"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION indicators without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.



Consult instructions for use.



Noise source



cTUVus certification

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1.6 Risk of Electric Shock



The primary risk associated with the installation of the SolBank3.0 series is electrical shock. *Installation and operational personnel will be exposed to voltages up to 1500 VDC from the SolBank3.0 series' battery packs.* Battery packs cannot be de-energized. 1500 voltage AC is also present - exposure levels will depend on site specific conditions. Risk of arc flash and electrocution is omnipresent at an ESS site. e-STORAGE encourages full compliance with the practices and procedures indicated in NFPA 70E including use of Personal Protective Equipment (PPE) sufficient to mitigate any hazards identified in a site-specific arc flash study.

Please refer to the remainder of this manual, the documents identified in Section 1.3, and a project/site specific EH&S plan for additional safety hazards.

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1.7 Product Certification and Compliance

SolBank3.0 series is compliant or have referenced following standards, regulations, and requirements identified in Table 1.

Table 1: SolBank3.0 series Standards Compliance

Classification		Regions	Standards
System	Design regulations	ALL	NEC – National Electrical Code® IEEE C84.1 – Standard Preferred Voltage Ratings for Alternating-Current Electrical Systems IEEE 693 – Recommended Practice for Seismic Design of Substations IEEE 1584-2018 – Guide for Performing Arc-Flash Hazard Calculations NFPA 855 – Installation of Energy Storage Systems NFPA 70E® – Standard for Electrical Safety in the Workplace® NFPA 72 – National Fire Alarm and Signaling Code IEC62933-5-2 – Safety requirements for grid-integrated EES systems - Electrochemical-based systems AS3000 - Electrical installations "Wiring Rules"
	Product certification	NA	IEC 60529 – Degrees of protection provided by enclosure UL 60730-1 – Standard for safety: Automatic Electrical Controls – Part 1:General Requirements NFPA 69® – Standard on Explosion Prevention Systems NFPA 68® – Standard on Explosion Protection by Deflagration Venting UL9540A – Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems UL1973 – Standard for safety: Batteries For Use In Stationary And Motive Auxiliary Power Applications UL9540 – Standard For safety: Energy Storage Systems And Equipment UN38.3 – Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria
	Product certification	EU	IEC62619 – Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications IEC63056 – Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems IEC/EN 62477-1 – Safety requirements for power electronic converter systems and equipment - Part 1: General IEC/EN 61000 – Electromagnetic compatibility (EMC)
Fire Protection and Safety	Design regulation	NA	NFPA 2001 – Standard on Clean Agent Fire Extinguishing Systems NFPA 15 – Standard for Water Spray Fixed System for Fire Protection NFPA 2-2023 – Hydrogen technologies code
		EU	BS 5839-1 – Fire detection and fire alarm systems for buildings BS 7273 -1 – Code of practice for the operation of fire protection measures

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			BS EN 54 Pt1- 21 – series for equipment **BS EN 15004-1:-2019 – Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance.** **BS EN 15004-2:2020 – Fixed Firefighting Systems-Gas Extinguishing Systems FK-5-1-12** **BS 6266:2011 – Fire protection for electronic equipment installations– Code of practice** **BS EN 12094-1:2003 – Fixed firefighting systems. Components for gas extinguishing systems Requirements and test methods for electrical automatic control and delay devices**
		AUS	**AS 4487-2013 – Condensed aerosol fire extinguishing systems – Requirements for system design, installation and commissioning and test methods for components** **AS 7240– Fire Detection and Alarm Systems** **AS1670 – Fire detection, warning, control and intercom systems – System design, installation and commissioning** **AS 1851-2012 – Routine service of fire protection systems and equipment**

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2 Acronyms and Abbreviations

AC - Alternating Current

AHJ - Authority Having Jurisdiction

BMS - Battery Management System

BOL - Beginning of Life

COG - Center of Gravity

DC - Direct Current

DMC - Distribution Management Cabinet

EMS - Energy Management System as the communication system that controls and monitors the SolBank3.0 series

EOR - Engineer of Record

ESS - Energy Storage System

EPC - Engineering, Procurement, and Construction contractor

HVAC - Heating Ventilation Air Conditioning

IFC - Issued for Construction

Installer - Installer of the SolBank3.0 series

LFP - Lithium Iron Phosphate

LOTO - Lock-Out-Tag-Out

NFPA - National Fire Protection Association

PCS - Power Conversion System (Inverter)

PPE - Personnel Protective Equipment

SPD - Surge Protection Device

SolBank3.0 series Controller - Local controller of the SolBank3.0 series BMS that communicates with the EMS

UPS - Uninterruptible Power Supply

MSD- Manual Service Disconnector

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3 Introduction

3.1 Acknowledgement

Thank you for purchasing the containerized SolBank3.0 series system supplied by e-STORAGE. The SolBank3.0 series is an advanced modular battery energy storage system incorporating industry leading capabilities enabled by cutting-edge technologies and innovative design. High energy density, liquid cooled battery and power electronics, extended service life, and advanced safety features are just a few of the attributes that set the SolBank3.0 series apart from other ESS products.

The SolBank3.0 series is fully factory integrated and tested at e-STORAGE's facility, arriving on site with battery racks populated and sub systems installed. This high level of pre-integration results in rapid installation, reduced EPC CapEx, and improved system performance and reliability.

The following document provides an overview of the SolBank3.0 series system and the installation steps required for successful integration with other system equipment and controls.

3.2 System Overview

The SolBank3.0 series system integrates all power electronics, controls, and safety features required to support the DC side of a battery energy storage system. An overview of the DC Pro layout and key features is shown in Figure 1-1 and further described in Table 3.

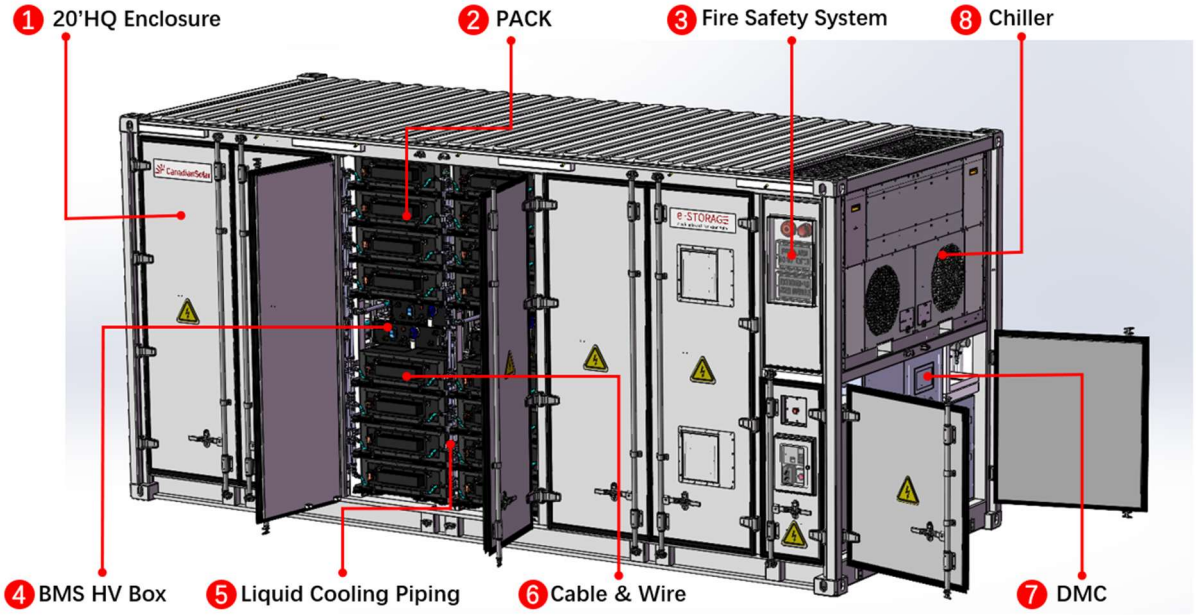


Figure 1-1: Layout and features of the SolBank3.0 series

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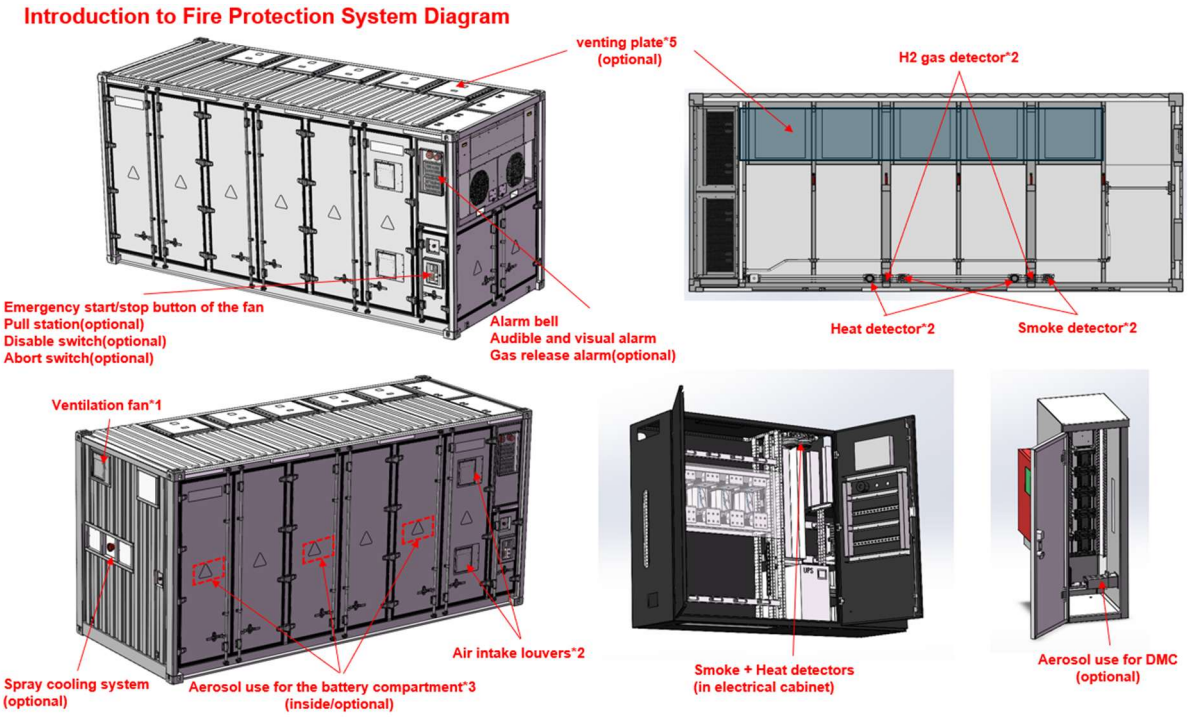


Figure 1-2: Layout and features of the SolBank3.0 series

Table 2: List of Fire Safety System equipment

	Name	Quantity	Remark
1	Fire Alarm Control Panel	1	Standard
2	Smoke detector	3	Standard
3	Heat detector	3	Standard
4	Audible and visual alarm	2	Standard
5	Alarm bell	1	Standard
6	H2 detector	2	Standard
7	Air intake louver	2	Standard
8	Ventilation fan	1	Standard
9	Emergency start/stop button of the fan	1	Standard
10	Aerosol use for the battery compartment	3	Optional
11	Aerosol use for DMC	1	Optional
12	Disable switch	1	Optional
13	Pull station	1	Optional
14	Abort switch	1	Optional
15	Gas release alarm	1	Optional
16	Venting plate	5	Optional
17	Spray cooling system	1	Optional

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Table 3: Key System Features

NO.	Name	Remarks
1	Standard Enclosure and Rack	All models of the SolBank3.0 series utilize a standard IP55 rated 20'ft HC container and battery rack design allowing for enhanced system modularity.
2	Pack	The SolBank3.0 series contains 48 Lithium Iron Phosphate (LFP) battery packs, each consisting of 104 series wired battery cells.
3	Fire Safety System	The SolBank3.0 series combines FACP, heat, smoke and gas detection with an explosion-proof ventilation system.
4	BMS HV Box	The SolBank3.0 series contains 12 BMS HV boxes. These are easily accessed for installation and maintenance within the middle line of the container. The BMS ensure optimal battery functionality and safety.
5	Liquid Cooling piping	The liquid-cooled piping connecting the chiller to the packs.
6	Cable & Wire	High-voltage connection and low-voltage communication power cable.
7	DMC	The Distribution and Control Cabinet houses all aux power distribution equipment including 2-hour backup UPS; system communication, control, and monitoring hardware including network switch, and Local EMS, and all required customer communication, signal, and aux power interfaces.
	Junction Box	The SolBank3.0 series' DC Junction box contains all primary DC busbar, fusing, Surge Protection Devices (SPD), and power monitoring required to safely exchanged power between the SolBank3.0 series and PCS.
8	Chiller	The SolBank3.0 series' liquid cooling/heating system facilitates improved battery temperature management efficiency relative to traditional forced air systems. Each battery pack is liquid cooled, allowing for greater heat dissipation and uniform cell temperature management. During charge and discharge, cell temperature is maintained between 20°C - 35°C.

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3.3 System Specifications

The SolBank3.0 series system includes two following different P-rate products, as shown in Table 4 below.

Table 4: SolBank3.0 series Specifications.

Item	Parameters	
Discharge Duration	2-hour	4-hour
Charge/Discharge P-rate	0.5P	0.25P
Nominal Capacity (kWh)	5016	5016
Initial Storage Capacity (kWh)	4700(For Centralized PCS)	4800(For Centralized PCS)
Operating DC Voltage Range (VDC)	1164.8 ~ 1497.6	
Recommended Discharge Power (kW)	2350(For Centralized PCS)	1200(For Centralized PCS)
# of LFP Battery Packs	48	48
# of BMS HV Boxes	12	12
Operating temperature	-30°C to 55°C (Ambient temperature)	

3.3.1 Dimension and Weight

The dimension and weight of SolBank3.0 series are presenting in the following figures. The weight may vary slightly with tolerance. Be sure to verify the approximate gross weight and center of gravity (COG), as shown in the Figure 2. For lifting procedure may refer to description of Section 5.1 and transportation cautions are clarified in other CSI e-STORAGE documents "Transportation Instruction" and "SolBank Transportation & Storage SOP"

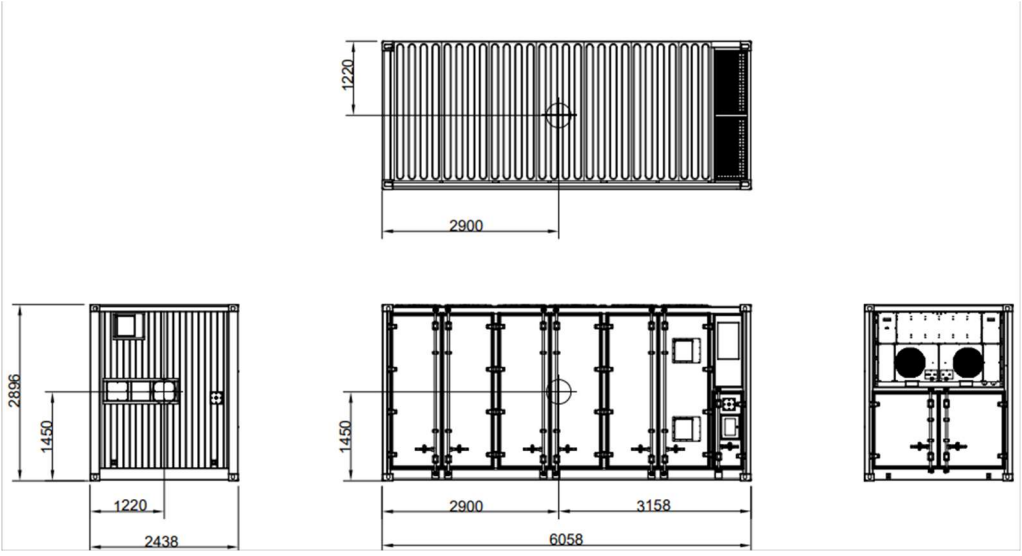


Figure 2 The Center of gravity of SolBank3.0 series(refer to Dwg NO. M170)

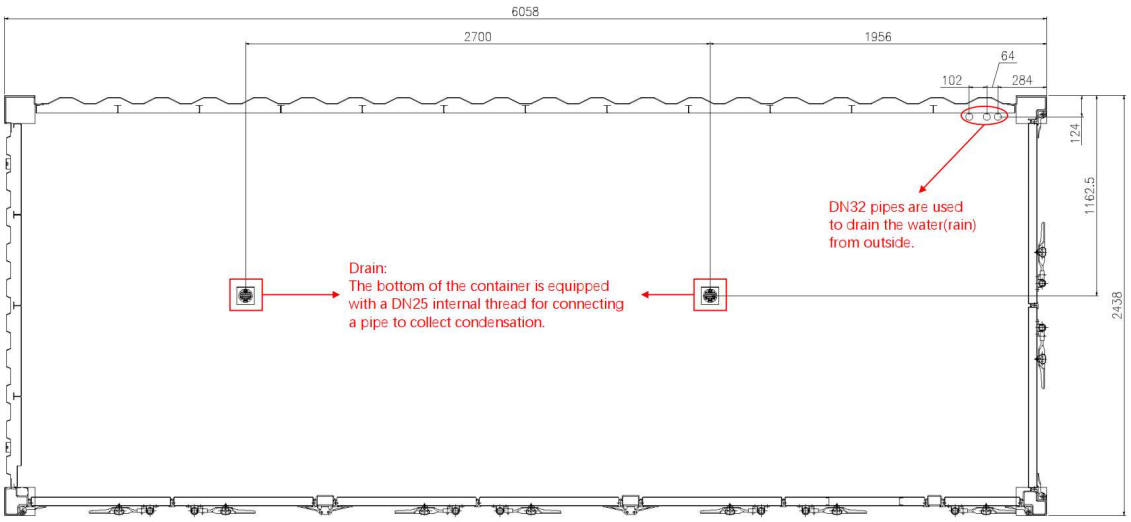
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Figure 3 The dimension of SolBank3.0 series

Product Version	*Length (mm)*	*Depth (mm)*	*Height (mm)*	*Approximate Standard Weight (kg)*
0.25P, 0.5P SolBank 3.0 series	*6058*	*2438*	*2896*	*43,000*

The bottom of SolBank3.0 series containers is equipped with two floor drains use for connecting a pipe to collect condensation and three DN32 pipes ues for drain the water from outside. When there is water inside SolBank, The water will go straight through the floor drain.



Top Section View of SolBank3.0

Figure 3-1: Drain design of SolBank3.0 series

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3.3.2 Site Layout and Clearances

The following sections provide guidance on the minimum equipment clearances and displacements required for maintenance and ventilation. Site designers and installers should always consult with the local agency having jurisdiction (AHJ) and fire department personnel regarding applicable codes and regulations, project-specific interpretations of NFPA 855, and other site safety and access considerations. Such project specific restrictions and requirements may increase required clearances beyond those noted below.

The SolBank3.0 series can be installed as a stand-alone unit or back-to-back with another SolBank3.0 series, as shown in Figure 4-1. The left side of SolBank3.0 series should keep no less than 1500mm(50.06”) for air exhaust distance, maintenance of the liquid cooling piping and safety channel distance. The right side of SolBank3.0 series should keep no less than 2500mm(98.43”) for maintenance of the chiller. If the top is covered, the top clearance should be greater than 3000mm to ensure that the chiller has enough space to dissipate heat.

When mounted back-to-back, the clearance between adjacent SolBank3.0 series surfaces must not exceed 250 mm (9.8”). This dimension is limited by the SolBank3.0 series attachment hardware ("Bridge lock") used for back-to-back mounting. However, a clearance of from 20(0.79”) to 150 mm (5.91”) between SolBank3.0 series is recommended. When SolBank3.0 series are installed back-to-back with the bridge lock, then only four anchor brackets are required, one bracket in each corner and bridge locks fitted linking the back-to-back SolBank3.0 series.

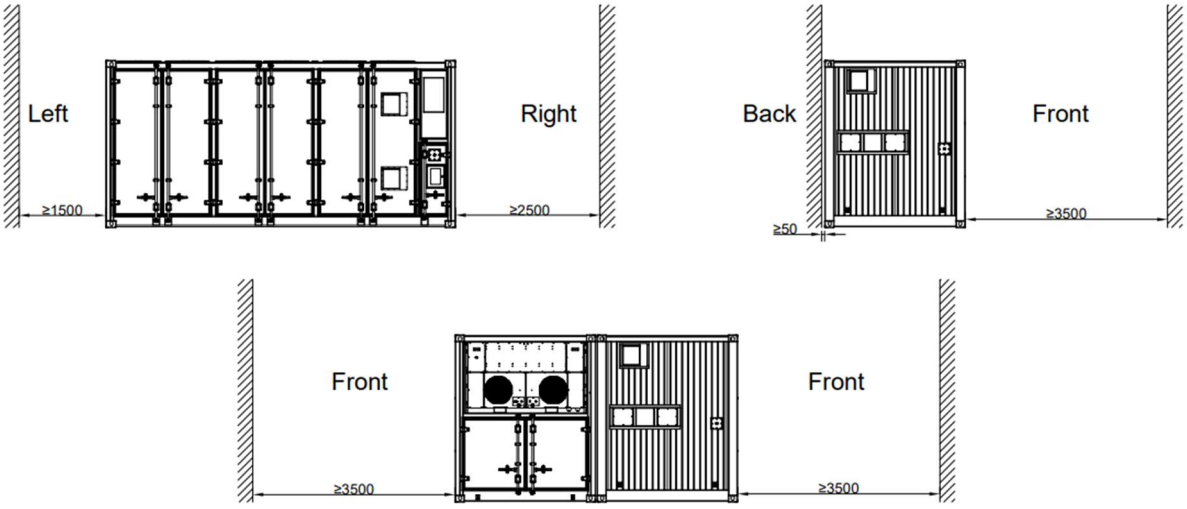


Figure 4-1: SolBank3.0 series recommended clearances (refer to Dwg NO. M110)

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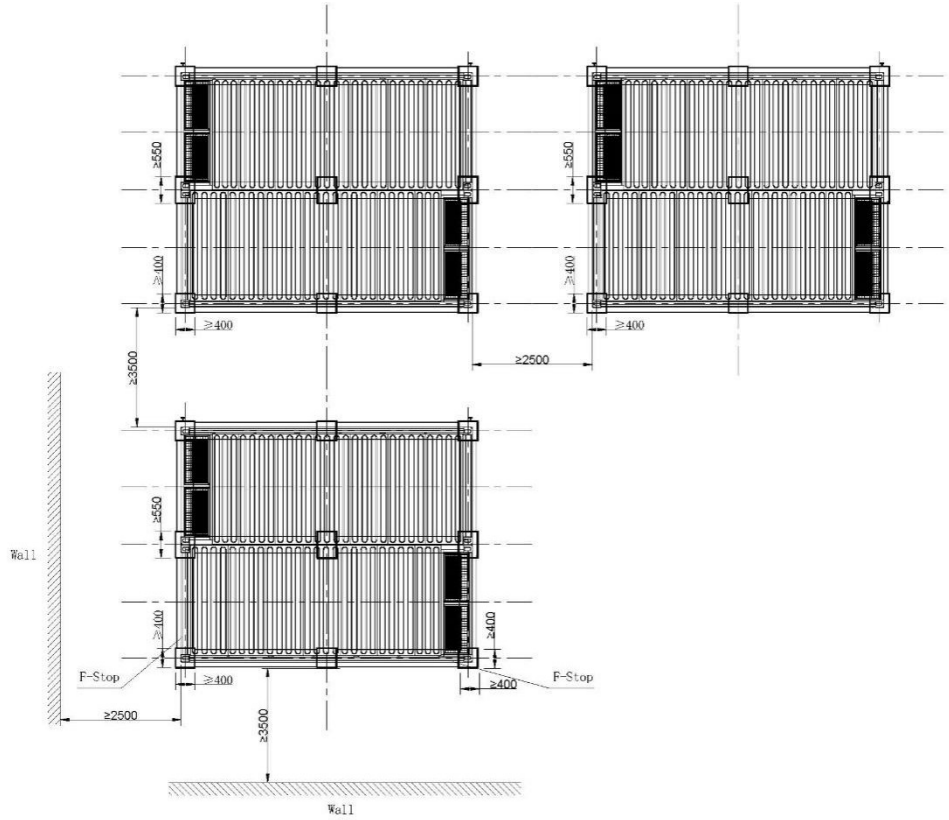


Figure 4-2: SolBank3.0 series recommended clearances for side by side(refer to Dwg NO. M140)

The “front” side of the SolBank3.0 series housing the access doors must always have a clear 3500mm (138”) between the SolBank3.0 series’ surface and all obstructions. This clearance is required to ensure sufficient space for door swing(811mm/31.93”), replacement of battery packs, and movement of equipment and personnel(3180mm/125.25”).
When SolBank3.0 series units are placed side by side, they must maintain a minimum clearance of over 2500mm (98.43”) between them to accommodate fast stop buttons and maintenance and operating procedures. This distance should be confirmed by the figures from different projects.

Note:

1. Spacing of SolBank3.0 series units to be revised due to specific project required. We will not make spacing changes in this standard drawing.
2. The 9540A certification has been completed. Please refer to the relevant documentation (TR No. CN24M32L 001, Organization: TÜV Rheinland (Shangai) Co., Ltd., Date: 2024/06/28).

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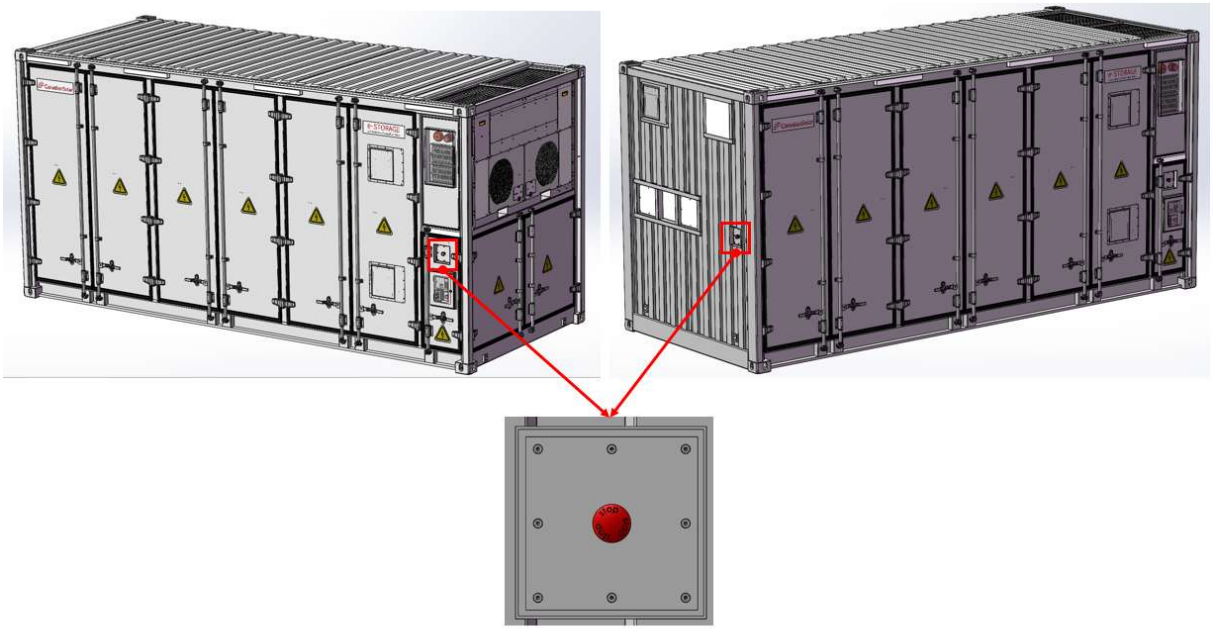


Figure 5: The location of F-stop button

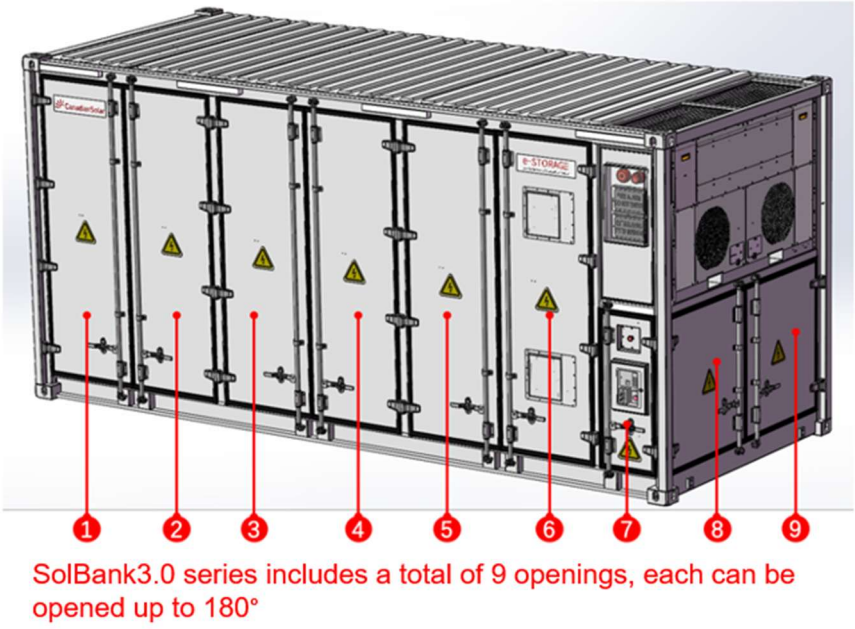


Figure 6: Description of container door opening angle

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4 Pre-Installation Procedures

4.1 Engineered System Design

The SolBank3.0 series design has been fully evaluated and optimized by e-STORAGE's engineers to ensure safety and performance. Likewise, the integration of SolBank3.0 series with other key ESS components (PCS, switchgear, transformers, grounding systems, auxiliary power, etc.) required project specific engineering review.

An engineering design package should be completed by an Engineer of Record (EOR) in the state where the project is located prior to the equipment being shipped to the site and installed. This design package should include the complete set of civil, structural and electrical drawings and studies required for a safe, reliable and code compliant ESS installation. All installers should have access to the drawings issued for construction.

All applicable SolBank3.0 series design documents shall be provided to the EOR prior to the start of the ESS design phase.

Note: If the directions and contents in this manual differ from project specific design documentation, please contact e-STORAGE for support and advisement.

4.2 Pre-installation Checklist

Before starting the installation of SolBank3.0 series, please make sure to review, check and complete the following items. Please note that the pre-installation checklist below may not represent a complete list of all items that need to be checked or completed prior to installing SolBank3.0 series. The following is provided as general advice only.

4.2.1 Safety

- ☐ All personnel have proper PPE as dictated by the project specific EH&S plan and safety guidance.

4.3 Tools, Equipment and Material Preparation

The following section provides an overview of key equipment and materials that may be required for installation of the SolBank3.0 series and integration with other ESS equipment at the project site. The items indicated in Table 5 are not included within the SolBank3.0 series or accompanying Installation Parts and must be procured or obtained separately. Further details regarding equipment and materials are provided in Section 5.5.

Note, Table 5 is provided for planning purposes only and does not reflect all tools, equipment, and construction commodities necessary for a complete installation. Always refer to project specific design documentation for specific details regarding integration of the SolBank3.0 series with other ESS equipment and the project specific EH&S plan regarding required PPE.

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- ☐ Codes and regulations
- ☐ A safety briefing is held for the specific installation procedures being undertaken
- ☐ All personnel are properly qualified and licensed to perform the installation procedures being undertaken
- ☐ A lifting plan has been completed for offloading and placement of SolBank3.0 series containers and other heavy equipment
- ☐ The site is clean, orderly and all hazards have been mitigated to the extent possible and required by law
- ☐ All lock-out-tag-out (LOTO) is complete if required
- ☐ Working areas have been properly isolated using marking tape, fencing, and signage as appropriate

4.3.1 Site Civil

- ☐ Foundations have properly cured
- ☐ Foundation dimensions reflect SolBank3.0 series dimensional requirements and those indicated in the site IFC civil documentation
- ☐ Foundation levelness is within required tolerances, The flatness after leveling does not exceed 0.002L
- ☐ Power, communication, and signal cable conduit stub-ups are located within required tolerances and properly labeled
- ☐ Grounding grid stingers are installed and located within required tolerances and ground grid has been properly tested

4.3.2 Other

- ☐ Weather is appropriate for installation procedures
- ☐ All required permits and approvals have been obtained
- ☐ Equipment siting and clearance requirements identified in Section 4.3.2 are maintained
- ☐ Site Auxiliary power distribution equipment has been installed and is energized, or ready to be energized in support of SolBank3.0 series safety and temperature management systems

Table 5: Recommended installation PPE, tools, equipment, and materials

Item	Remarks
Basic PPE	
Hard hat	To protect head from impacts from falling objects and other hazards
Safety gloves	To protect hands against cuts, abrasion, and other hazards
Safety glasses	To protect eyes from contact with foreign objects and airborne debris
Safety toe boots	To protect feet from heavy objects and equipment
Hearing protection	To protect ears from loud noises generated by machinery and other tools
High visibility vest	To ensure all personnel are seen by equipment operators

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Specialty PPE	Arc flash PPE, fall prevention harnesses, and other hazard specific PPE as required by the site conditions and the site EH&S manager or local laws and regulations
First-aid Kit	Basic first-aid kit. To include eye wash station.
Equipment and Tools	
Crane	Crane (and support personnel) meeting capacity and reach requirements as identified in the project specific lifting plan
Forklift	Required for pallet receiving and the movement of equipment and materials around the site.
Roto hammer	Used for drilling anchor bolt holes in foundations
Impact driver & drills	Used for fastener installation and equipment mounting and installation
Wrenches	To include torque wrench. Used for installation of DC cable copper lugs and other equipment. Torque wrench should be calibrated before use. Insulated tools should be used.
Wire crimpers	To include appropriate die for all lugs used. Should be calibrated before use. Insulated tools should be used.
Screwdrivers	Used for installation of auxiliary power supply cable and signal wire terminals and other equipment. Insulated tools should be used.
Multimeter	To include long leads and high DC voltage capability. Recommend specification: FLUKE-15B. Should be calibrated before use.
Unpacking equipment	Knives, scissors, crowbar, hammer, etc.
Ladder	Used to access the roof of the SolBank3.0 series. Minimum length should be 5M (16.4ft). Ladder should meet OSHA and EH&S plan requirements
Pallet jack	Used for equipment receiving
Portable generator	Used to operate equipment while aux/temp power supply is de-energized.
Key Installation and Integration Materials	
DC Cable	DC conductors connecting the SolBank3.0 series to the DC side of the ESS's PCS. To include required lugs.
Auxiliary Power Supply Cable	Conductors connecting the site aux power supply to the aux power terminals of the SolBank3.0 series. To include required lugs
Communication Cable	Cable facilitating communication between the SolBank3.0 series, other SolBank3.0 series, and the customers EMS (Energy Management System). To include terminations
Signal Wire	Cable transmitting contactor and relay signals between the SolBank3.0 series, other SolBank3.0 series, and the customers EMS. To include terminations
Grounding Cable	Cable connecting a dedicated site grounding grid stinger to the SolBank3.0 series' ground bus. To include required lugs
Misc items	Shims, cable ties, conduit fittings, duct seal, caulking, labels, and other construction commodities.

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Twist Lock	Used for anchoring SolBank3.0 series to the foundation. Recommended for all regions, but necessary for high seismic zones.
Bridge Lock	Used for connecting adjacent SolBank3.0 series' when installed back-to-back.

4.4 SolBank3.0 series Receiving and Inspection

This section details initial receiving and inspection processes that must be completed prior to initiation of installation procedures. The SolBank3.0 series will arrive on site as two separate deliveries. One delivery will consist of the SolBank3.0 series container itself, and all components within that are factory installed. The other delivery will consist of Installation Parts as identified in Annex 2. Contact the shipping company to confirm shipping weights prior to equipment arrival and offloading.

4.4.1 Precautions



The SolBank3.0 series will arrive on site with batteries installed and partially charged. Risk of electrocution exists. Exercise extreme caution.



Equipment may shift during transport and may be unstable. Use caution when approaching and inspecting.



PPE is required when removing equipment packaging. Refer to EH&S plan for task specific requirements.



Forklifts and other heavy equipment should only be operated by qualified personnel with support from spotters and other required support personnel.

4.4.2 Installation Parts Receiving

The Installation Parts inventory consists of equipment, parts, and materials, supplied by e-STORAGE, that must be field installed as part of the SolBank3.0 series installation process. Installation Parts will arrive on site within a wooden crate. This crate should be inspected for signs of damage prior to being opened. After opening the wooden crate, inspect contents and confirm all items identified in Annex 1 are included within.

If damage is observed, take photos and note specific damage on shipping company's documentation prior to delivery driver leaving the site. e-STORAGE is not responsible for shipping damage unless the above steps are completed.

4.4.3 SolBank3.0 series Receiving

The SolBank3.0 series will arrive on-site on a flatbed trailer. Upon arrival, remove the protective

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wrapping to facilitate inspection of the SolBank3.0 series. Note, Installer may opt to leave other protective elements in place to protect the SolBank3.0 series during lifting procedures. Proceed with a detailed inspection of the SolBank3.0 series' exterior, looking for signs of impact with other devices, or other damage resulting from transport stresses.

Under the advisement of the site safety manager, open the SolBank3.0 series' doors with the key placed at the fast stop button. And inspect internal systems for signs of damage. Examine for indications of leaks in the coolant distribution system, damage to racks or other equipment, or shifting of secured items within. Ensure that all doors open and close freely and are fully secured prior to offloading.

If evidence of damage is found do not proceed with offloading the SolBank3.0 series until first contacting a e-STORAGE representative and documenting such damage.

4.5 Other Key ESS Equipment

Operation of the SolBank3.0 series is enabled via the installation of several other pieces of customer provided key equipment. The spec of such equipment is outside the scope of this manual and should be developed in collaboration with the project EOR and other design personnel to ensure compliance with project requirements.

Provided below is a list of key ESS equipment typically included in traditional ESS architecture and notable requirements for integration with the SolBank3.0 series. Prior to integrating the SolBank3.0 series with such equipment, Installer should verify appropriateness of specification.

4.5.1 Power Conversion System (PCS)

A bi-directional PCS (Inverter) is required to facilitate charging and discharging of the SolBank3.0 series' battery bank. The PCS converts AC power to DC power during charge mode; and DC power to AC power during discharge mode. The PCS should be sized per the model of SolBank3.0 series installed and the power requirements of the project including any point of interconnection constraints.

Specific SolBank3.0 series PCS requirements:

1) The DC input voltage range must be wider than that of the SolBank3.0 series. See Table 4 for further details.
2) The common mode voltage of the PCS DC side should be less than 1500V.
3) The charging current ripple of PCS DC output should be less than 5%, and the charging voltage ripple should be less than 3%.
4) The PCS should be capable of responding to BMS charge/discharge current limiting signals.
5) The PCS must have a capacitor pre-charge circuit.

4.5.2 Auxiliary Power Distribution

A dedicated auxiliary power feed must be obtained in support of ESS aux loads such as HVAC equipment, controls and communication devices, and other SolBank3.0 series internal components.

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Typically, auxiliary power equipment includes a dedicated transformer, metering, power distribution bus bar and circuit protection.

Black start solution, please refer to User Manual at section 6.3.6 Black Start Mode (Optional Function).

Specific SolBank3.0 series auxiliary power requirements:

Energy Consumption @ ℃ of 0.25P SolBank 3.0				
	Rated DC load full charge discharge cycle		Idle load	
Temperature (°C)	Peak Power (kVA)	Average Energy Consumption (kW)	Peak Power (kVA)	Average Energy Consumption (kW)
-30	22.66	3.00	22.66	3.35
-15	22.66	4.55	22.66	2.64
0.00	22.66	6.70	22.66	1.94
25.00	22.66	8.01	22.66	0.76
45.00	22.66	13.42	22.66	1.21
55.00	22.66	15.08	22.66	1.72

Energy Consumption @ ℃ of 0.5P SolBank 3.0				
	Rated DC load full charge discharge cycle		Idle load	
Temperature (°C)	Peak Power (kVA)	Average Energy Consumption (kW)	Peak Power (kVA)	Average Energy Consumption (kW)
-30	39.33	6.83	39.33	3.83
-15	39.33	8.82	39.33	3.01
0.00	39.33	18.24	39.33	2.18
25.00	39.33	29.93	39.33	0.80
45.00	39.33	31.62	39.33	1.25
55.00	39.33	30.56	39.33	1.60

The table above is the energy consumption containing 1 chiller, 1 DMC AC, 2 dehumidifiers. If a specific project needs to add the third dehumidifier, please refer to the aux consumption shown in the table below.

Dehumidifier				
	Rated DC load full charge discharge cycle		Idle load	
Temperature (°C)	Peak Power (kVA)	Average Energy Consumption (kW)	Peak Power (kVA)	Average Energy Consumption (kW)
-30	0.26	0.00	0.26	0.00
-15	0.26	0.00	0.26	0.00
0.00	0.26	0.00	0.26	0.00
25.00	0.26	0.15	0.26	0.00
45.00	0.26	0.23	0.26	0.00
55.00	0.26	0.23	0.26	0.00

Critical Loads – SolBank 3.0, 0.25P & 0.5P					
Item	DMC Fan	FSS	BMS	24V power	DMC Control
Max continuous active power(kW)	0.175	0.865	1.285	0.1	0.1

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Max continuous apparent power(kVA)	0.22	1.02	1.29	0.11	0.11
Max continuous aux load rating(kVA)	2.75				

5 Installation

The following sections outline the installation procedures required to fully install and integrate the SolBank3.0 series into the ESS project site. Figure 7 below provides an overview of the SolBank3.0 series installation process. These steps must be followed sequentially and be performed by qualified personnel.

During each step of the installation, safety is of paramount importance. Please note all safety hazards described in this section and adhere to the project specific EHS plan.

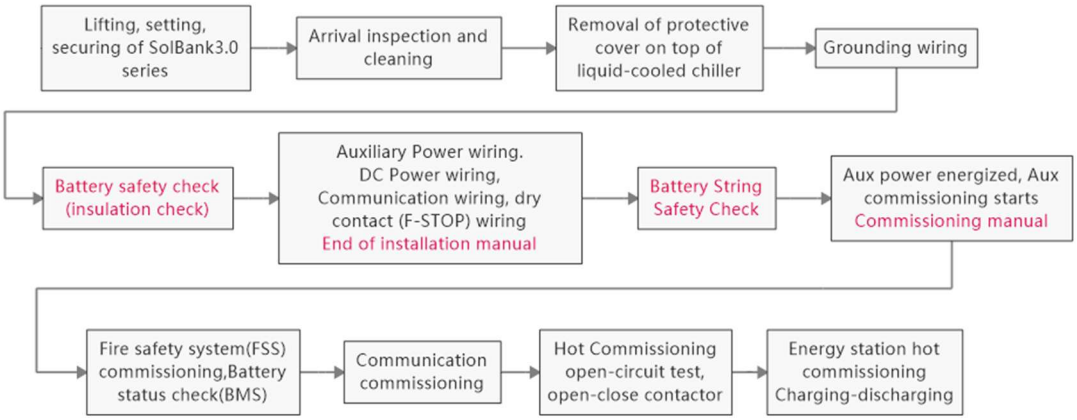


Figure 7: SolBank3.0 series Installation Process Overview

5.1 Lifting, Setting, and Securing the SolBank3.0 series

This section details the procedures and tasks required to set and secure the SolBank3.0 series on site foundations.

5.1.1 Workflow

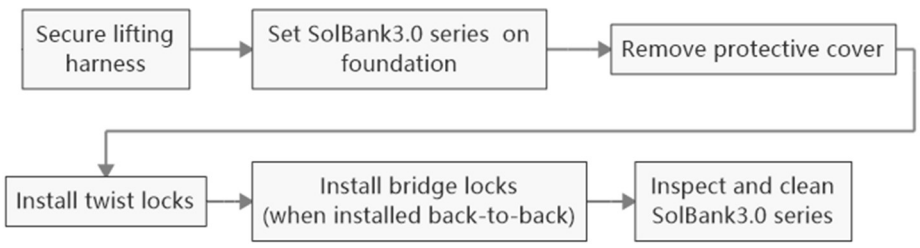


Figure 8: SolBank3.0 series lifting and placement.

Note: Bridge wares indicated in step 5 above is only required in back-to-back installations. See Section 6.1.5 below for more details.

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5.1.2 Recommended Tools and Equipment

Table 6: Recommended tools and equipment

Name	Purpose	Remark
Bridge lock	Used for connecting adjacent SolBank3.0 series' when installed back-to-back.	2 pieces per back-to- back installation. Provided by e-Storage
High-Capacity Crane	Used for lifting the SolBank3.0 series system from delivery truck to foundations	Size to be determined by lifting plan. Dependent on required reach of arm and other site specifics. Provided by Installer
Concrete expansion bolts and nuts	Used for anchoring SolBank3.0 series to foundations	8 pieces per two SolBank3.0 series for back-to-back installation. 4 pieces per SolBank3.0 series for Stand-alone installation; Specification per EOR design; Provided by Installer.
Twist lock	Used for anchoring SolBank3.0 series to the foundation. Recommended for all regions, but necessary for high seismic zones.	8 pieces per two SolBank3.0 series for back-to-back installation 4 pieces per SolBank3.0 series for Stand-alone installation; Provided by e-Storage.
Roto Hammer	For drilling holes in foundation	Provided by Installer.
Torque Wrench	For securing expansion bolts and Bridge lock	Provided by Installer.
Ladder	For SolBank3.0 series roof access	Provided by Installer.
PPE	Basic PPE and proper fall protection	Provided by Installer.
Misc. items	Other tools and equipment that might be needed for this process	Provided by Installer. Shims, cable ties, conduit fittings, duct seal, caulking, labels, and other construction commodities.

5.1.3 Precautions



The SolBank3.0 series will arrive on site with batteries installed and partially charged. Risk of electrocution exists. Exercise extreme caution.



All tasks described in this Section must be performed by appropriately qualified personnel.



A task-specific lifting plan must be developed by qualified personnel and reviewed with all participating individuals prior to removing SolBank3.0 series from the flatbed trailer

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and setting on foundations. Shipping weight should be used to verify design weight and crane selection.



PPE is required during all stages of this process. Refer to EH&S plan for task-specific requirements.



Forklifts and other heavy equipment should only be operated by qualified personnel with support from spotters and other required support personnel.



When working on top of the SolBank3.0 series, or other elevated locations, personnel should be equipped with appropriate fall protection.



When working on top of the SolBank3.0 series, personnel should refrain from stepping on air vents and other sensitive components.

5.1.4 Lifting and Setting Procedure

- ✓ Step 1: Clearly mark the foundations where the SolBank3.0 series shall be located. Special care should be taken to confirm the precise location of conduit stubs and grounding stinger.
- ✓ Step 2: Identify the “front” side of the SolBank3.0 series (the side with the logo and all access doors) and ensure lift equipment is setup such that the front of the SolBank3.0 series can be placed in accordance with site design documentation.
- ✓ Step 3: Identify the SolBank3.0 series identification number and ensure that each SolBank3.0 series is placed on the appropriate foundation in accordance with site design documentation.
- ✓ Step 4: Attach lifting harness with equipment on the 4 lifting points identified in Figure 9 as per the task-specific lifting plan. This lifting plan is to be developed by qualified personnel in collaboration with site safety personnel and crane operators.
- ✓ Step 5: Remove from trailer and set on foundation were indicated by location markings. Take special care to ensure conduit stubs enter the SolBank3.0 series in the correct location. See Figure 10. Conduits will penetrate special glands in the SolBank3.0 series which prevent ingress of animals, insects and external debris. Add shim as required until level.
- ✓ Step 6: After removing the lifting harness, remove all remaining protective packaging and recycle.
- ✓ Step 7: Open the door of DMC AUX cabinet and the FACP cabinet , as shown in Figure 11. You will find out packing boxes, with a total of 48 MSD, bridge lock, self-painting and other parts.

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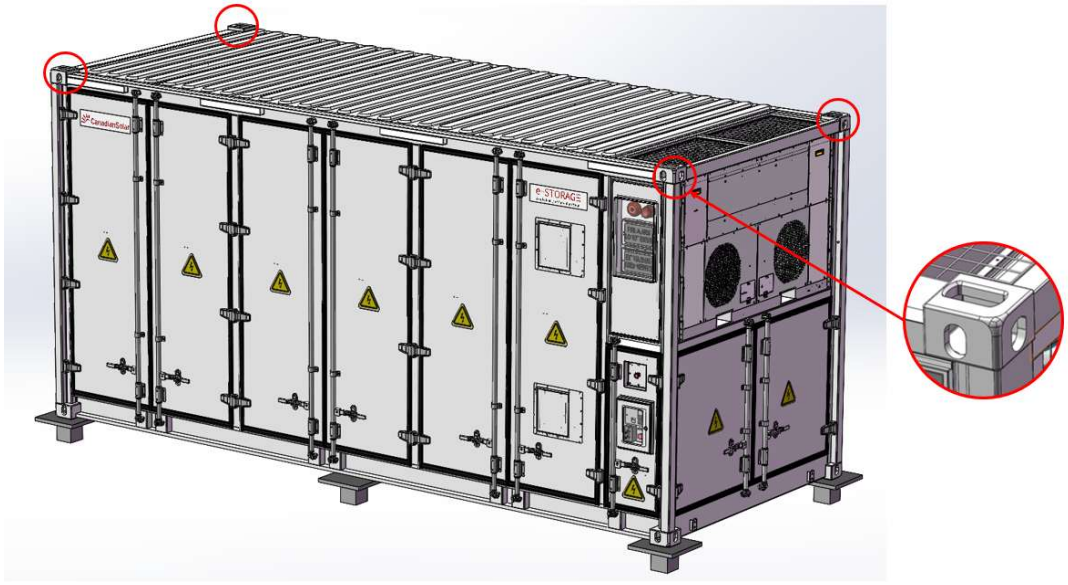


Figure 9-1: Location of SolBank3.0 series lifting points

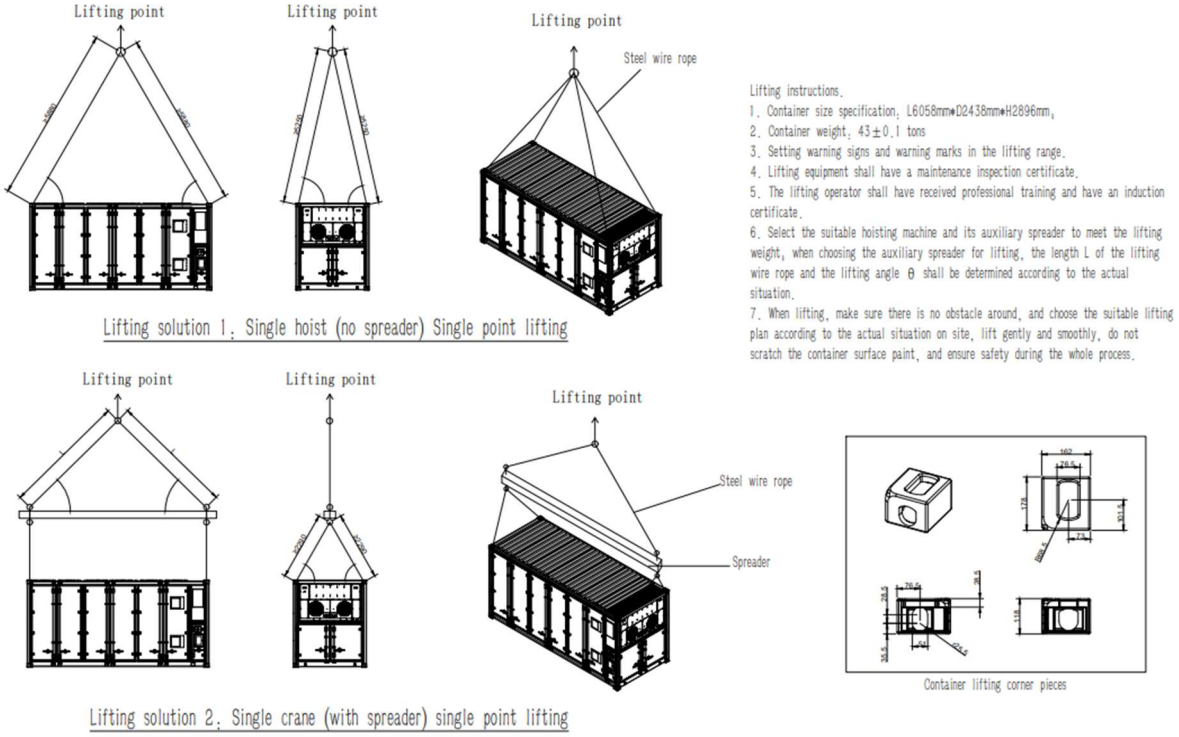
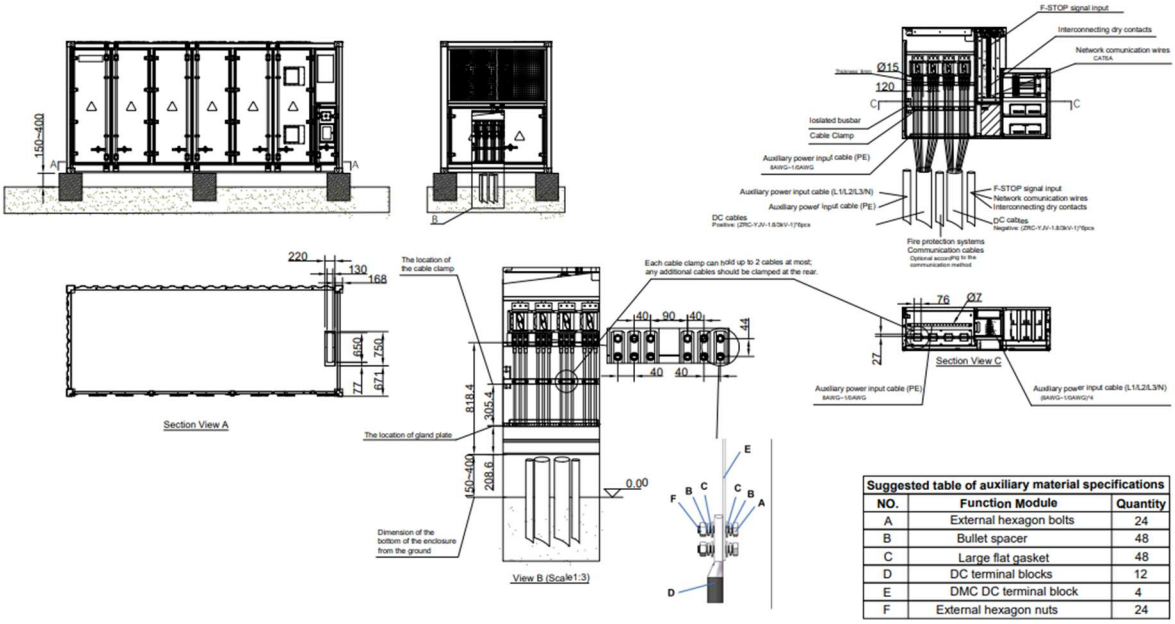


Figure 9-2: SolBank3.0 series Container Lifting Program (refer to Dwg NO. M180)

（Before lifting, 15mm steel plate should be placed in advance at the location shown to fill the support gap.）

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Suggested table of auxiliary material specifications		
NO.	Function Module	Quantity
A	External hexagon bolts	24
B	Bullet spacer	48
C	Large flat gasket	48
D	DC terminal blocks	12
E	DMC DC terminal block	4
F	External hexagon nuts	24

Figure 10: Foundation Conduit Stub-ups(Centralized PCS)
(refer to Dwg NO. M310-SolBank3.0 -SolBank external interface diagram-Single Bus
Or M310-SolBank3.0 -SolBank external interface diagram-Split Bus)

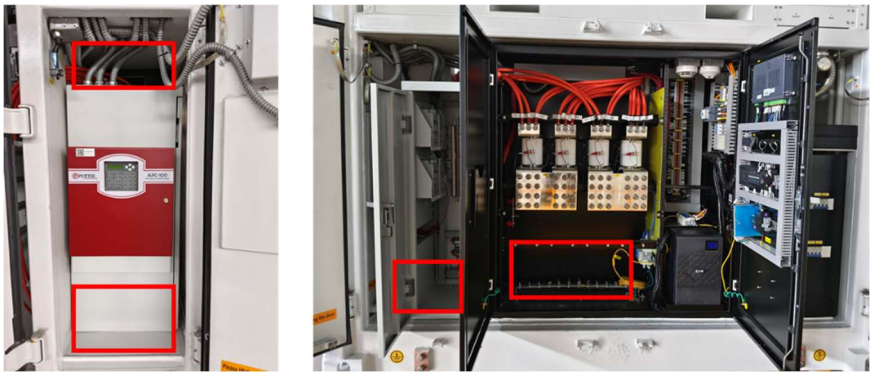


Figure 11: The red boxes in the picture indicate the possible positions where the spare parts may be placed.

5.1.5 Anchoring and Securing Procedure

✓ Step 1: Secure base of SolBank to foundation using concrete expansion bolts and twist locks as shown in Figure 12 and Figure 13. For back-to-back installation, 8 twist locks are recommended (4 per SolBank) but four is also acceptable in low seismic areas, one per corner with bridge locks. For a stand-alone installation, it is recommended that 4 twist locks also be installed. The EOR shall perform an engineering review of anchoring design to ensure compliance with local AHJ requirements and regional seismic activity. The base of the steel frame structure can also be used for welding and fixing, which needs to be treated with rustproof paint after welding.

Note: Expansion bolts shall be provided and installed by the Installer on site according to the design by the EOR.

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✓ Step 2: For back-to-back installations, the top back edge of adjacent SolBank3.0 series must be connected at the 2 locations shown in Figure 14 using the Bridge lock shown in Figure 15.

Note: The bridge lock is designed to accommodate gap between SolBank3.0 series units that are installed back –to-back for <250mm (9.8”). Bridge locks should be tightened to a torque of 300 NM. During this step, the installer must not step on top of the roof. Rooftop maximum weight (less than 500 kg per m^2).

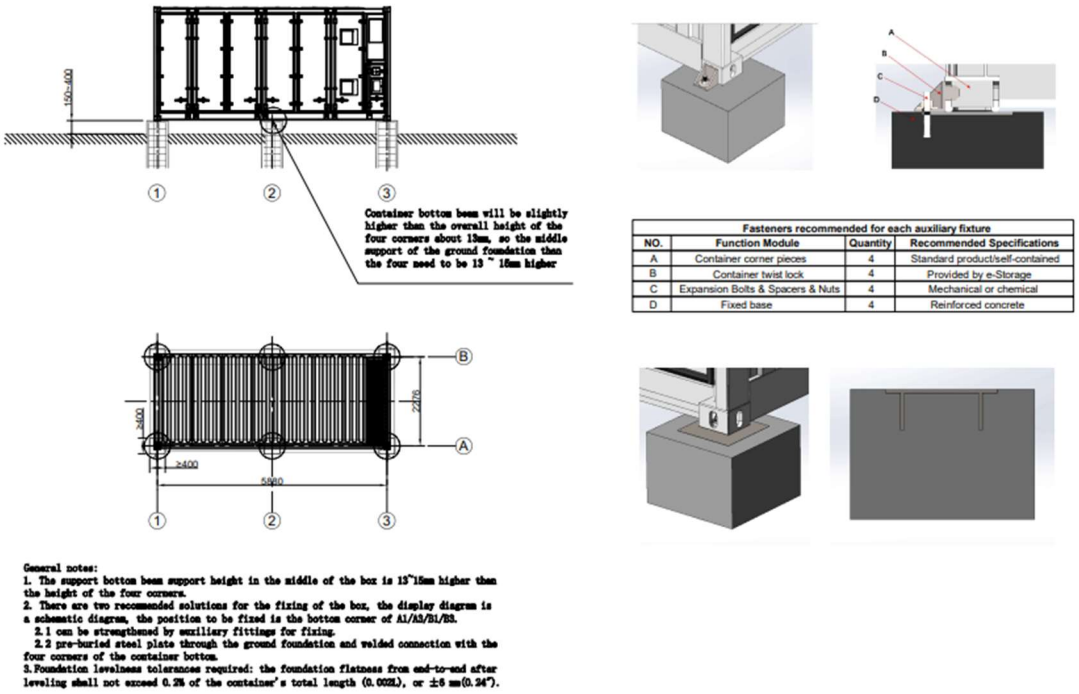


Figure 12: SolBank3.0 series anchoring in corner position. Refer to details for site specific design by EOR. (refer to Dwg NO. M150)

（Depending on the PACK removal tooling and the height of F-stop, the support height should be 150mm to 400mm, which needs to be confirmed with e-STORAGE.）

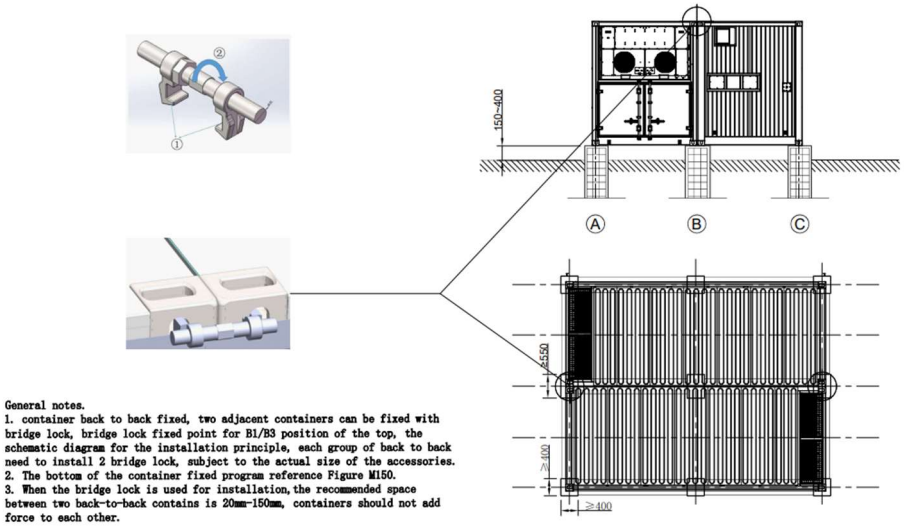


Figure 13: Location of anchoring hardware and Bridge Lock for back-to-back SolBank3.0 series installation. Refer to details for site specific design by EOR. (refer to Dwg NO. M160)

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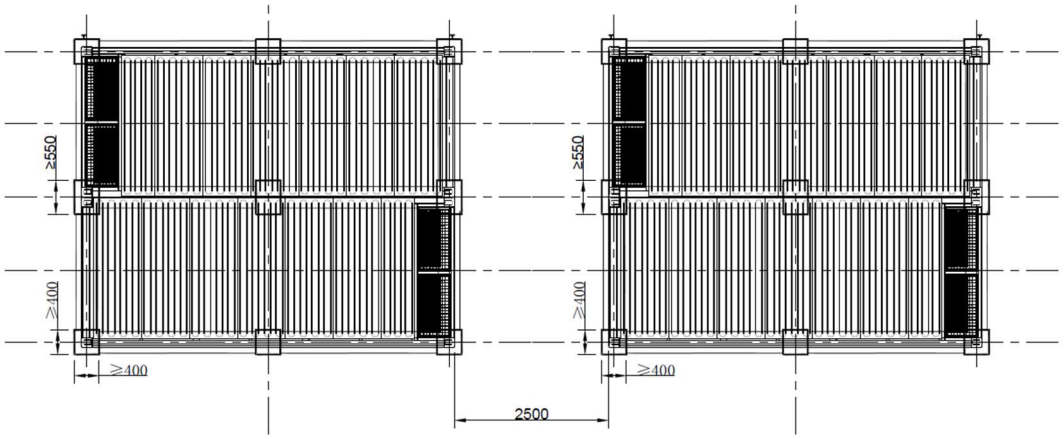


Figure 14: Space between SolBank3.0 series Installation . Refer to details for site specific design by EOR.

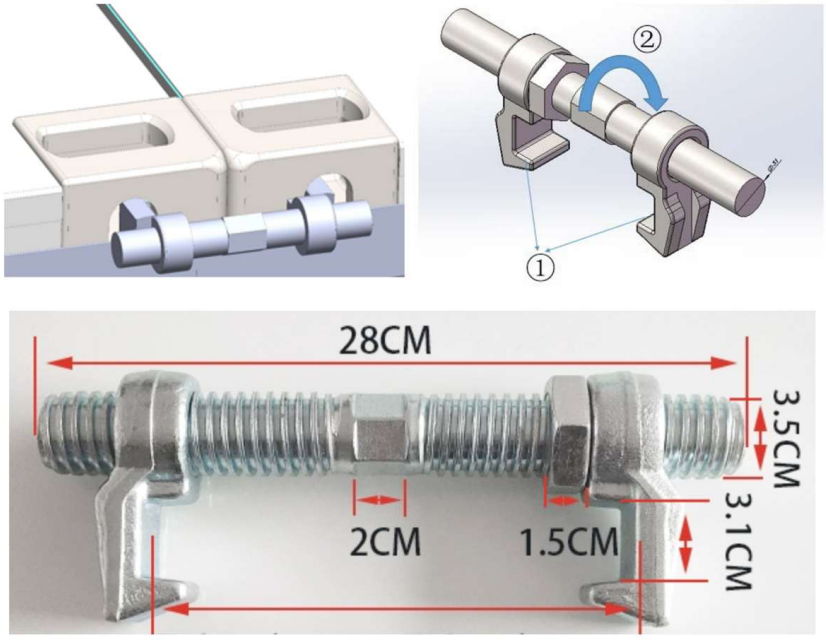


Figure 15: Installation effect of Bridge Lock. Refer to details for site specific design by EOR.

5.2 Arrival Inspection and Cleaning

5.2.1 Inspection and Cleaning

After completing the above steps, SolBank3.0 series should be thoroughly inspected again to ensure that no damage occurred during transportation and unloading. In addition, dust and debris accumulated during transportation should be removed, especially from areas of the SolBank3.0 series that are unsafe to handle during operation, if it is safe to do so. Please note that and the recommended minimum protection level is PPE-1. The battery is energized. Use it with special care.

Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

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5.2.2 Coolant Pipelines Inspection

Special care should be taken during this inspection to ensure no damage to the coolant distribution lines was incurred during transport. The cabinet floor should be inspected for standing liquid or other signs of leaks. Additionally, transport lines should be visibly inspected for the presence of accumulated droplets, kinking, or other damage. Please refer to the SolBank3.0 series Maintenance Manual for further details regarding the location and routing of the distribution lines and system pressure gauge.

5.2.3 Desiccants removal

When the above is completed, desiccants should be removed by EPC. The installation location of desiccants is shown in the figure 16. A ladder maybe necessary to be helpful to remove desiccants.

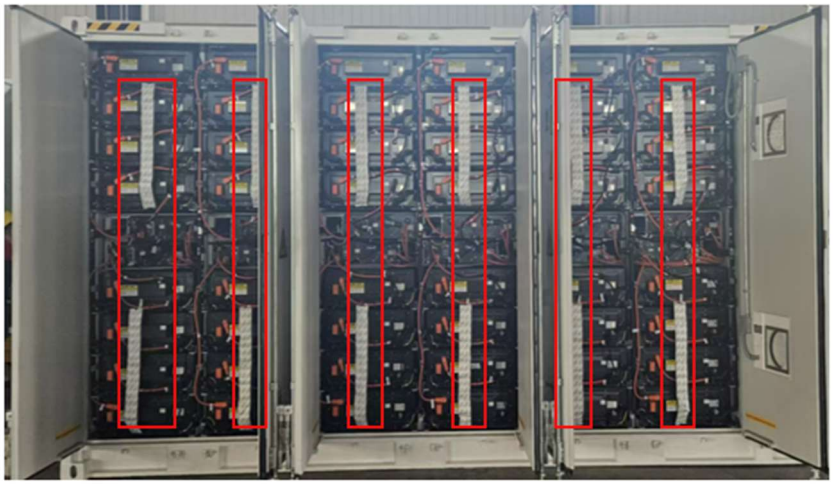


Figure 16: The installation location of desiccants

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5.3 Fire Alarm Panel Wiring

This section details the fire system panel wiring and networking of different versions of SolBank3.0 series.

5.3.1 Recommended and Equipment

Table 8: Recommended and equipment

Name	Purpose	Remarks
Screwdriver	Electrician flat head screwdriver, Phillips screwdriver	Provided by Installer
PPE	Basic PPE	Provided by Installer
SFP Modules and Fiber optic cable	For NCF-1000 NIC networking (for Potter Control Host solution)	Provided by Installer (Select according to the networking method)
Network cable and super category 6 network cable connectors	For NCE-1000 NIC networking (for Potter Control Host solution)	Provided by Installer (Select according to the networking method)
VM100 Input and output modules	For ADVANCED monitoring host networking	Provided by Installer (Select according to the networking method)

5.3.2 Precautions



The SolBank3.0 series will arrive on site with batteries installed and partially charged. Risk of electrocution exists. Exercise extreme caution.



All tasks described in this Section must be performed by appropriately qualified personnel.



PPE is required during all stages of this process. Refer to EH&S plant for task-specific requirements.



The battery backup for the fire control panel during transportation will be removed and packed separately to avoid unnecessary hazards during transportation. Refer to the step below for the installation location of the battery backup.

5.3.3 Procedure

Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

Wiring and connection of communication cables:

- ✓ Step 1: According to the different communication methods of the fire alarm system, different communication cables and connectors are configured, which can be referred to Figure 17-1 and Figure 17-2.
- ✓ Step 2: Refer to Figure 17-3 for the communication cable path to show the wiring connection.

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Wiring and connection of communication cables:

Battery backup wiring:

- ✓ Step 1: Complete AUX power
- ✓ Step 2: Prepare the negative power terminal connection in the fire cabinet Figure 18 .
- ✓ Step 3: After completing the wiring for power supply, the fire control panel will enter the charged state and can be connected to the utility power supply after confirming that no other detectors have alarm signals.

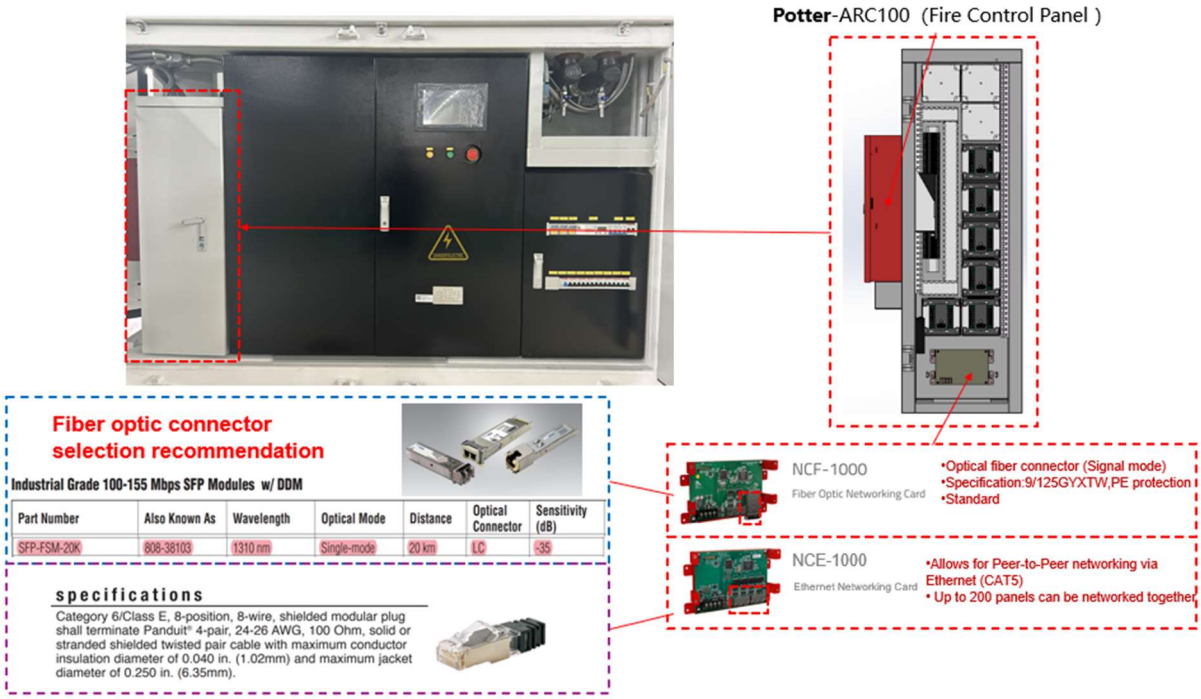


*Figure 17-1: **Potter** Fire Control Panel Communication Wiring Position*

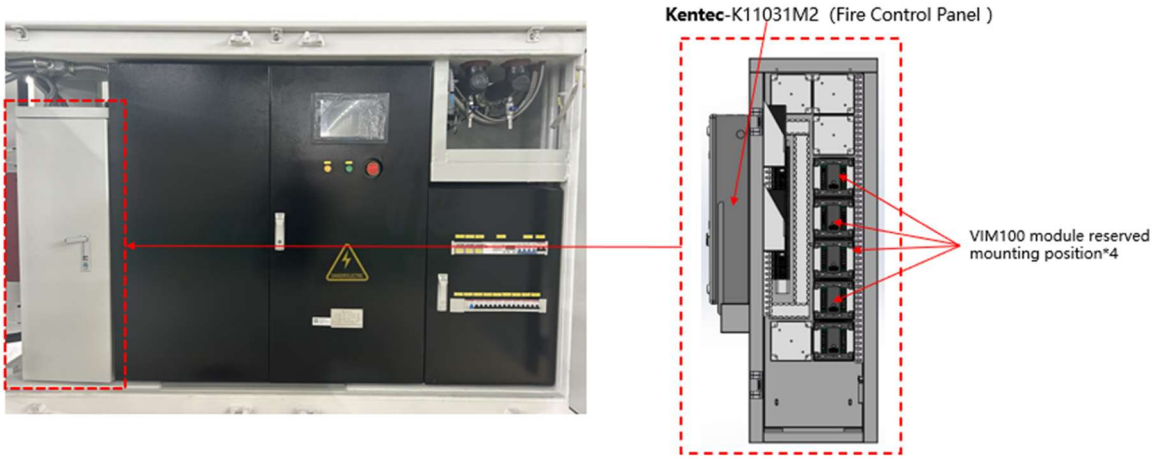


*Figure 17-2: **Kentec** Fire Control Panel Communication Wiring Position*

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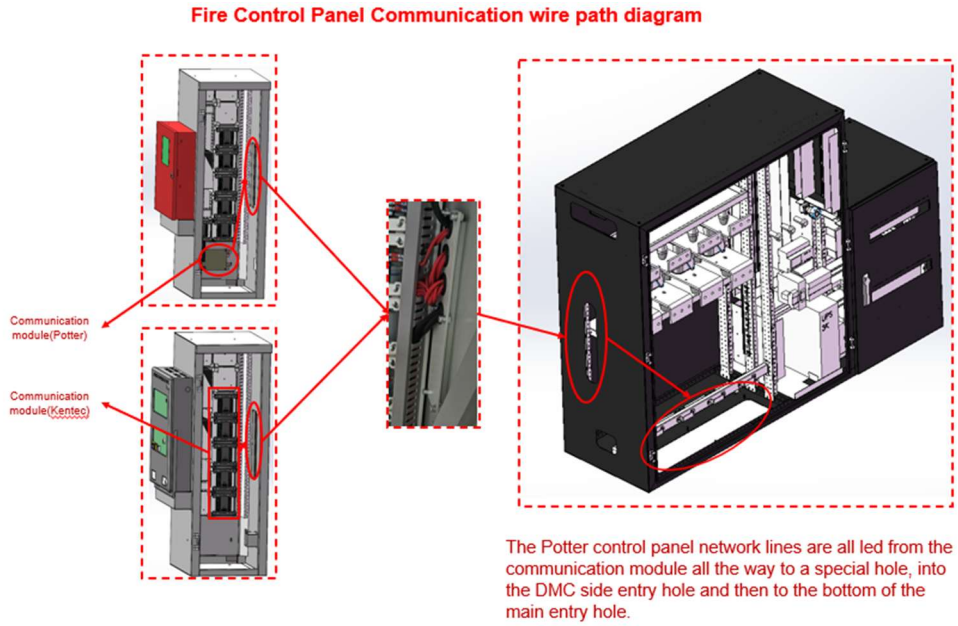


Figure 17-3: Fire Control Panel Communication wire path diagram

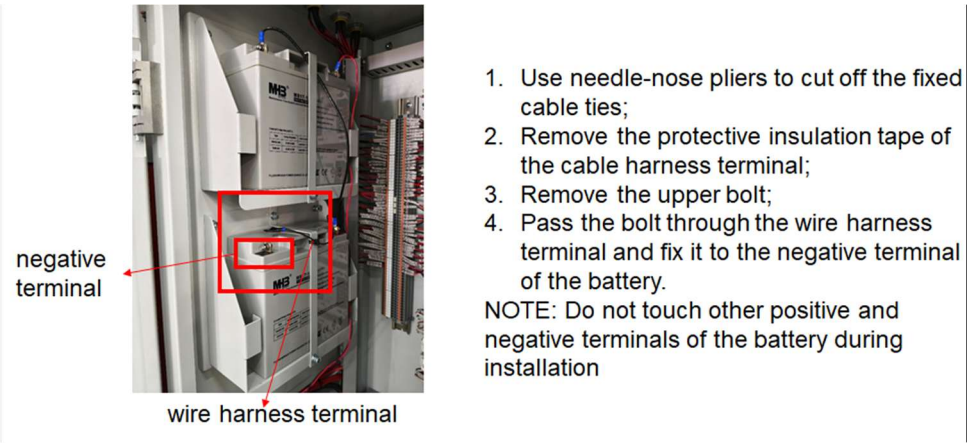
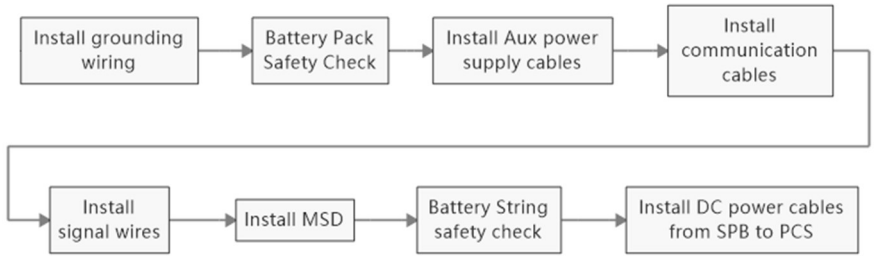


Figure 18： Wiring for FACP battery

5.4 SolBank3.0 series System Wiring

The following section details the field wiring procedures required to electrically integrate the SolBank3.0 series.

5.4.1 Workflow



✓ *Figure 19: SolBank3.0 series System Wiring （Suggested installation order）*

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5.4.2 Recommended Tools and Equipment

Table 9: Recommended tools and equipment

Tool Name	Quantity	Remarks
Cable pulling equipment	--	Used to pull cable through underground conduit
Crimpers and proper dies	--	Used for crimping lugs
Wrenches	--	Used to install lugs onto busbar
Torque wrench	--	Used to tighten terminations to required torque
Basic electrical tools	--	Required for wire prep and installation
Power and communication cable	--	As specified in each subsequent section
Termination lugs and hardware	--	As specified in each subsequent section
Threading board	1	Placed inside container
Misc. construction commodities		Electrical tape, wire labels, duct seal, cable ties, etc.
PPE	--	Basic PPE and specialized electrical PPE per site specific EH&S plan

5.4.3 Precautions



The SolBank3.0 series will arrive on site with batteries installed and partially charged. Batteries cannot be deenergized. Although the battery packs will not be interconnected, risk of electrocution exists. Exercise extreme caution.



High DC voltage present. Properly rated insulated gloves, insulated footwear, insulated tools, arc flash clothing, and face shields are recommended when working around batteries and energized circuits.



Ensure DC Disconnects are open and battery strings are isolated from PCS when working on system.



Always employ proper lock-out-tag-out (LOTO) procedures as applies when on circuits or equipment that have the ability to be energized.



All tasks described in this Section must be performed by appropriately qualified personnel.



Always ensure correct polarity and prevent shorts against rack frames and other grounded devices.



PPE is required during all stages of this process. Refer to EH&S plan for site-specific requirements.



Always label conduits, cables and circuits according to polarity and project labeling requirements.

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Do not modify the outer enclosure of the SolBank3.0 series. All cables must enter the SolBank3.0 series as specified and not through custom knockouts. Modification of SolBank3.0 series without prior e-STORAGE approval may result in loss of warranty and certification.



Communication cables shall not be placed in the same conduit as power cables unless shielded. Non-shielded communication cable must be separated from power cable by greater than 0.5m (1.64').



Upon completion of wiring, all conduits and points of cable entry must be closed off with duct seal other preventative measure to prevent ingress of animals and insects.

5.4.4 SolBank3.0 series Grounding Procedure

Table 10: Required Materials

Item	Requirements	Remarks
Grounding lug and hardware	Double-hole copper lug and hardware.	Provided by Installer
	M16 bolt nut and washers.	Provided by e-STORAGE

- ✓ Step 1: Ensure a safe working environment by consulting with the site safety manager.
- ✓ Step 2: SolBank3.0 series grounding auxiliary material size needs to be configured according to the box stainless steel grounding bus and fixing bolt size, as shown in Figure 20.
- ✓ Step 3: Each SolBank3.0 series is equipped with 4 grounding points, and at least one pair of diagonal grounding points (set 1 or set 2) is required for installation, as shown in Figure 21 below.

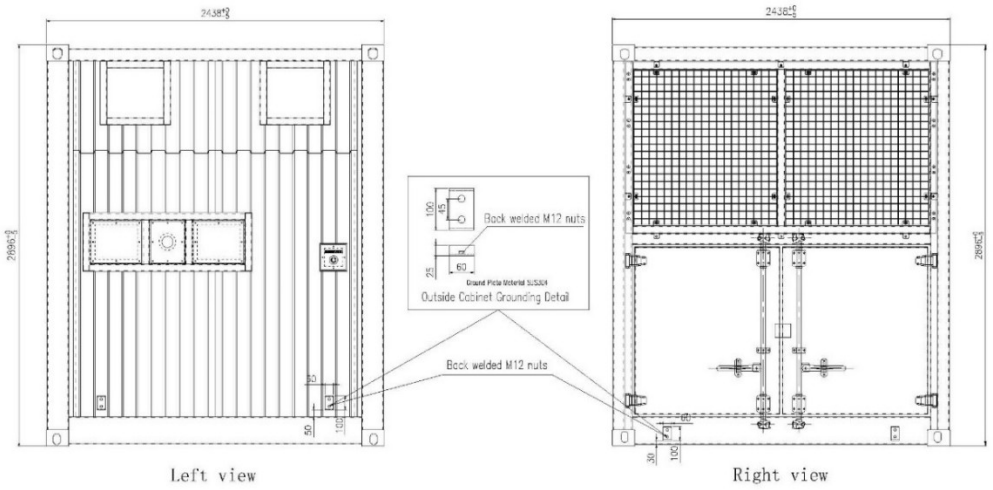


Figure 20: SolBank3.0 series grounding detail

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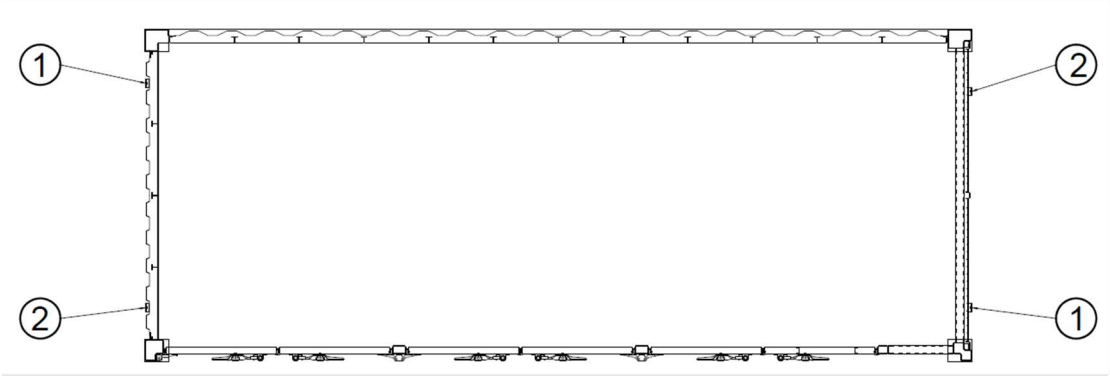


Figure 21: SolBank3.0 series grounding locations.

5.4.5 SolBank3.0 series DC Cable Installation Procedure

Table 11: Required Materials

Centralized PCS Solution		
Item	Requirements	Remarks
DC Cables-0.5P	Cable size, type, length, and count to be specified by the EOR. As a general guidance, straight-through copper cables sized between 474.4 kcmil (240mm²)*6 (per pole) and 600kcmil (304mm²) may be considered for optimal performance. If alternative cable types/sizes are under consideration, it is strongly advised to contact e-STORAGE for further consultation. Current Calculation: The rated charge and discharge power of the 0.5P system is 2350kW. Maximum power is 2350*1.2=2820kW., Maximum current of the system: 2820kw*1000/416/2.8 =2421A., Average current to each cable is: 2421A/6=404A.	Provided by Installer
DC Cables-0.25P	Cable size, type, length, and count to be specified by the EOR. As a general guidance, straight-through copper cables sized between 138.2 kcmil (70mm²)6 (per pole) and 237kcmil (120mm²) may be considered for optimal performance. If alternative cable types/sizes are under consideration, it is strongly advised to contact e-STORAGE for further consultation. Current Calculation: The rated charge and discharge power of the 0.25P system is 1200kW. Maximum power is 1200*1.2=1440kW.,	Provided by Installer

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	Maximum current of the system: 1440kw*1000/416/2.8 =1236A., Average current to each cable is: 1236A/6=206A.	
Cable lugs and hardware	Double-hole copper lug.	Provided by Installer
	M14 bolt, nut and washers.	Provided by e-STORAGE

Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

- ✓ Step 1: Ensure a safe working environment via consultation with site safety manager.
- ✓ Step 2: If not pre-installed prior to SolBank3.0 series placement, then pull DC power cables from PCS cable termination compartment to SolBank3.0 series through pre-installed conduits. Cables should enter SolBank3.0 series at the locations shown in Figure 23.
- ✓ Step 3: Route cables to termination bus shown in Figure 22. Take special care to ensure correct polarity. Label cable as required.
- ✓ Step 4: Cut to length, install lugs, and terminate to bus. The DC cable installation must comply with the UL 486A-486B. Please refer to Figure 24 for hardware assembly.
- ✓ Step 5: Use the provided clips to secure the cables to the cable support bracket. Fix a maximum of two cables at the front, and secure any excess cables at the rear, ensuring that the copper busbars remain tension-free when suspending the cables.
- ✓ Step 6: Secure power cables.

Caution: In the case that SolBank3.0 series units are connected in parallel (i.e. connected to the same DC bus of the PCS), a maximum 1.0V voltage drop imbalance on the same DC input needs to be maintained between the SolBank3.0 series units.

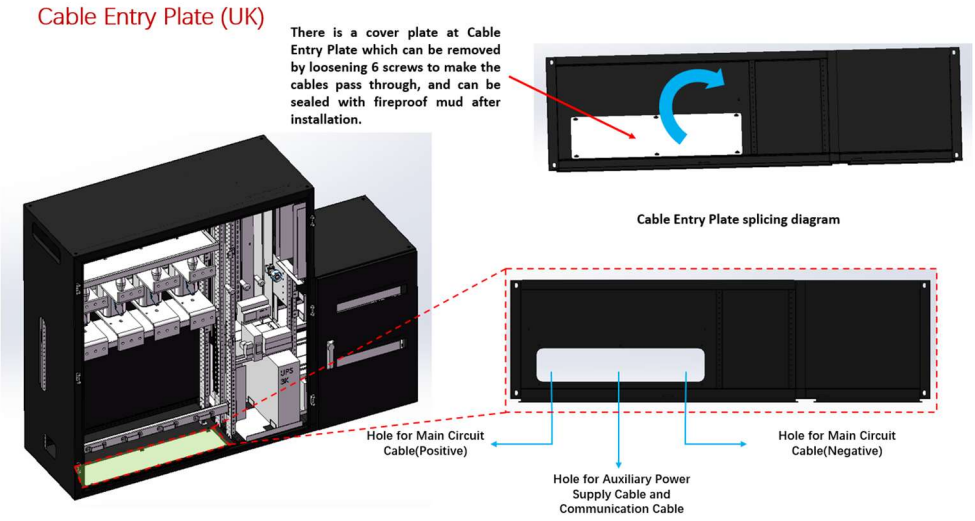


Figure22: Cable entries of the SolBank3.0 series with the "Cable Entry Plate"

(Note: Figure20 provided recommended cable arrangement, the actual panel provided will be blank and could be drilled per cable entry onsite)

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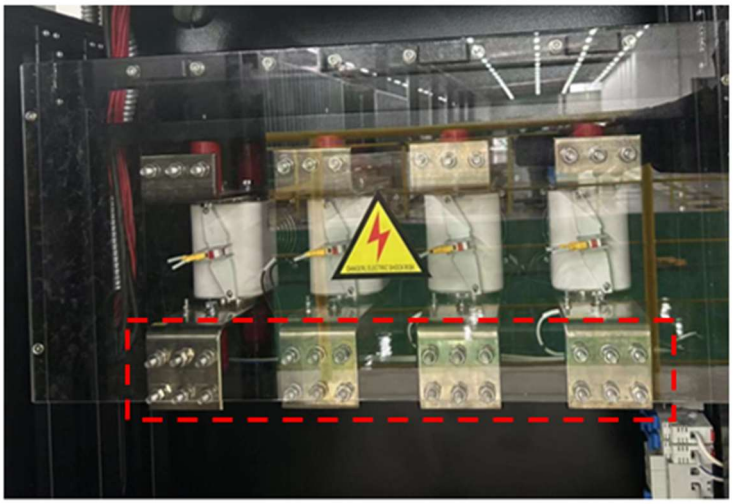
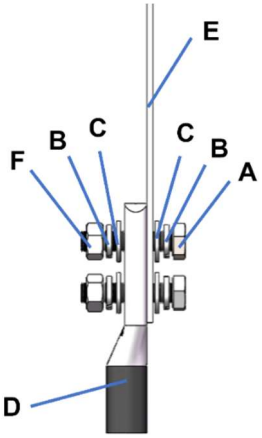


Figure 23: Cable termination



Position	Designation	Remarks
A	M14 Bolt	Provided by e-STORAGE
B	Split washer	Provided by e-STORAGE
C	Baffle washer	Provided by e-STORAGE
D	Double-hole wiring lugs	Provided by EPC
E	Wiring copper bar	Provided by e-STORAGE
F	M14 Nut	Provided by e-STORAGE

Figure 24: Cable lug hardware assembly refence diagram for centralized PCS

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5.4.6 Auxiliary Power Cable, Signal Wires and Communication Cable Installation Procedures

Table 12: Required Materials

Item	Requirements	Remarks
Auxiliary Power Cables	Cable size, type, and length to be specified by the EOR. Each DC SolBank3.0 series requires a 5-wire circuit. (Please refer to DWG. M310 for recommended cable size.)	Provided by Installer
Communication Cables	Cable length and count to be specified by the EOR. BMS-EMS communication CAT6A with RJ45 terminations required. Communication rate should not be less than 8Mbps. Shield wire required if adjacent to power cables.	Provided by Installer
Signal Wires (If designed for the specific project/site)	Cable size, type, and length to be specified by the EOR. Each DC SolBank3.0 series requires four (4) signal wires. 1. X4:14, X4:15 (Interconnecting dry contacts)+/- with two（2） 1mm² communication wires 2. X3:27, X3:37 (External F-stop Signal Input) +/- with two（2） 1mm² communication wires	Provided by Installer

Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

- ✓ Step 1: Ensure a safe working environment via consultation with site safety manager.
- ✓ Step 2: Identify location of SolBank3.0 series auxiliary power supply terminations, as shown in Figure 25.
- ✓ Step 3: Pull auxiliary power cables from auxiliary power supply to SolBank3.0 series via the location identified in Figure 22.
- ✓ Step 4: Route cables, cut, and terminate within the U-style compression fittings.
- ✓ Step 5: Identify location of SolBank3.0 series communication terminations.
- ✓ Step 6: Pull communication cables from the project EMS (or other devices) to the SolBank3.0 series via the location identified in Figure 24. Refer to the project specific network diagram, developed by the EOR, for interconnected devices and point-to-point wiring instructions.
- ✓ Step 7: Identify location of SolBank3.0 series signal wire supply terminations, as shown in Figure 26.
- ✓ Step 8: Pull signal wires from the project EMS (and other devices) to the SolBank3.0 series. Refer to the project specific network diagram, developed by the EOR, for interconnected

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devices and point-to-point wiring instructions.

- ✓ Step 9: Install the UPS battery .
- ✓ Step 10: Referring to Figure 27, connect the wire of UPS battery terminal.
- ✓ Step 11: Secure all cabling with cable ties. Ensure all cables and conduits are properly labeled.
- ✓ Step 12: Close off all conduits and wire penetrations with duct seal or foam.

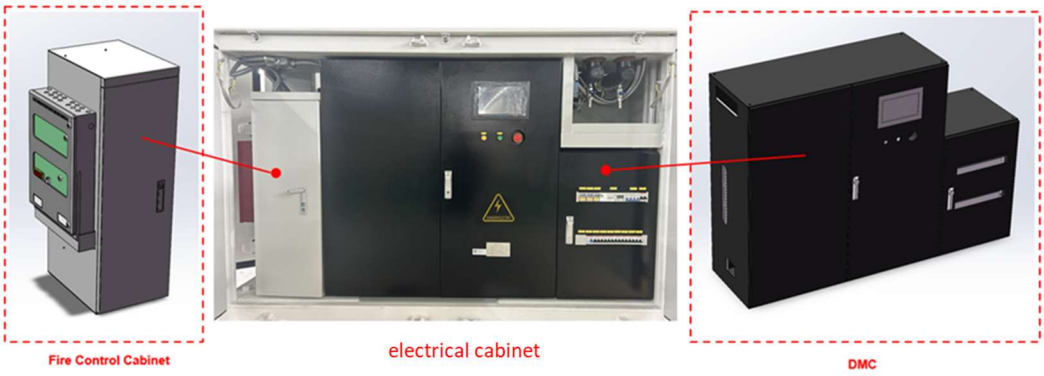
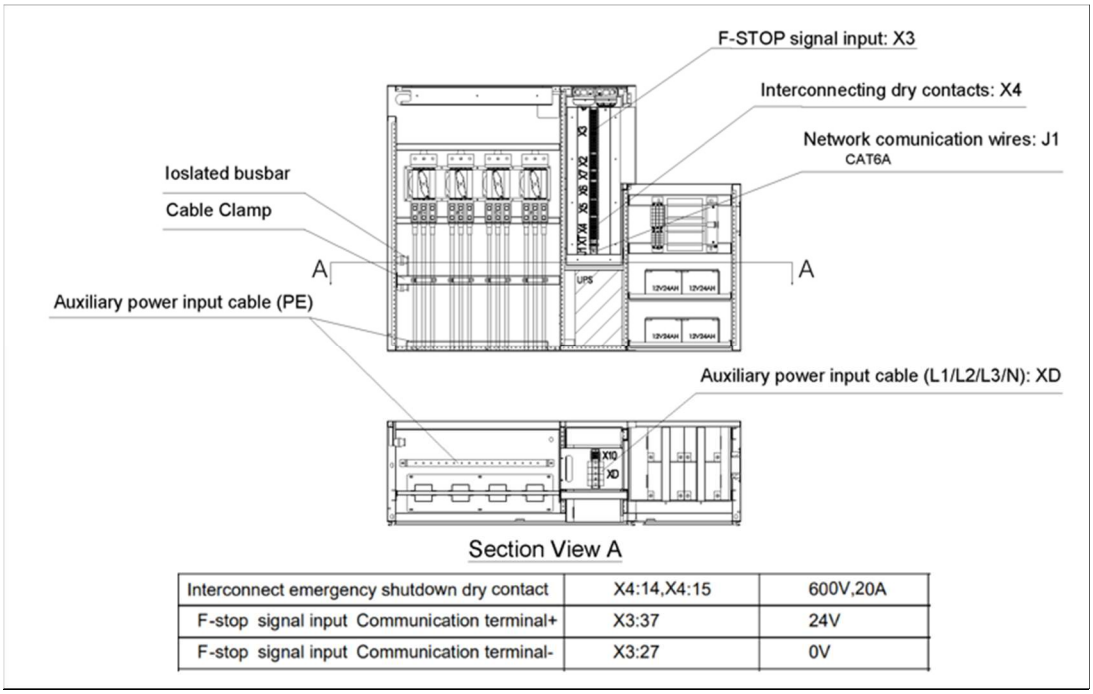


Figure 25: Description of Solbank Electrical Cabinet Layout



Interconnect emergency shutdown dry contact	X4:14,X4:15	600V,20A
F-stop signal input Communication terminal+	X3:37	24V
F-stop signal input Communication terminal-	X3:27	0V

Figure 26: Description of busbar layout and dry contact

X4:14, X4:15 (Interconnect emergency shutdown dry contact): When the SolBank3.0 series is normal, this terminal is normally close signal, when the SolBank3.0 series has local F-stop or fire secondary or combustible gas secondary signal, it outputs open conduction signal.

X3：27, X3:37 (F-stop signal input). When this signal is normally close, SolBank3.0 series operates normally. when this signal changes to a open pilot signal, SolBank3.0 series will control the AC auxiliary power supply to be disconnected and the DC contactor of the BMS Box to be disconnected, and the system will stop operating.

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Figure 27: UPS battery wiring description

5.5 SolBank3.0 series Battery Power Cable Connection

The following sections detail the tasks required to electrically integrate the SolBank3.0 series' battery packs.

5.5.1 Recommended and Equipment

Table 13: Required Materials

Tool Name	Quantity	Remarks
Basic electrical tools	--	Required for cable and wire management
Misc. construction commodities		Electrical tape, wire labels, cable ties, etc.
PPE	--	Basic PPE and specialized electrical PPE suitable for high DC voltages per site specific EH&S plan

5.5.2 Precautions



The SolBank3.0 series will arrive on site with batteries installed and partially charged. Batteries cannot be deenergized. Risk of electrocution exists. Exercise extreme caution.



High DC voltage present. Properly rated insulated gloves, insulated footwear, insulted tools, arc flash clothing, and face shields are recommended when working around batteries and energized circuits.



Ensure DC Disconnects are open and battery strings are isolated from PCS when working on system.



Always employ proper lock-out-tag-out (LOTO) procedures when on circuits or equipment that have the ability to be energized.





All tasks described in this Section must be performed by appropriately qualified personnel.

Always ensure correct polarity and prevent shorts against rack frames and other grounded devices.

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PPE is required during all stages of this process. Refer to EH&S plan for task-specific requirements.



Always label conduits, cables and circuits according to polarity and project labeling requirements.



Always confirm polarity and handle energized cables with care. Improper wiring or accidental shorting against battery rack frames or other grounded devices will void warranty on all battery packs in the impacted string.

5.5.3 SolBank3.0 series Battery Pack Safety Check

To ensure safe transport of the SolBank3.0 series, the battery packs have been electrically isolated by disconnecting several interconnection cables. Before the batteries can be reconnected, if the Shockaction indicators or Tilt sensor on the container shown in the following Figure 28 turned to red, Insulation Resistance testing needs to be performed on each battery pack. The results of the test are recorded in the “Insulation Resistance Test – Battery Packs” chart, Addendum 1.

Test 1: Positive to Ground

Red Test Lead = Battery Positive Terminal
Black Test Lead = Container Ground
Test Voltage = 500Vdc
Test Time = 1 minute
Passing Score = > 20MΩ

Test 2: Negative to Ground

Red Test Lead = Battery Negative Terminal
Black Test Lead = Container Ground
Test Voltage = 500Vdc
Test Time = 1 minute
Passing Score = > 20MΩ

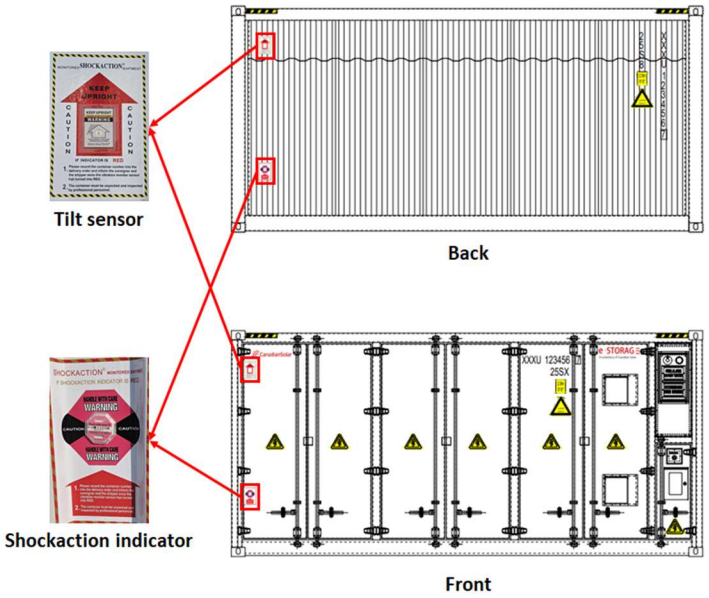


Figure 28: Location of the Shockaction indicator and Tilt sensor

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5.5.4 SolBank3.0 series Wiring Instructions

The SolBank3.0 series contains (48) 1P104S battery packs and twelve (12) BMS boxes. A typical battery string consists of four (4) 1P104S battery packs wired in series and connected to a single BMS as shown in Figure 29-1. Twelve (12) such strings exist within each SolBank3.0 series. The below process describes the field reconnection process.

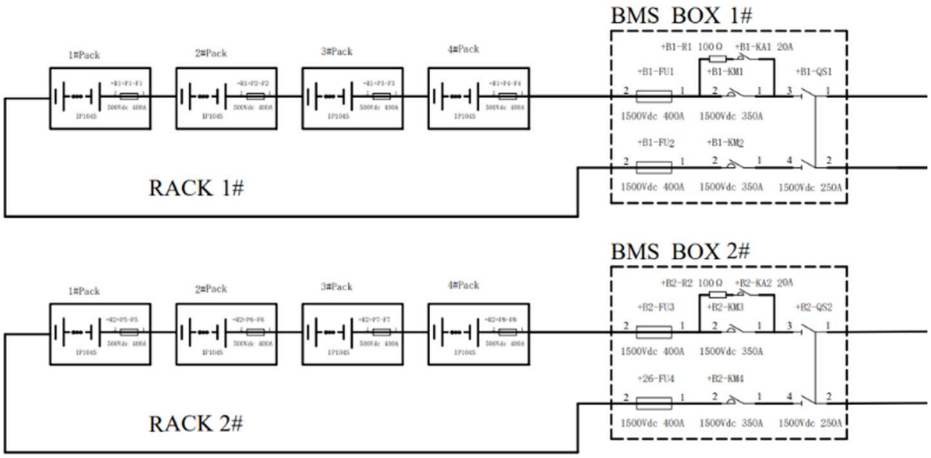


Figure 29-1: Description of busbar layout

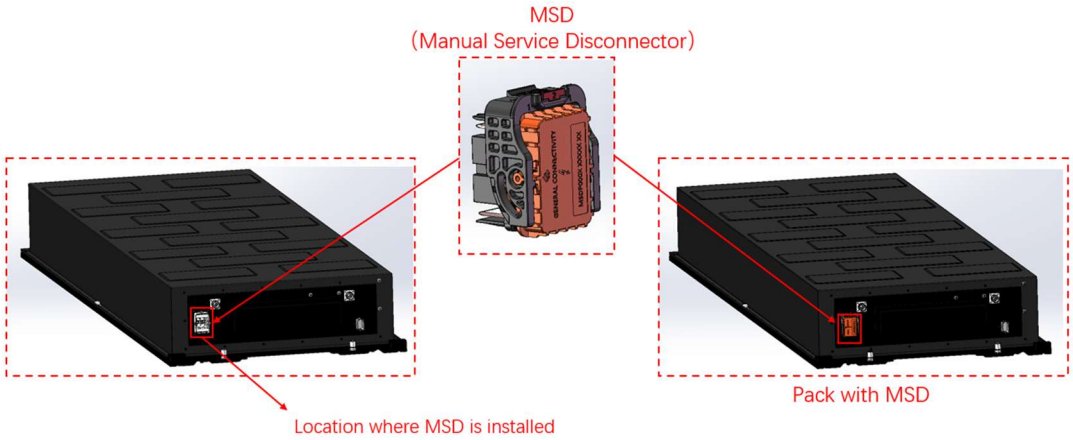


Figure 29-2: MSD Installation

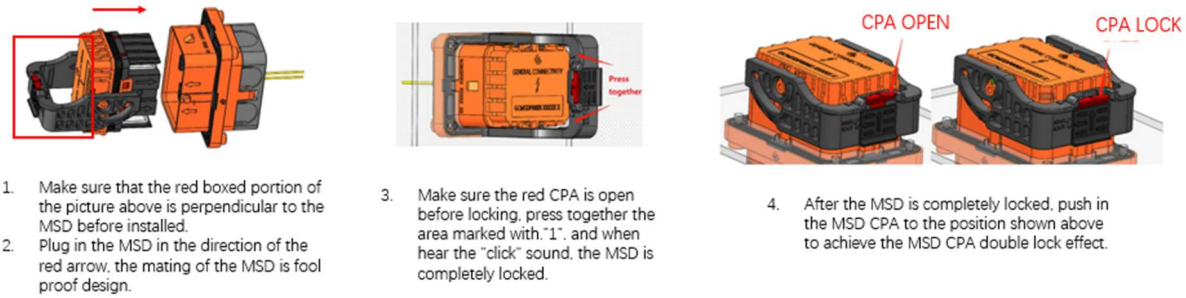


Figure 29-3: MSD Installation Instruction

As noted in the precautions section above, these batteries are charged and therefore personnel will be handling and terminating energized cables. Extreme caution and proper PPE are required.

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Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

- ✓ Step 1: Consult with the site safety manager to ensure a safe working environment.
- ✓ Step 2: Visually verify the connection path of all cables in the workflow.
- ✓ Step 3: Install MSD on each battery pack. Refer to the Figure 29-2 and Figure 29-3 for MSD installation instruction, The MSD is placed in three cartons as shown in Figure 11.

5.5.5 SolBank3.0 series Battery String Safety Check

After installing all MSDs onto the battery packs, perform insulation testing on each battery string. The results of the test are recorded in the "Insulation Resistance Test – Battery Strings" chart, Addendum 1.

Test 1: Positive to Ground
Red Test Lead = Battery Positive Cable
Black Test Lead = Container Ground
Test Voltage = 1500Vdc
Test Time = 1 minute
Passing Score = > 20MΩ

Test 2: Negative to Ground
Red Test Lead = Battery Negative Cable
Black Test Lead = Container Ground
Test Voltage = 1500Vdc
Test Time = 1 minute
Passing Score = > 20MΩ

As the cables pass the insulation resistance test, they can be connected to the corresponding BMS terminal.



Figure 30: SolBank3.0 series C15-1P104S Battery Pack. Battery negative terminal are shown above.

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Figure 31: BMS plug&stock and termination locations. Battery string positive termination(lower) and negative termination (upper) are shown above.



Figure 32: Battery cable quick connect. To install, push into receptacle/terminal until a notable click is heard. To release, press the side button and remove.

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6 Inspection and Equipment Cleaning

6.1 Inspection

This section details post installation cleaning and inspection procedures required to be performed prior to system energizing and testing.

6.1.1 Precautions



When cleaning and inspecting the SolBank3.0 series, always de-energize the system and use LOTO procedures. If de-energizing is not possible, utilize proper PPE and safety procedures.



All tasks described in this Section must be performed by appropriately qualified personnel.

Important note: During installation period, in order to avoid water vapor from entering the SolBank3.0 series enclosure leading to unfavorable results such as corrosion, the door and the cable entry opening should not remain opening for more than 1 day. The cable entry opening can use an interim cover.

6.1.2 Cleaning Tasks

- ✓ Step 1: Ensure a safe working environment via consultation with site safety manager.
- ✓ Step 2: Remove all installation debris from inside the SolBank3.0 series. Vacuum and clean surfaces where safe to do so.
- ✓ Step 3: Wipe down all interior and exterior surfaces and remove foreign contaminants and debris.

6.1.3 Inspection Tasks

The following are visual inspections:

- ✓ Verify correct operation of doors, latches and seals.
- ✓ Verify all conduits and points of entry are properly sealed.
- ✓ Verify all cables are secured with wire ties and professional wire management techniques were used.
- ✓ Verify all bolts and equipment fasteners are in place and terminated to the proper torque values specified in this manual. Special attention should be paid to primary DC electrical terminations and ground terminations.
- ✓ Verify all conduits and cables are properly labeled.
- ✓ Visually confirm installation is performed per site documentation and all cables and wires are terminated at their proper locations.
- ✓ Visually inspect cables or signs of damage to insulation.

6.2 Commissioning

Commissioning procedures and steps will be provided only by SolBank3.0 series Commissioners. Please contact e-STORAGE 6 weeks in advance of planned commissioning to schedule e-STORAGE Installation support.

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7 String Solution

The SolBank3.0 series system for string solution includes two following different P-rate products, as shown in Table 4 below.

Table 14: SolBank3.0 series Specifications for String PCS Solution

Item	Parameters	
Discharge Duration	2-hour	4-hour
Charge/Discharge P-rate	0.5P	0.25P
Nominal Capacity (kWh)	5016	5016
Initial Storage Capacity (kWh)	**4800(For String PCS)**	**5000(For String PCS)**
Operating DC Voltage Range (VDC)	1164.8 ~ 1497.6	
Recommended Discharge Power (kW)	**2400(For String PCS)**	**1250(For String PCS)**
# of LFP Battery Packs	48	48
# of BMS HV Boxes	12	12
Operating temperature	-30°C to 55°C (Ambient temperature)	

Wiring and cable specifications for string solution are shown in the figures and table below.

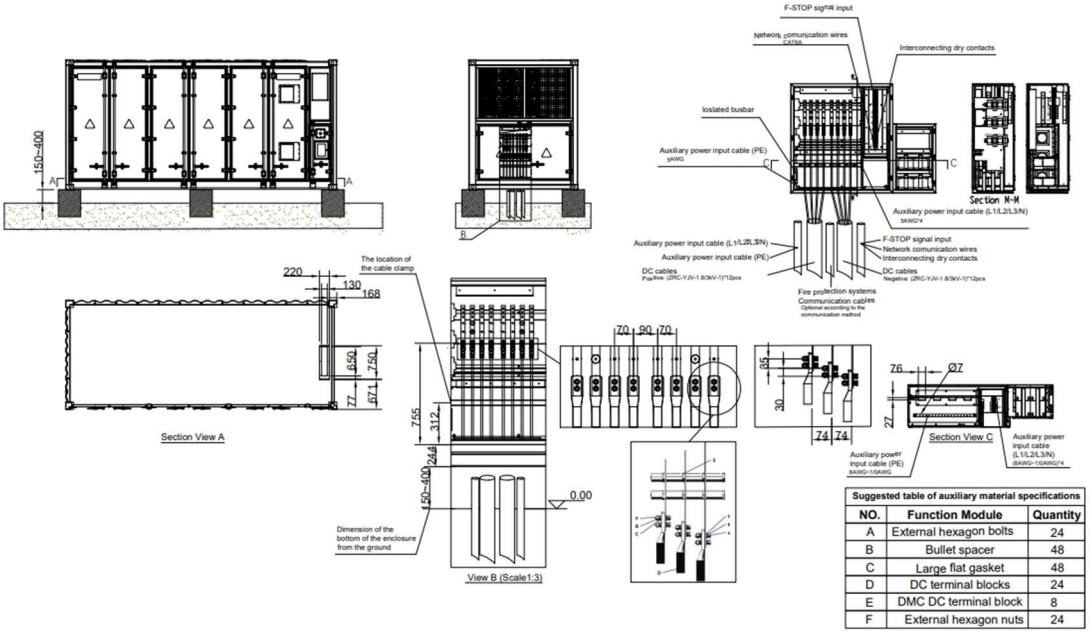
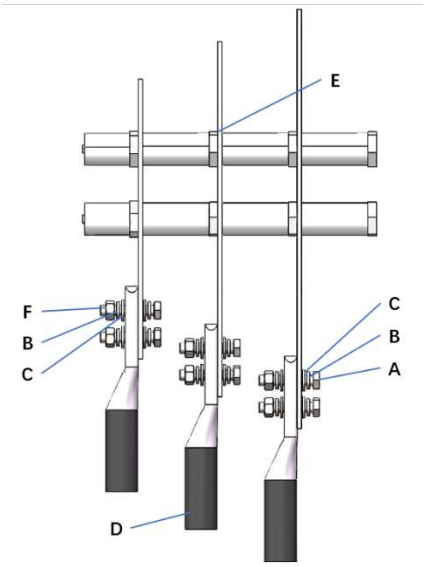


Figure 33: Foundation Conduit Stub-ups(String PCS) (refer to Dwg NO. M310)

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String PCS Solution		
Item	Requirements	Remarks
DC Cables-0.5P	Cable size, type, length, and count to be specified by the EOR. As a general guidance, straight-through copper cables sized between 138.2 kcmil (70mm²)*12 (per pole) and 187.5kcmil (95mm²) may be considered for optimal performance. If alternative cable types/sizes are under consideration, it is strongly advised to contact e-STORAGE for further consultation. Current Calculation: The rated charge and discharge power of the 0.5P(For String PCS) system is 2400kW. Maximum power is 2400*1.2=2880kW., Maximum current of the system: 2880kw*1000/416/2.8 =2473A., Average current to each cable is: 2421A/12=206A.	Provided by Installer
DC Cables-0.25P	Cable size, type, length, and count to be specified by the EOR. As a general guidance, straight-through copper cables sized between 69 kcmil (35mm²)*12 (per pole) and 98.7kcmil (50mm²) may be considered for optimal performance. If alternative cable types/sizes are under consideration, it is strongly advised to contact e-STORAGE for further consultation. Current Calculation: The rated charge and discharge power of the 0.25P(For String PCS) system is 1250kW. Maximum power is 1250*1.2=1500kW., Maximum current of the system: 1500kw*1000/416/2.8 =1288A., Average current to each cable is: 1288A/12=108A.	
Cable lugs and hardware	Single-hole copper lug.	Provided by Installer
	M10 bolt, nut and washers.	Provided by e-STORAGE

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Position	Designation	Remarks
A	M10 Bolt	Provided by e-STORAGE
B	Split washer	Provided by e-STORAGE
C	Baffle washer	Provided by e-STORAGE
D	Single-hole wiring lugs	Provided by EPC
E	Wiring copper bar	Provided by e-STORAGE
F	M10 Nut	Provided by e-STORAGE

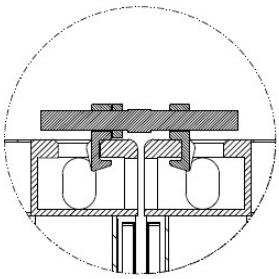
Figure34: Cable lug hardware assembly refence diagram for string PCS
Note: For string PCS version, DC cables should be installed in order from inside to outside.

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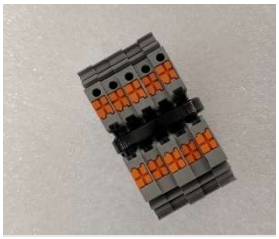
8 Annexes

8.1 Annex 1: Installation Components List

The following components are supplied by e-STORAGE and shipped with the SolBank product delivery.

Name	Quantity	Picture	Remarks
Bridge lock	Project Specific up to 2 pcs per pair of SolBank3.0 series (for back-to-back installation only)		Fixed back-to-back on top (Field installation)
Twist lock	Used for four bottom corners of the container fixed, each container installation of 4 pieces		Installation of containers (Field installation) Transport separately
MSD	MSD connectors, 48 in total		Installed in the front of the Battery Pack
Paint-spray 9003 Paint-spray 7035	2 bottles		Spray to prevent rust

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Pin terminal box	5 PCS		
Hexagon socket bolt/M14*45 Hexagon nut/M14 Flat washer/D14 Spring-pad/D14	1 PCS		Spare part in addition.
Neutral silicone weather-resistant adhesive	1 PCS		

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8.2 Annex 2: Installation point checklist

Pre-Installation Inspection				
No.	**Check items**		**Check records**	**Remarks**
1	Transportation arrival inspection	Upon arrival, remove the protective cover, and check the exterior for bumps, paint damage		
2		Check the status of the anti-tipping label for proper condition		
3		Check door locks for loss, vandalism		
4		Check that the lamination of openings for air conditioners, fans, pressure equalizers, etc. is intact and undamaged		
5	Unpacking material inspection	Whether the fixing corners are configured		
6		Fire control panel batteries are configured or damaged		
7		Whether overage spare parts are complete in the storage box under chiller on the door. Refer to the paper-based "overage spare parts list" in the box.		
8	SolBank3.0 series installation base check	Whether the support points are implemented according to the design support requirements		
9		Whether the leveling level of the support surface meets the flatness requirement		
Signature of inspector:		Date of inspection:		
Post-Installation Inspection				
No.	**Check items**		**Check records**	**Remarks**
1	Structural installation inspection	SOLBANK3.0 SERIES bridge locks or twist locks are in place and torque is confirmed.		
2		2 protective plates on top of liquid-cooled chiller are removed.		
3	Electrical connection check	Ground wire is firmly installed without loosening, and connected to any two diagonally opposite ground pads.		
4		All DC cable plugs are in place		
5		Is the communication cable loose		
6		DC output power cable is connected in place and not loose		
7	Functional check of fire protection system	Lead-acid batteries in the fire panel were installed well.		
8		Whether all fire detectors operate normally, and the host computer has no abnormal alarms		
9		Whether the fan can be started and stopped normally (fan-specific start/stop switch)		
10		Appearance of all detectors in good condition		
Signature of inspector:		Date of inspection:		

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8.3 Annex 3: Bolt torque reference table

Table 15: Bolt Torque Reference Table for Structural Fasteners

Metric Thread Size	Recommended metric bolt tightening torque	
	ft lbs	Nm
M4	2.1	2.8
M5	4.1	5.6
M6	7.2	9.8
M7	11.6	15.7
M8	18.1	24.5
M10	32.5	44.1
M12	57.9	78.5
M14	94.4	128
M16	144.6	196
M18	191.8	260
M20	275.1	373

Table 16: Bolt Torque Reference Table for Electrical Wiring

Metric Thread Size	Recommended metric bolt tightening torque	
	ft lbs	Nm
M4	1.1	1.5
M5	2.4	3.2
M6	4.1	5.5
M8	7.4	10
M10	14.8	20
M12	25.8	35
M14	44.3	60
M16	59	80
M18	88.5	120
M20	125.4	170

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8.4 Annex 4: Insulation Resistance Test

Project Name:

Battery Number:

Serial Number:

Name of the tester：

Company：

Signature：

Date：

Serial number the testing equipment：

Calibration certificate number：

Note:Calibration certificate to be supplied by the tester

Insulation Resistance Test – Battery Packs											
Rack 1			Rack 2			Rack 3			Rack 4		
Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
Rack 5			Rack 6			Rack 7			Rack 8		
Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		
Rack 9			Rack 10			Rack 11			Rack 12		
Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd	Bat	+ to gnd	- to gnd
1			1			1			1		
2			2			2			2		
3			3			3			3		
4			4			4			4		

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Insulation Resistance Test – Battery Strings							
BMS 1		BMS 2		BMS 3		BMS 4	
+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd
BMS 5		BMS 6		BMS 7		BMS 8	
+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd
BMS 9		BMS 10		BMS 11		BMS 12	
+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd	+ to gnd	- to gnd

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Appendix C

SOLBANK 3.0 DATA SHEET

e-STORAGE

A subsidiary of Canadian Solar

UTILITY-SCALE ENERGY STORAGE



SolBank 3.0

ENERGY STORAGE SYSTEM
S-5016-2H-NA|S-5016-4H-NA

Capacity: 5.0 MWh

e-STORAGE, a subsidiary of **Canadian Solar**, is a world-class energy storage solution provider, specializing in storage system design, manufacturing, and integration of battery energy storage systems for utility-scale applications.

The company offers value-added system consulting and turnkey EPC services, in addition, we provide customers with our proprietary LFP battery solution SolBank.

Together, we are building a brighter, greener future for all.

SolBank 3.0 Highlights

- **Cutting-Edge Technology**: SolBank 3.0 features high-density LFP cells, an active balancing BMS, and an innovative liquid cooling TMS, ensuring optimal safety.

- **Compliance and Certifications**: SolBank 3.0 adheres to all industry standards: NFPA855, NFPA69, NFPA72, NFPA70E, and optional NFPA68. Certified under UL1973, UL9540, UL9540A, UN38.3/UN3536, ensuring rigorous safety and performance criteria.

Key Features

Enhanced Energy Density

- Utilizes 314 Ah battery cells and compact integration, increases single container energy density up to 45%
- Reduces land cost by up to 35% in a 100MWh project

Safety

- IP67-rated pack design
- Up to 20% faster detection of abnormal and automatic protection
- Advanced pack thermal isolation, electrical redundancy protection, and multi-level fire protection, effectively minimize potential issues
- Tested and passed large-scale fire testing with verified, no enclosure level propagation

Intelligent Control

- Liquid cooling cuts auxiliary consumption up to 30%
- Active balance and string-level management, guarantee high efficiency and availability

Compatibility & Installation

- Supports various PCS topologies
- Turn-key integration and stationery certification, reduce project schedule risks by up to 40%
- Plug-and-play setup for streamlined commissioning



SolBank 3.0
System Parameter

e-STORAGE
A subsidiary of Canadian Solar

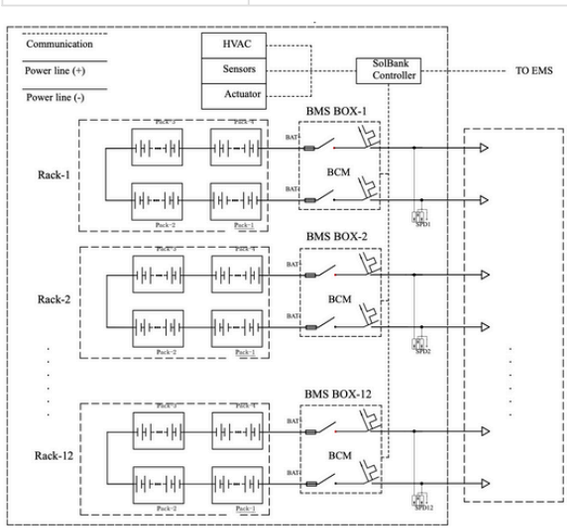
General	
Product Model	CSI-SolBank-S-5016-2h-NA
	CSI-SolBank-S-5016-4h-NA
Battery Chemistry	Lithium Iron Phosphate (LFP)
Pack Configuration	1P104S (104 Cells)
Rack Configuration	1P416S (4 Packs)
System Configuration	12P416S (12 Racks)
Nominal Capacity*	5016 kWh
Nominal DC Voltage	1331.2 V
Operation DC Voltage Range(1)	1164.8 V ~ 1497.6 V

Performance		
Charging/Discharging Mode	0.5 P / 0.5 P	0.25 P / 0.25 P
Rated DC Power(2)	2350 kW	1200 kW
Rated DC Capacity(3)	4700 kWh	4800 kWh
Duration @Rated DC Power	2hrs	4hrs
Round Trip Efficiency (RTE)(4)	93%	94%
Auxiliary Load (Standby/Peak)	1.5 kVA / 50 kVA	1.5 kVA / 22 kVA
Max. Short Circuit Current	10 kA*12	10 kA*12
Operating Temperature (Ambient)(5)	-30 °C to 55 °C (derating from 45°C to 55°C)	
Relative Humidity(5)	≤95% (non-condensing)	
Altitude	< 2000 m (derating from 2000 m to 4000 m)	
Noise Sound Pressure Level (LPA) at 1 meter distance	≤75 dB(A)	

Auxiliary Systems	
Auxiliary Power Interface	AC480 V / 60 Hz, 3P5W
Thermal Management System	Smart liquid cooling/heating
External Communication Interface	Ethernet connection, Modbus TCP/IP protocol

Mechanical	
Enclosure	20ft. high-cube container
Dimensions (L*W*H)	6058*2438*2896 mm (238.50*95.98*114.02 in)
Weight (Battery Included)	43,000 kg (94,800 lbs)
Enclosure Ingress Rating	IP55 / NEMA 3R
Painting/Coating	RAL9003 / C4 Coating
Seismic Parameter	Zone 4

Safety	
Fire Detection and Alarm	Fire alarm panel, heat and smoke detection, alarm bell and strobe
Explosion Prevention	Combustible gas detector with active ventilation
Uninterrupted Power Reserve	Container level UPS for 2-hr control system backup; dedicated fire safety UPS for 24-hr fire alarm backup
Emergency Stop/Automatic Shut-off	Local and Remote
Fire Suppression Options	Aerosol-based suppression system. Dry pipe sprinkler system.



Notes
* Nominal capacity is a calculated number using the entire summation of the cells and their specified capacities.
(1). The unit is rated at 1164.8V~1497.6V for optimized product performance, the maximum voltage range for the battery system is 1060.8V~1497.6V.
(2). Rated DC Power is measured at the product DC terminal, the Rated DC Power and Initial Storage Capacity is limited to the use of two SolBank 3.0 units connected in parallel.
(3). Rated DC Capacity represents the baseline capacity for specification and performance guarantees. The product's actual usable capacity may exceed this value to support long-term performance.
(4). DC RTE is measured during capacity test at Rated DC Power, refer to the product warranty document for the complete procedure.
(5).Options need to be selected to fully meet the 55°C, 95% RH.

Due to ongoing innovation, improvements, and product enhancements, the technical specifications in this document are subject to change and are not guaranteed.
Canadian Solar reserves the right to update or change its products or this technical data without prior notice and customers should not rely upon these or any technical specifications which are not made part of a definitive binding agreement.

Canadian Solar SSES (US) Inc.
4273 King Street East, Suite 102 | Kitchener, Ontario, N2P 2E9, Canada| contact@csestorage.com

Appendix D

NFPA 69 TEST REPORT

Prüfbericht-Nr.: *Test report no.:*	**CN25P9GU 001**	**Auftrags-Nr.:** *Order no.*:	**326096316**	Seite 1 von 22 *Page 1 of 22*
Kunden-Referenz-Nr.: *Client reference no.:*	**2371109**	**Auftragsdatum**: *Order date:*	2025-02-21	
Auftraggeber: *Client:*	CSI Energy Storage Co., Ltd. No.348 Lushan Road, SND, Suzhou, 215129 Jiangsu, P.R. China			
Prüfgegenstand: *Test item:*	Battery Energy Storage System			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	CSI-SolBank-S-5016-2h-NA,CSI-SolBank-S-5016-4h-NA, CSI-SolBank-S-5016-2h-EU, CSI-SolBank-S-5016-4h-EU			
Auftrags-Inhalt: *Order content*:	Test report			
Prüfgrundlage: *Test specification:*	This report provides evaluation and CFD analysis of the ventilation system in energy storage system referring to Chapter 8 in NFPA69:2024.			
Wareneingangsdatum: *Date of sample receipt:*	2025-03-07			
Prüfmuster-Nr.: *Test sample no:*	Engineering sample			
Prüfzeitraum: *Testing period:*	2025-03-08 - 2025-03-18			
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result*:*	See main report			



geprüft von: *tested by:*	Shiheng Zhang	**genehmigt von:** *authorized by:*	Simon Wang
Datum: *Date:* 2025.03.28		**Ausstellungsdatum:** *Issue date:* 2025.03.28	
Stellung / *Position:*	**Project Engineer**	**Stellung** / *Position:*	**Authorizer**

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* — Prüfmuster vollständig und unbeschädigt / *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample as. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

V05

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1. General Production Information:

1.1. Cell

The product information and parameters are provided by the client as below.

Manufacturer .....:	CSI Energy Storage Co., Ltd.	
Model number .....:	CSI314	
Chemistry .....:	$LiFePO_4$	
Physical configuration .....:	Prismatic	
Electrical rating .....:	Rated capacity:	314 Ah
	Nominal voltage:	3.2 V
Standard charge method.....:	Charge current:	157 A
	End of charge voltage:	3.8 V
Standard discharge method.....:	Discharge current:	157 A
	End of discharge voltage:	2.0 V

1.2. Module

The product information and parameters are provided by the client as below.

Manufacturer name :		CSI Energy Storage Co., Ltd.	
Model number :		CSI-SolBank-P-104.5-2h-A	CSI-SolBank-P-104.5-4h-A
Physical configuration :		Metal enclosure with metal cover	
		Weight: 670±15kg	
		Cells in series/parallel: 1P104S	
Cooling method :		Liquid cooling	
Separation between cells :		Aerogel	
Electrical rating :		Rated capacity: 314 Ah	
		Nominal voltage: 332.8V	
Standard charge method :	Charge current :	157 A	78.5A
	End of charge voltage :	374.4 V	
	Charge temperature range:	0~55 °C	
Standard discharge method..... :	Discharge current :	157 A	78.5A
	End of discharge voltage :	265.2 V	
	Discharge temperature range:	0~55 °C	
External dimensions (mm) :		2180±5mm(L)×790±3mm(W)×248±5mm(H)	

1.3. Energy Storage System

The product information and parameters are provided by the client as below.

	Battery rack	Battery rack
Product	LFP Lithium Ion Energy Storage System	LFP Lithium Ion Energy Storage System
Type/model	CSI-SolBank-R-418-2h-A	CSI-SolBank-R-418-4h-A
Cell Capacity [Ah]	314	314
Cell Quantity	416	416
Battery structure	(104)4S	(104)4S
Nominal voltage [V]	1331.2	1331.2
Rated capacity [kWh]	418	418
Upper limit charging voltage [V]	1497.6	1497.6
Maximum charging power[kW]	208	104
Maximum discharging power[kW]	208	104
Over charge protective voltage [V]	1518.4	1518.4
Cut-off voltage [V]	1060.8	1060.8
Temperature range for charging [°C]	0°C to 55°C (Environment)	0°C to 55°C (Environment)
Temperature range for discharging [°C]	0°C to 55°C (Environment)	0°C to 55°C (Environment)
Temperature threshold for protection	Low temperature of battery:5°C High temperature of battery:45°C Battery temperature difference: 15°C	Low temperature of battery:5°C High temperature of battery:45°C Battery temperature difference: 15°C
Recommend charging method by manufacturer	208 kW CP 2h	104 kW CP 4h
Dimension [mm]	2180(L)×790(W)×248(H)×4	2180(L)×790(W)×248(H)×4
Weight [kg]	2640	2640
Cooling type	Liquid cooling and liquid heating for cell	Liquid cooling and liquid heating for cell
Altitude	3000m	3000m

2. Product Description:

2.1. General Description

This product is used for Energy Storage System.

This EUT covered by this report is DC system for energy storage, which mainly consists of 12 Lithium ion battery racks, 1 liquid chiller, fire protection, some auxiliary power supply components integrated in 1 cabinet.

Each battery rack includes 1 master control box and 4 battery packs in series connection. Total 12 racks parallel connection for the completed system.

The main output circuit for the system is optional for a set of ports (for 12 racks), or two sets of ports (each for 6 racks), depends on the main output busbar. Suitable disconnect device(s) should be provided for main circuit(s) in end-installation.

The insulation between the DC circuit and the metal enclosure is basic insulation. And the insulation between the DC circuit and communication ports is reinforced insulation or double insulation.

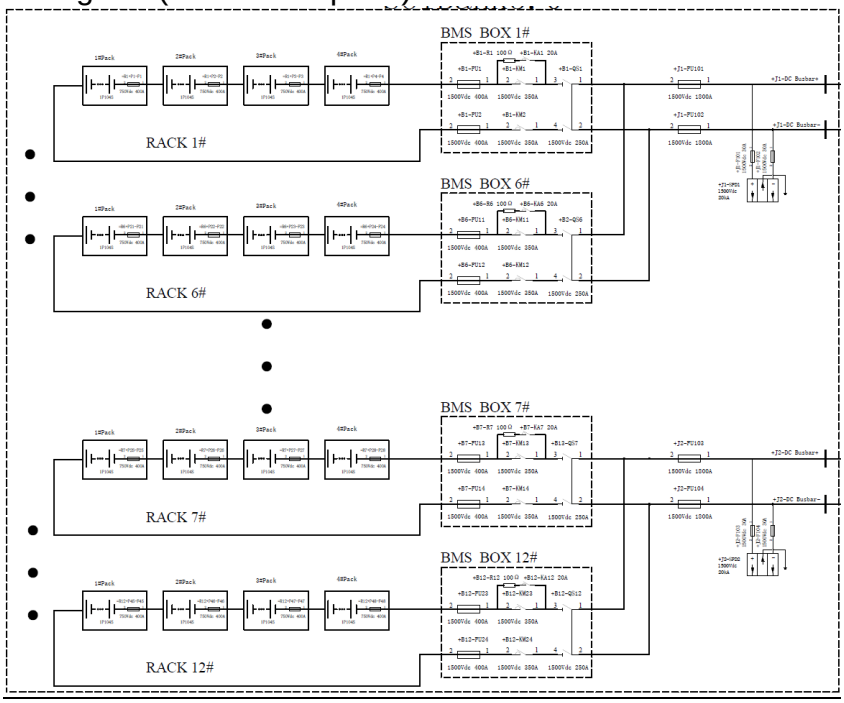
The battery system has overcharge, over-discharge, over current and short-circuits proof circuit. The electronic circuits and software controls for the battery system replied upon protective functions of the battery management system have been evaluated in accordance with UL 60730-1 Annex H.

The EUT is outdoor type with IP55 degree, PD2 was evaluated for inside and PD3 for outside.

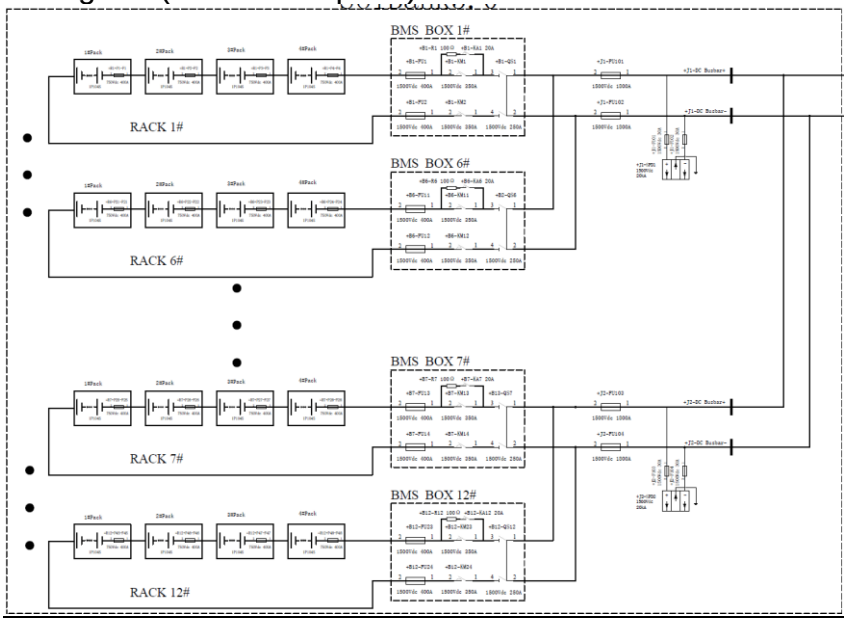


2.2. Energy Storage System Block Diagram

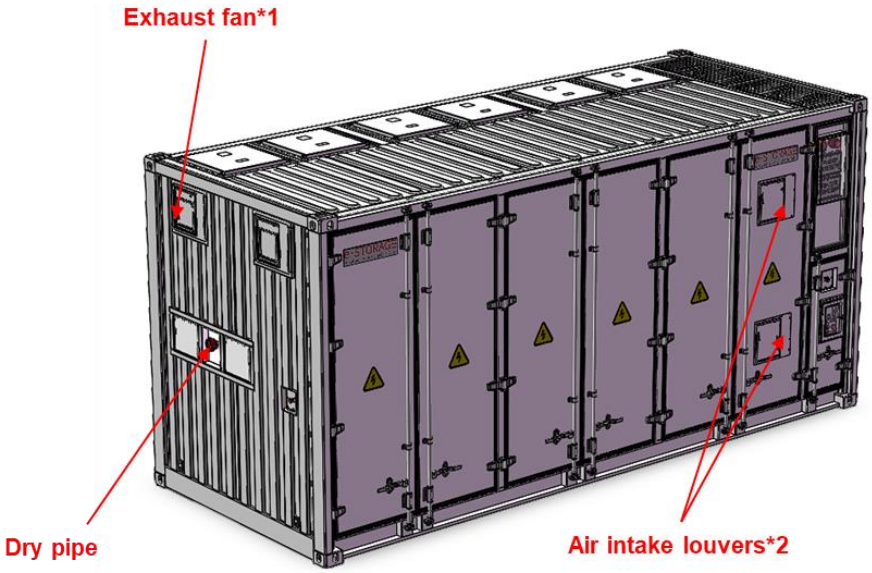
Main circuit block diagram (two sets of ports):



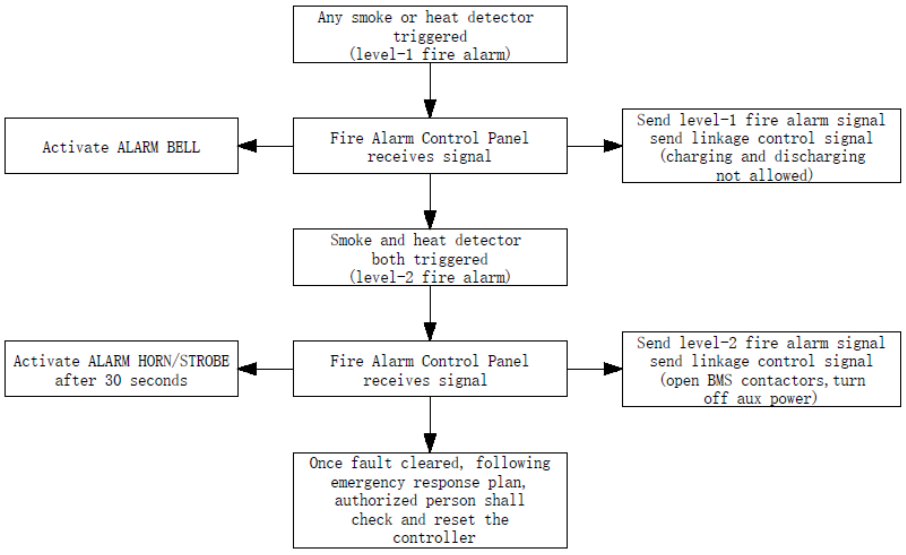
Main circuit block diagram (one sets of ports):

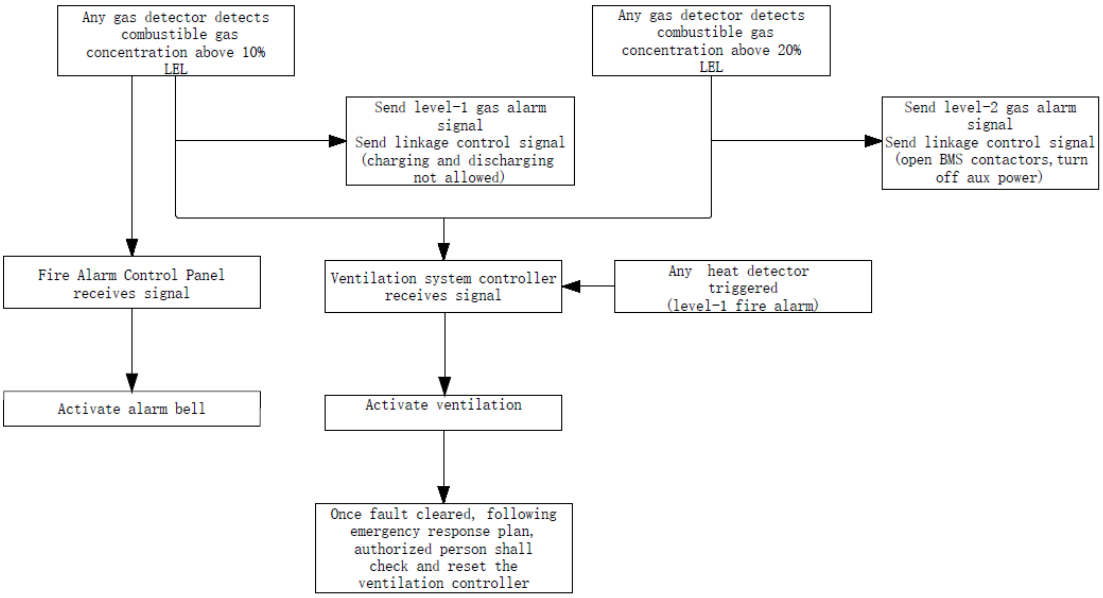


2.3. Venting System Information



Layout





Logic Diagram of the fire safety system and Ventilation System

3. Ventilation system evaluation referring to Chapter 8 in NFPA69:2024

Clause	Requirement – Test	Result – Remark	Verdict
Chapter 8	**Deflagration Prevention by Combustible Concentration Reduction**		--
8.1	**Application.** The technique for combustible concentration reduction shall be permitted to be considered where a mixture of a combustible material and an oxidant is confined to an enclosure and where the concentration of the combustible can be maintained below the lower flammable limit (LFL).	Specified in details in "CFD analysis of the ventilation system"	P
8.2	**Basic Design Considerations**		P
8.2.1	All of the following factors shall be considered in the design of a system intended to reduce the combustible concentration below the LFL:	Specified in details in "CFD analysis of the ventilation system"	P
	1) Required reduction in combustible concentration		P
	2) Variations in the process, process temperature and pressure, and materials being processed		P
	3) Operating controls		P
	4) Maintenance, inspection, and testing		P
	5) Concentration variation with time and location within the protected enclosure		P
8.2.2	The LFLs of the combustible components shall be determined at all operating conditions, including startup and shutdown.		P
8.2.3	**Protection System Design and Operation**		P
8.2.3.1	The owner or operator shall be responsible for a thorough analysis of the process to determine the type and degree of deflagration hazards inherent in the process		P
8.2.3.2	Information required for the monitoring and control of the concentration of combustible components shall be compiled and documented. This information shall include, but not be limited to, the following:		P
	(1) Monitoring and control objectives		P
	(2) Monitored and controlled areas of the process		P
	(3) Dimensioned drawings of the process with the following: (a) Equipment make and model if available, including volumes and diameters and design strengths (b) Plan and elevation views with flows indicated		P

3. Ventilation system evaluation referring to Chapter 8 in NFPA69:2024

Clause	Requirement – Test	Result – Remark	Verdict
	(4) Startup, normal, shutdown, temporary operations, and emergency shutdown process conditions and ranges for the following: (a) Flow (b) Temperature (c) Pressure (d) Oxidant concentration (e) Fuel concentration		P
	(5) Process flow diagram and description		P
	(6) Ambient temperature in process area		P
	(7) Process interlocks		P
8.2.3.3	The owner or operator shall disclose any and all process information required for the protection system design.		P
8.2.3.4	The protection system design shall be subject to a documented review by a qualified person.		P
8.2.3.5	The owner or operator shall be responsible for the maintenance of the system after installation and acceptance based on procedures provided by the vendor. Maintenance records shall be retained for inspection by the authority having jurisdiction.		P
8.2.3.6	The owner or operator shall be responsible for periodic inspection of the system by personnel trained by the system manufacturer. The inspection frequency shall be in accordance with Section 15.7.		N/A
8.2.3.7	Management of Change. The effect of any process change shall be addressed as specified in Section 15.11.		N/A
8.2.3.8	All documentation relevant to the protection system shall be retained in accordance with Chapter 15.		P
8.3	**Design and Operating Requirements**		P
8.3.1	**Combustible Concentration Limit.** The combustible concentration shall be maintained at or below 25 percent of the LFL for all foreseeable variations in operating conditions and material loadings, unless the following conditions apply:	Specified in details in “CFD analysis of the ventilation system”	P
	(1) Where continuously monitored and controlled with safety interlocks, the combustible concentration shall be permitted to be maintained at or below 60 percent of the LFL.	Not applicable	N/A

3. Ventilation system evaluation referring to Chapter 8 in NFPA69:2024

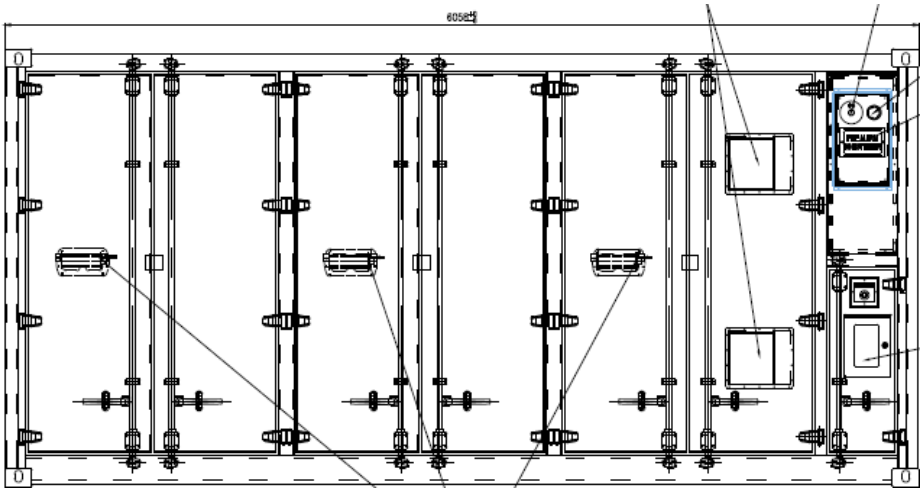
Clause	Requirement – Test	Result – Remark	Verdict
	(2) Aluminum powder production systems designed and operated in accordance with NFPA 484 shall be permitted to be maintained at or below 50 percent of the LFL.	Not applicable	N/A
8.3.2	**Catalytic Oxidation.** Where catalytic oxidation is used for combustible concentration reduction, the following shall apply:		N/A
	(1) Isolation systems shall be provided in all inlets to the catalytic oxidation unit.		N/A
	(2) Unless the combustible concentration is monitored continuously, the effectiveness of the catalytic oxidation system shall be verified periodically in accordance with the manufacturer's recommendations.		N/A
8.3.3	**Ventilation or Air Dilution**		P
8.3.3.1	If ventilation is used, the outlets from the protected enclosures shall be located so that hazardous concentrations of the exhausted air cannot enter or be drawn into the fresh air intakes of environmental air‐handling systems.		P
8.3.3.2	Air intakes shall meet one of the following requirements:		P
	(1) They shall be located so that combustible material cannot enter the air-handling system, even in the event of spills or leaks.		P
	(2) They shall be provided with gas detectors that automatically interlock to stop air intake.		P
8.3.3.3	Filters, dryers, or precipitators in the air intakes shall be located such that they are accessible for cleaning and maintenance.		P
8.4	**Instrumentation**		P
8.4.1	Instrumentation shall be provided to monitor and control the process flows.		P
8.4.2	Instrumentation shall be calibrated according to the requirements of Chapter 15.		P
8.4.3	Where the enclosure being protected presents a personnel hazard, alarms shall be provided to indicate abnormal operation of the system.		P

4. CFD analysis of the ventilation system

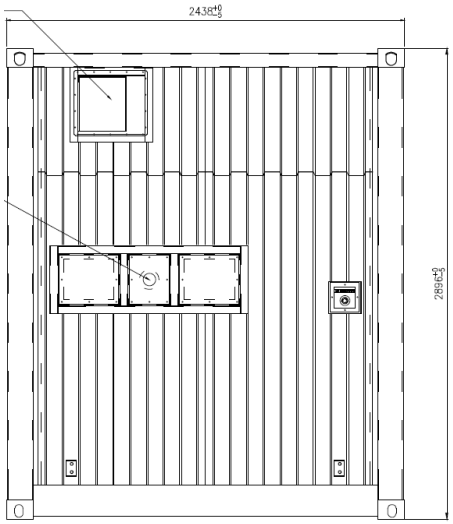
4.1. Basic Information of the system

The interior and exterior drawings provided by CSI were verified between TUV and CSI before running any calculation.

Figure 4-1 shows an external view of the container and the dimensions from a front and left view. The cube measures 6.058*2.438*2.896 m including one battery cabinets, liquid coolant unit and Auxiliary power supply unit. The cabinet contains 48 modules in rack and 104 cells in each module. The overall internal volume of battery cabinet is approximately 31.38 m^3. Subtracting the space filled by racks, modules, and the support structure, the actual open internal volume (efficient volume) is 8.74 m^3.



Front view



Left view

Figure 4-1: Geometry of CSI energy storage system

4.2. Principles and Assumptions

The following safety systems and CFD analysis have been acknowledged for the basis of the study's assumptions. Note that the scenarios and assumptions are run according to cell level, module level and unit level UL9540A test to show progressively worse-case scenarios based on the information available and are considered to be conservative.

4.2.1. Thermal runaway and propagation

(1) Propagation between cells:

The UL 9540A test report of module level and unit level indicate that cell to cell propagation could happen within a submodule which contains 26 cells. According to the test report, a total of 5 cells failed both the module level test and the unit level test. Therefore, 5 cells failure is considered in this study.

Assumption 1: There are 5 cells failure within submodule is considered in this study.

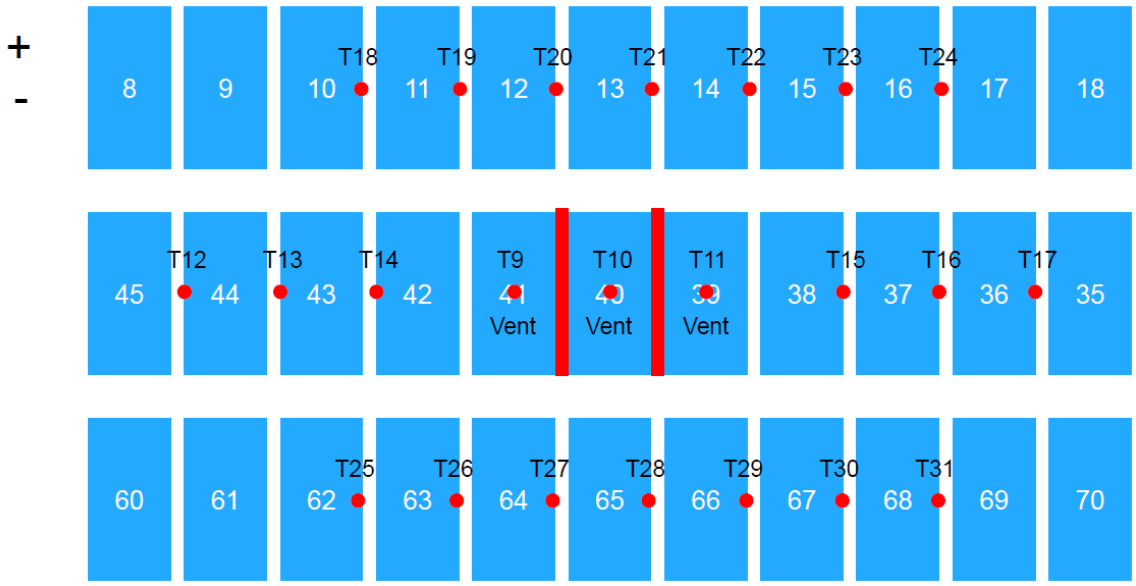


Figure 4-2: Initiating module set up in unit level UL9540A test report.

(2) Propagation between modules:

The UL 9540A test report of unit level does not indicate that it is possible to have propagation between modules.

Assumption 2: There is no module-to-module propagation.

4.2.2. Leakage profile and gas composition

(1) Leakage profile:

The data and test phenomenon in cell level, module level and unit level UL 9540A test report provide gas release rate and total amount. The gas release rate profile in this study is the worst scenario that considered the raw data from module level UL 9540A test. (See Figure 4-3).

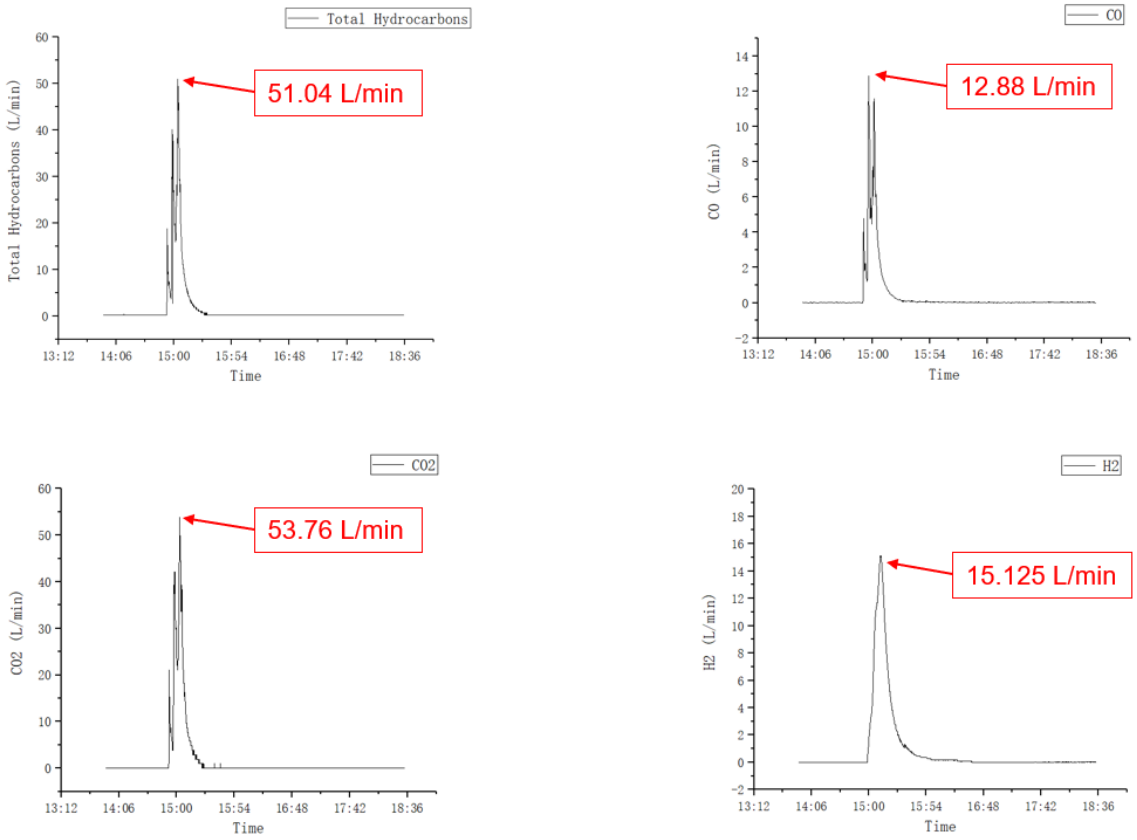


Figure 4-3: Module level gas generation and composition data

For conservative consideration, it is assumed that gas release rate is set to be a constant value which is the maximum release rate throughout the test. Based on module level and unit level test, the gas release is 132.805 LPM according to the test raw data of THC, CO, CO_2 and hydrogen release rate in module level test (See Figure 4-4).

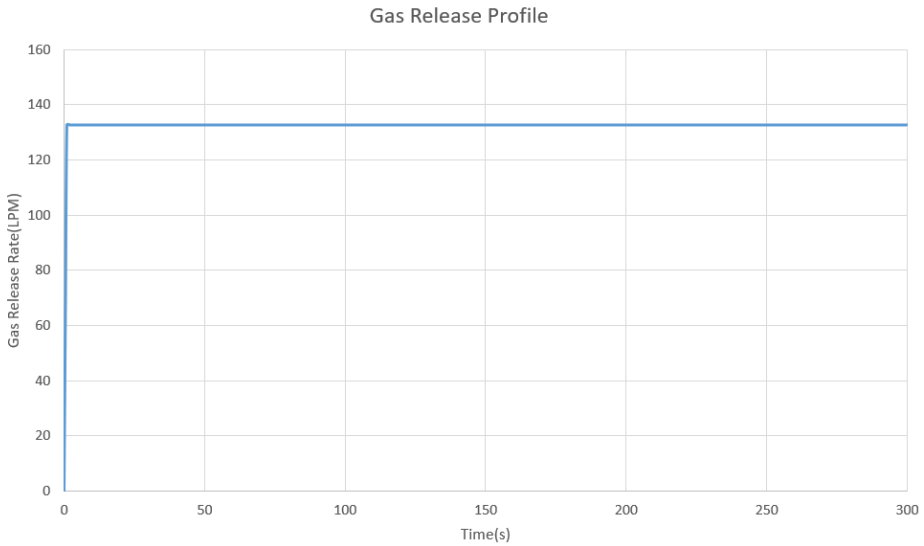


Figure 4-4: Gas release rate profile

Assumption 3: The offgas release profile is set as above for each scenario.

(2) Position of the leak:

According to unit level UL 9540A test, module 1-2 was chosen to be the initial module to form a maximum thermal effect (See Figure 4-5), and the test photo shows the offgas will release from the gas release valve located at the back of module. However, the gas release from the bottom module of the rack (M1-1) takes more time to reach the detector which located at the top of the container. For conservative consideration, the bottom module of the rack (M1-1) is set to be the initiating module.

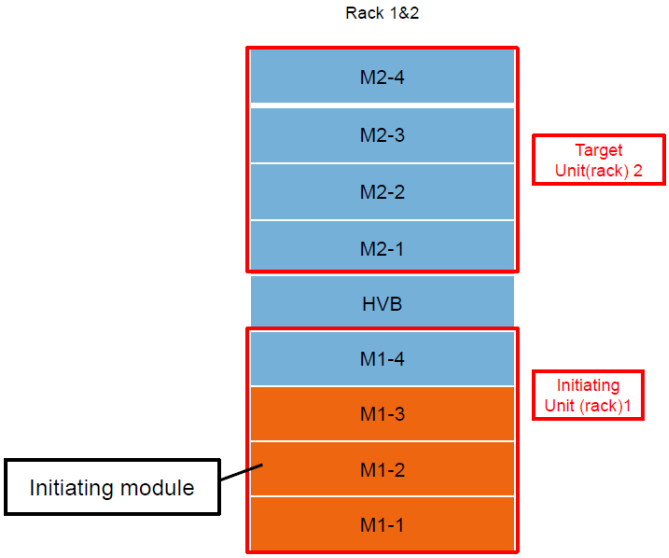


Figure 4-5: Unit level UL 9540A test setup

In order to investigate the influence of the gas release position relative to the sensor and the position of the air inlet and outlet on the exhaust effect, three gas release positions which located on the bottom module of left rack, middle rack and right rack are calculated and simulated separately to see the effect. (See Figure 4-6)

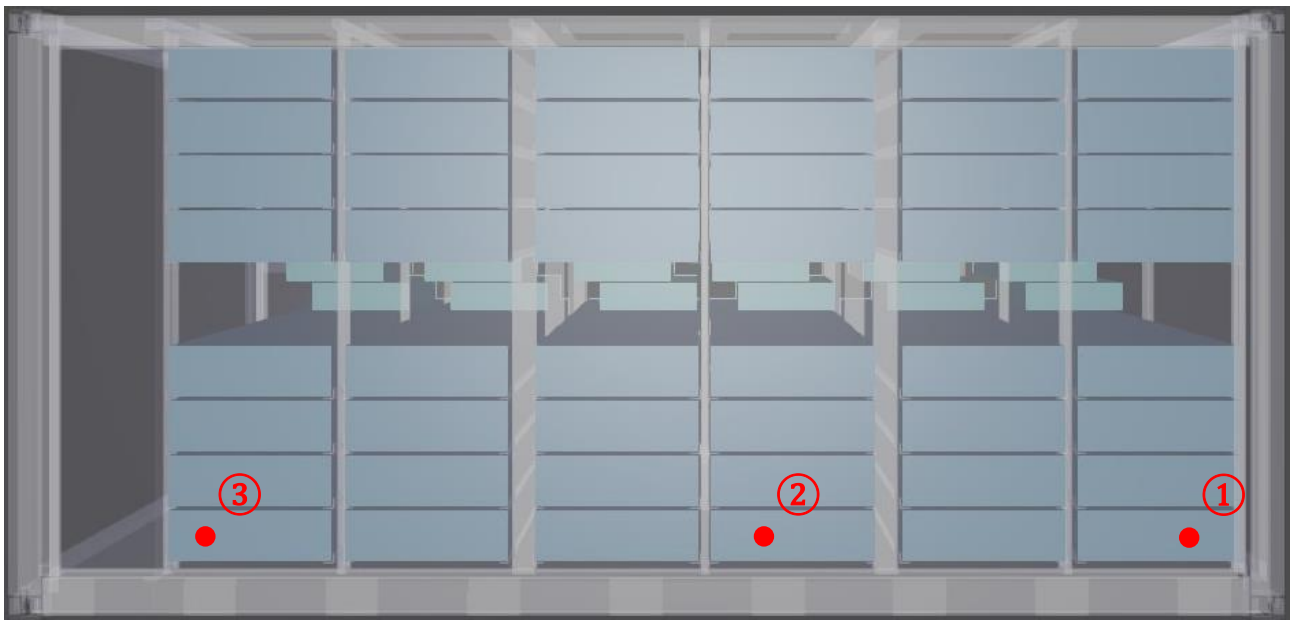


Figure 4-6: Location of gas leakage position (back view).

Assumption 4: Three offgas release positions on M1-1 of the three racks are considered in this study. (See Figure 4-6)

(3) Gas detector:

Regarding the construction of the container, there is two gas detectors equipped on the edge of roof, the location is shown in figure 4-7.

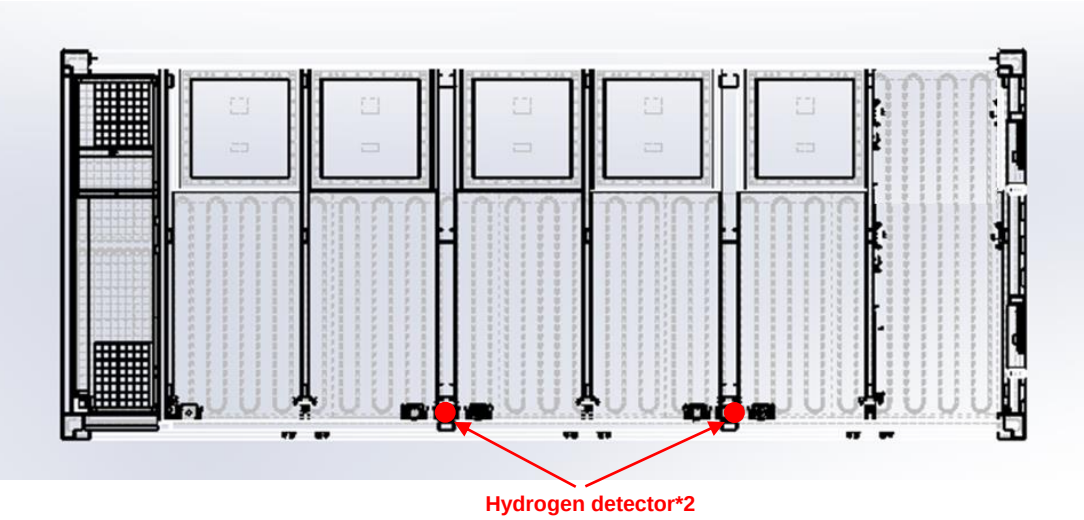


Figure 4-7: Location of gas detectors (top view).

Assumption 5: The positions of gas detectors are set as above to monitor the concentration of hydrogen and trigger ventilation fans.

(4) Gas composition and LFL:

Gas composition was provided in the test data of cell level UL 9540A report. Table 4-1 lists the release gas composition by volume.

Table 4-1: Gas composition by volume

Gas component		Concentration % (v/v)
Methane	CH_4	4.495
Acetylene	C_2H_2	0.157
Ethylene	C_2H_4	2.299
Ethane	C_2H_6	0.729
Propyne	C_3H_4	0.012
Propylene	C_3H_6	0.952
Propane	C_3H_8	0.211
Butylene	C_4H_8	0.616
Butane	C_4H_{10}	0.080

Hydrogen	H_2	49.725
Carbon Monoxide	CO	13.898
Carbon Dioxide	CO_2	26.826
Total	-	100

The LFL of offgas is provided as 7.3%vol by cell level UL 9540A test report.

Assumption 6: Gas composition is as above, LFL of gas is set to be 7.3%vol in this study.

4.2.3.System safety

(1) Ventilation system:

The container is fitted with one exhaust fan and two inlet motorized blinds which activate immediately when 10% LFL H_2 is detected. The rated flow rate of exhaust fan is 1393.34 m^3/h (820 CFM), consider flow rate attenuation in actual container, the exhaust fan operates at a flow rate of 1019.52 m^3/h (600 CFM) for a conservative consideration. (See 2.3).

Manufacturer name	Type number	Dimension	Flow Rate (Max)
NANJING HEBEN M&E EQUIPMENT TECHNOLOGY CO., LTD	TPF13, TPF14	410×360mm	820 CFM

Assumption 7: The dispersion simulations are run with exhaust fan which operates at a flow rate of 1019.52 m^3/h (600 CFM). The activation time will be calculated from the CFD simulations.

(2) Thermal runaway control:

No thermal runaway prevention system is installed.

Assumption 8: Thermal runaway occurs in the module.

(3) Deflagration panels:

No deflagration panel installed on the container.

Assumption 9: No deflagration panel acts in this report.

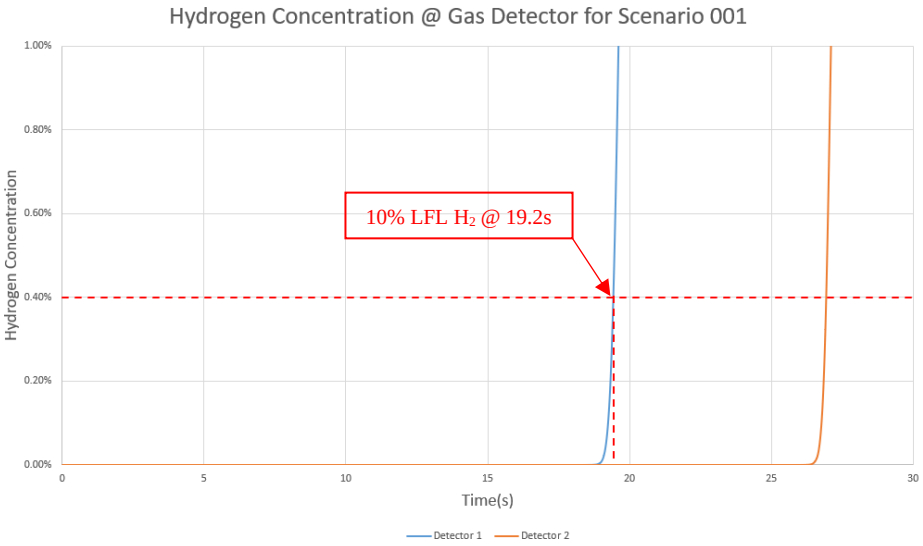
4.3. Simulation Results

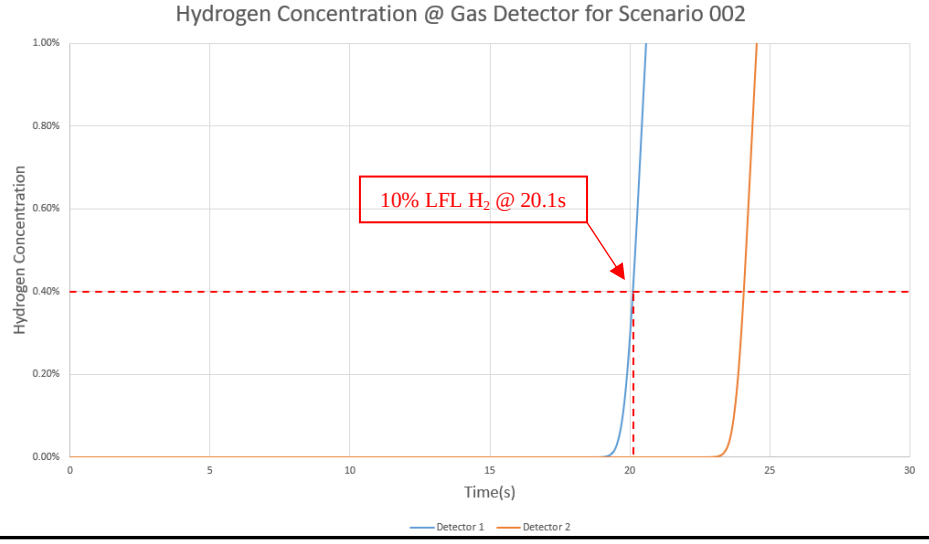
A total of 3 dispersion scenarios were run representing progressively worse-case scenarios based on the assumptions made in the previous sections. The modelling covers 3 leakage position.

According to the strategy of ventilation system provided by CSI, the fan will be activated when detection reaches 10% LFL of hydrogen, consider the actual time lag that takes for exhausting fan to reach maximum flow rate, 5s time lag for fan start was added to each scenario after detector activated. Table 4-2 shows the activating time for each scenario. Figure 4-8 shows the hydrogen concentration at the location of gas detector in each scenario.

Table 4-2: Fan activating time.

Scenario	Leakage Point	Activating time (s)
001	1	19.2
002	2	20.1
003	3	20.2





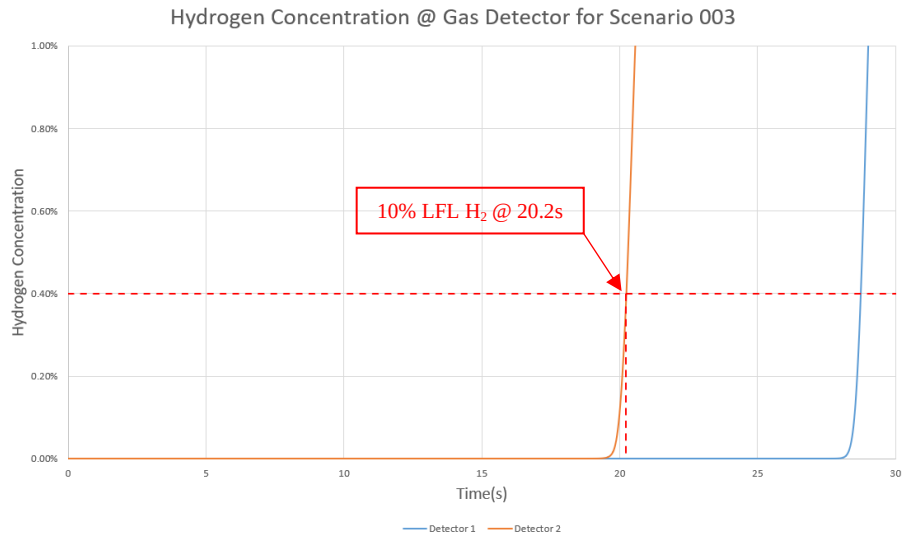


Figure 4-8: Hydrogen concentration at detectors.

Table 4-3 presents a summary of the scenarios and the results from the simulation. The maximum average concentration inside enclosure is presented as the combustible concentration limit according to NFPA 69 Chapter 8.

Table 4-3: Average gas concentration

Scenario	Maximum average gas concentration	
	Vol%	%LFL
001	0.547%	7.49%LFL
002	0.590%	8.08%LFL
003	0.653%	8.95%LFL

Figure 4-9 shows the average gas concentration for each scenario with the extraction fans activated.

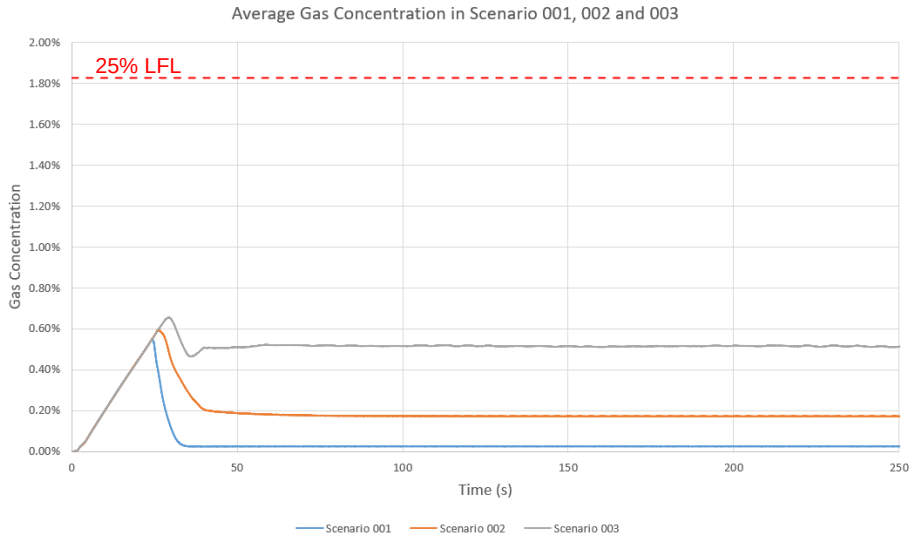
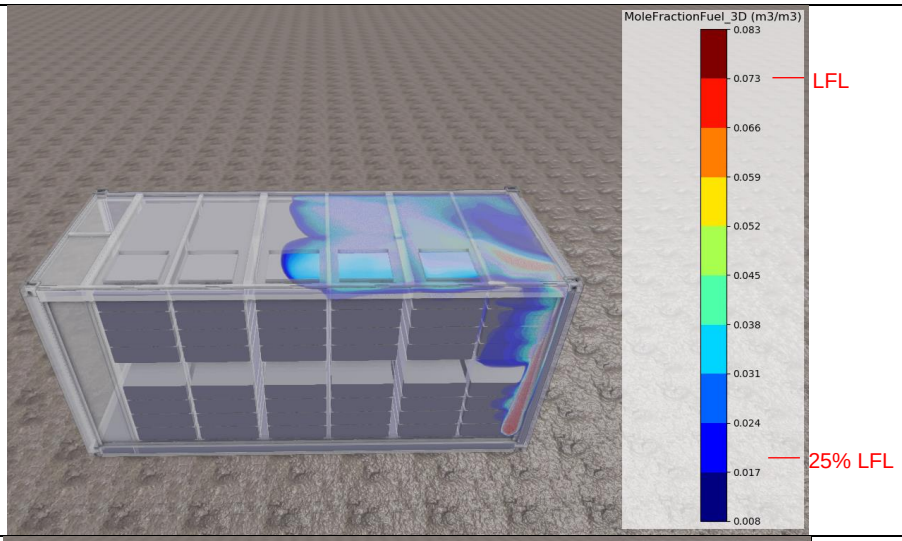
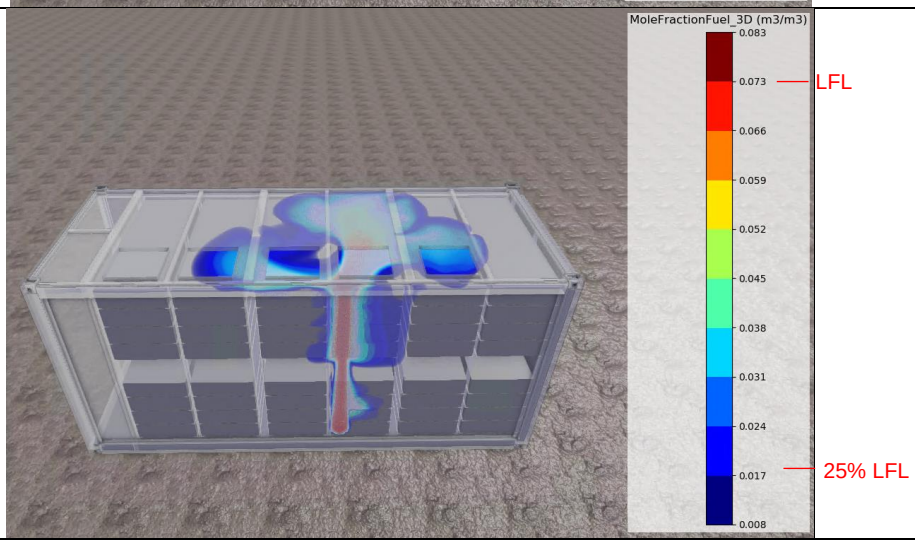


Figure 4-9: Average gas concentration in scenario 001, 002 and 003.

From the simulations we observe:

a) All scenarios with extraction fans activated can reduce flammable volume of gas;
b) All scenarios with extraction fans activated can remain gas average concentration below 25% LFL in the container;
c) There is small pocket of gas above 25%LFL throughout the process (see Figure 4-10).

Figure 4-10 shows the gas cloud inside container at the time step that the gas average concentration is the maximum for each scenario.

Scenario	Gas cloud @ maximum average concentration
001	
002	

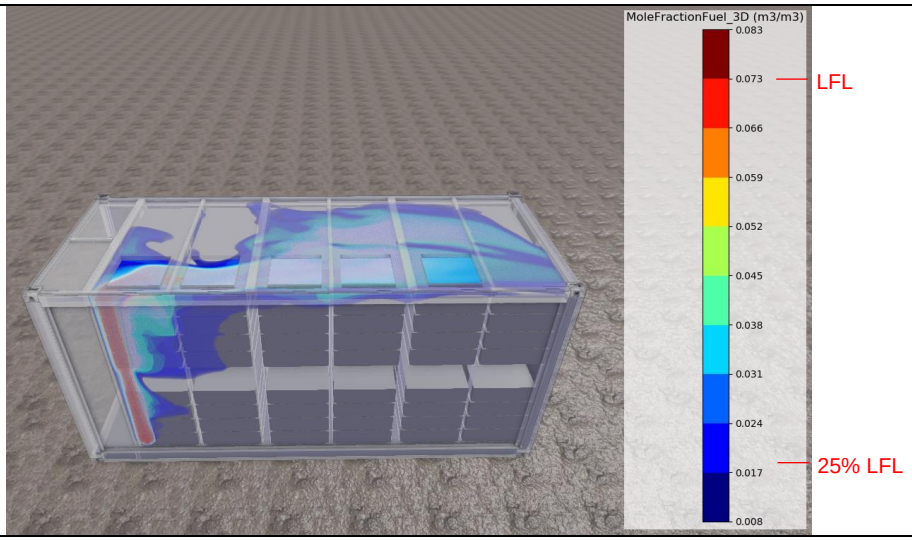
003		

Figure 4-10: Gas cloud at maximum average concentration

4.4. NFPA 69 Analysis

Chapter 8 of NFPA 69 is a section of the standard that discusses deflagration prevention by combustible concentration reduction, which applies to the flammable gas extraction system (via fans and gas detection). Chapter 8 states that the following design and operating requirements must be met to comply with NFPA 69:

The combustible concentration shall be maintained at or below 25 percent of the LFL for all foreseeable variations in operating conditions and material loadings, unless the following conditions apply:

(1) Where continuously monitored and controlled with safety interlocks, the combustible concentration shall be permitted to be maintained at or below 60 percent of the LFL.

(2) Aluminum powder production systems designed and operated in accordance with NFPA 484 shall be permitted to be maintained at or below 50 percent of the LFL.

As shown in Figure 4-9, the extraction fans keep the average concentration of gas in the container below 25% LFL in all scenarios. It is noted that small pockets of gas are seen to exceed 25% LFL during the extraction of the gases.

5. Conclusions

Conclusions for CSI Energy Storage System NFPA 69 CFD Analysis are:

a) All scenarios with extraction fans activated can reduce flammable volume of gas;
b) All scenarios with extraction fans activated can remain gas average concentration below 25% LFL in the container.
c) The combustible concentration of all scenarios is within the limit of NFPA 69.

The scenarios in this report follow the situation of cells fail and gas release from test observations outlined in the UL 9540A test report and considered conservative by releasing gas at maximum release rate throughout the test. The exhausting fan activate when gas concentration at detector reaches 10% LFL for hydrogen, consider the actual time lag that takes for exhausting fan to reach maximum flow rate, 5s time lag for fan start was added to each scenario. We could notice from figure 4-9 and 4-10 that the ventilation capability could cover larger scale cell failure condition.

6. References

(1) NFPA69:2024 Standard on Explosion Prevention Systems

(2) Cell Level UL9540A Report: CN243TAR 001

(3) Module Level UL9540A Report: CN25HYJ6 001

(4) Unit Level UL9540A Report: CN25DK3S 001

End of Report

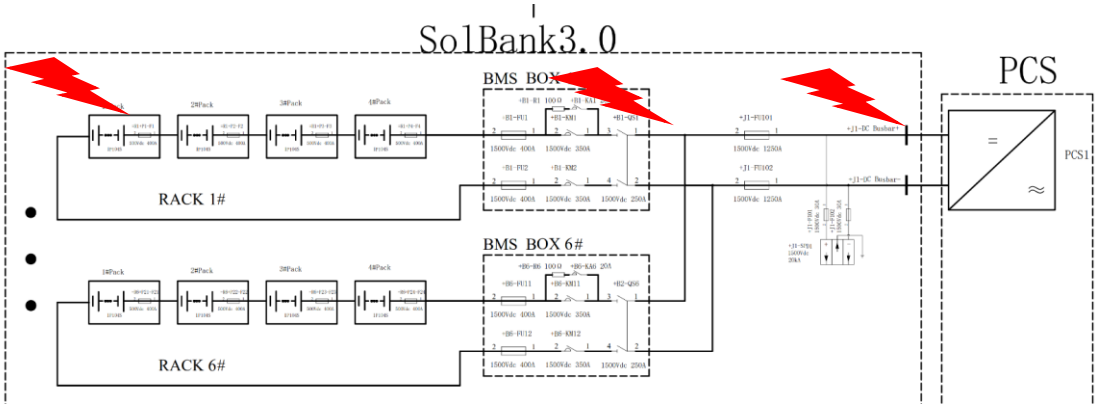
Appendix E

DC SHORT CIRCUIT STUDY

DC Arc Flash Calculation Report-0.25P-Solbank3.0-V4

1 Calculation of short circuit current

This section pretends to obtain the expected let-through peak current at three different locations within an isolated SolBank 3.0 rated for 4 hrs of discharge duration according to the IEC 61660.



Picture1：Short-circuit locations

The procedure that will be followed is:

1. Determination of the internal resistance (R_s) of the system based on internal test data. The value will be obtained for the most restrictive scenario (BoL and 100 % of SOC)

2. Determination of the prospective short-circuit current (I_{sc}) at the most restrictive scenario (BoL and 100 % of SOC)

3. Determination of the internal inductance (L_s) of the system from experimental test results. The inductance of the external cables used during the test will be neglected.

$$Itest = \quad Vtest/Rtest * (1 - e\text{^}((-Ttest * Rtest)/Ltest)\ )$$

a. V_{test}: Oper circuit voltage before short-circuit test

b. R_{test}: sum of "measured external short-circuit resistance and the internal resistance of the battery at V_{test}. It can also be obtained by dividing the V_{test} by the steady state current of the short-circuit.

c. I_{test}: measured let-through peak current during the experimental short-circuit test

d. T_{test}: time from the beginning of the fault and the moment when the current start decreasing once the fuse starts blowing

4. Determination of the pre-arcing time for the most restrictive scenario (100% of SOC) (T_p) by using the prospective short-circuit current (I_{sc}) obtained in the second step

5. Determination of the expected let-through peak current by using the equation that represents the natural evolution of a short-circuit in a battery.

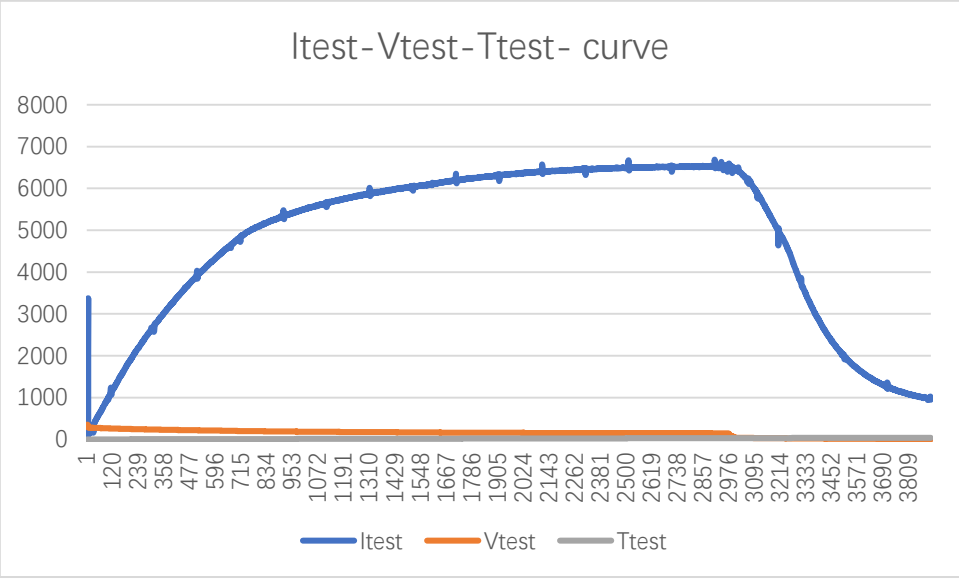
$$I_{peak} = I_{sc}*[1 - e^{(-T_p/ \tau)}]$$

Where τ is the time constant obtained by L/R.

1.1 Short circuit calculation for a single pack

1. Determination of the internal inductance (L_s) and the internal resistance (R_{pack}) of the system from experimental test results.

Test conditions: In Pack, There are two 2-meter copper wires of 70mm² led out from B+ and B- , Then connect it to the testing instrument with two 2.5-meter copper wires of 95mm² , and a 19.42mΩ resistor is connected in series to each cable.



Picture 2 : Pack short circuit test data curve (Time unit: μs)

a. V_{test} = 347.5 V

b. I_{peak} = 6670 A,

c. R_{test}=347.5V/6670A=52.1 mΩ

d. T_p: considering the time of 0.5 ms that correspond to a current value equal to 4000 A

$$4000 = 6670 * \left(1 - e^{\frac{-0.0005*0.0521}{Ltest}}\right)$$

L_{test}≈ 0.00002842 H

L_{cable}= 0.00000451 H

L_{pack}= 0.0000239 H

R_{pack}=52.1-19.42 -2.1 = 30.58mΩ

2 Determination of the prospective short-circuit current (I_{sc}) at the most restrictive scenario (BoL and 100 % of SOC) → I_{sc} = 104*3.38 / 0.03058 =11495A.

放电 OCV

T/℃	100%	98%	96%	92%	90%	85%	80%	75%	70%	65%	60%	55%
-30℃												
-20℃	3.3990				3.3140		3.3130		3.3075		3.2989	
-10℃												
0℃												
10℃												
15℃	3.4160	3.3328	3.3320	3.3315	3.3320	3.3308	3.3310	3.3300	3.3290	3.3100	3.2920	3.2900
25℃	3.3804	3.3330	3.3323	3.3322	3.3323	3.3312	3.3309	3.3301	3.3297	3.3059	3.2936	3.2917
35℃	3.3537	3.3340	3.3333	3.3335	3.3331	3.3327	3.3320	3.3316	3.3311	3.3059	3.2968	3.2953
45℃												
55℃												

Picture 3 : DC-DCR data table (BoL)

1. Determination of the expected let-through peak current for the most restrictive scenario.

$$I_{peak} = 11495*[1 - e^{(-T_p/\tau)}]$$

τ = 0.0000239H/0.03058Ω=0.0007815 s

Without the short-circuit protection provided by Fuse, the curve graph of $I_{peak_}$ T_p is as follows:

Determination of the pre-arc time during the fault when pack installs fuse.

No.	Part Number	Size	In (A)	I²t/ (A²s) [b]		I²t/ (A²s) [c]		Loss (W) [a]		Weight (g)	Min Package	Max Package	Remark
				Prearc	Clearing	Prearc	Clearing	0.5In	In				
1	RS08R-LGH 400A	00	400	1100000	1500000	732000	1510000	11.6	65.9	200±15	8	48	配装于 MSD/Fitted to MSD

Picture 4 : MSD Fuse Data Sheet

$$\int_0^{Tp} I^2peak \cdot TpdTp = 1100000\ A^2s$$

$T_p \approx 0.008924$ s (It should be noted that the MSD Fuse used in our test is different from the actual product's MSD fuse.)

$I_{peak} = 11495$ A

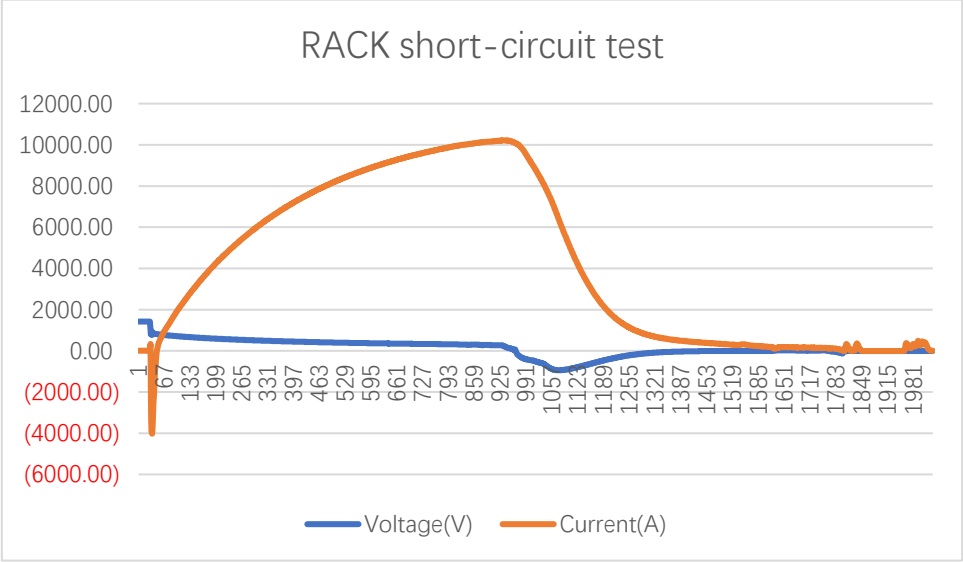
After Pack joined fuse (MSD), when a short circuit occurred, the allowable I_{peak} value was 11495A, and the pre-arc time of the fuse was 0.008924s.

1.2 Short circuit calculation for a single rack

1. Determination of the internal inductance (L_s) and the internal resistance (R_{pack}) of the system from experimental test results.

   Test conditions: In Pack, a 19.96mΩ resistor is connected in series to each cable.





a. V_{test} = 1418.5 V

b. I_{sc} = 10219 A,

c. R_{test}=1418.5V/10219A=138.8mΩ

d. T_p: considering the time of 0.484 ms that correspond to a current value equal to 8056 A

$$8056 = \ 10219 * \left(1 - e^{\frac{-0.000484*0.1388}{Ltest}}\right)$$

L_{test}≈ 0.0000268 H

L_{cable}= 0.0000015 H

L_{rack}= 0.0000253 H

R_{rack}=138.8-19.96 = 118.84mΩ

Determination of the prospective short-circuit current (I_{sc}) at the most restrictive scenario (BoL and 100 % of SOC) → I_{sc} = 104*3.38*4 / 0.11884 = 11832A

2. Determination of the expected let-through peak current for the most restrictive scenario.

$$I_{peak} = 11832*[1 - e^{(-T_p/\tau)}]$$

τ =0.0000268H/0.11884Ω=0.0002255s

Without the short-circuit protection provided by Fuse, the curve graph of $I_{peak_}$ T_p is as follows:

Determination of the pre-arc time during the fault

序号	型号	尺寸代码	额定电流 A	I^2t ($A^2.s$) *DC1600V		功耗 W	重量 (g)	最大包装数量	安装方式
				弧前	熔断				
1	RSZ307-3-RAZ-100A1500V	3	100	1090	5000	55	2350±100	6	推荐安装方式：M8螺栓、螺母安装 推荐扭矩：（11±1）N.m
2	RSZ307-3-RAZ-125A1500V		125	1940	8500	65			
3	RSZ307-3-RAZ-160A1500V		160	3650	15800	83			
4	RSZ307-3-RAZ-200A1500V		200	5900	25500	100			
5	RSZ307-3-RAZ-250A1500V		250	10900	47000	115			
6	RSZ307-3-RAZ-315A1500V		315	20500	88000	133			
7	RSZ307-3-RAZ-350A1500V		350	27380	120000	142			
8	RSZ307-3-RAZ-400A1500V		400	39400	168000	155			
9	RSZ307-3-RAZ-450A1500V		450	58900	277500	160			

Picture 5 : BMS-BOX Fuse Data Sheet

$$\int_0^{Tp} I^2peak \cdot TpdTp = 39400\ A^2t$$

$T_p \approx 0.000586$ s

$I_{peak} = 10953$ A

After Rack joined fuse (BMS-BOX), when a short circuit occurred, the allowable I_{peak} value was 10953A, and the pre-arc time of the fuse was 0.000586s.

1.3 Short circuit calculation of a split (6pcs racks)

1. Determination of internal resistance (R_s): Calculate based on the split with lower resistance (racks 7..12)

String	7	8	9	10	11	12
R of rack/(mΩ)	118.84	118.8	119.45	119.54	120.55	120.55
R_{s1} =19.93 mΩ+1.58 mΩ = 21.51 mΩ						

Table 1 : Internal resistance of a split system

2. Determination of the prospective short-circuit current (I_{sc}) at the most restrictive scenario (BoL and 100 % of SOC) → I_{sc} = 104*3.38*4 / 0.02151= 65368 A.

3. Determination of the internal inductance (L_s) of the system from experimental test results.

$L_{s_split} \approx (L_{pack} + L_{cable}) / 6$

τ =0.0000268/6/0.02151=0.000207s

Determination of the pre-arc time during the fault.

Technical parameter:

P/N	Current Rating (A)	Pre-arcing I^2t (A^2s)	Total I^2t (A^2s)	Power Loss at In (W)	Power Loss at 0.8xIn (W)	Power Loss at 0.5xIn (W)
ESS5-630	630	169,000	1,098,000	183	99	45
ESS5-700	700	200,000	1,434,000	192	104	47
ESS5-800	800	320,000	2,081,000	202	109	49
ESS5-900	900	467,000	3,035,000	212	115	52
ESS5-1000	1000	658,000	4,280,000	233	126	57
ESS5-1100	1100	804,000	5,228,000	241	130	59
ESS5-1250	1250	1,140,000	7,410,000	262	142	64
ESS5-1350	1350	1,430,000	9,290,000	273	147	67
ESS5-1500	1500	1,870,000	12,140,000	286	155	70
ESS5-1600	1600	2,450,000	15,910,000	284	154	69
ESS5-1800	1800	3,170,000	20,570,000	315	170	77

Picture 6 : DMC Fuse Data Sheet

$\int_0^{Tp} I^2peak \cdot TpdTp$=1140000 A²s

$T_p \approx$ 0.000549 s

I_{peak} =60720A

After Pack joined fuse (DMC), when a short circuit occurred, the allowable Ipeak value was 60720A, and the pre-arc time of the fuse was 0.000549s.

1.4 Short circuit calculation of a split (12pcs racks)

1. Determination of internal resistance (R_s): Calculate based on the split with lower resistance (racks 1..12)

String	7	8	9	10	11	12
R of rack/(mΩ)	118.84	118.8	119.45	119.54	120.55	120.55
String	1	2	3	4	5	6
R of rack/(mΩ)	121.892	121.92	121.72	121.72	121.1	121.11
R_{s2} =10.05 mΩ+ 1.38mΩ = 11.43mΩ						

Table 2 : Internal resistance of a split system

2. Determination of the prospective short-circuit current (I_{sc}) at the most restrictive scenario (BoL and 100 % of SOC) → I_{sc} = 104*3.38*4 / 0.01143= 123016A.

3. Determination of the internal inductance (L_s) of the system from experimental test results.

   $L_{s_single} \approx (L_{pack} + L_{cable}) / 12$

   $\tau = 0.0000268/12/0.01143 = 0.000195s$

Determination of the pre-arc time during the fault.

Technical parameter:

P/N	Current Rating (A)	Pre-arcing I^2t (A^2s)	Total I^2t (A^2s)	Power Loss at In (W)	Power Loss at 0.8xIn (W)	Power Loss at 0.5xIn (W)
ESS5-630	630	169,000	1,098,000	183	99	45
ESS5-700	700	200,000	1,434,000	192	104	47
ESS5-800	800	320,000	2,081,000	202	109	49
ESS5-900	900	467,000	3,035,000	212	115	52
ESS5-1000	1000	658,000	4,280,000	233	126	57
ESS5-1100	1100	804,000	5,228,000	241	130	59
ESS5-1250	1250	1,140,000	7,410,000	262	142	64
ESS5-1350	1350	1,430,000	9,290,000	273	147	67
ESS5-1500	1500	1,870,000	12,140,000	286	155	70
ESS5-1600	1600	2,450,000	15,910,000	284	154	69
ESS5-1800	1800	3,170,000	20,570,000	315	170	77

Picture 7 : DMC Fuse Data Sheet

$\int_0^{Tp} I^2peak \cdot TpdTp$=1140000 A²s

$T_p \approx$ 0.000573 s

I_{peak} =116502A

After Pack joined fuse (DMC), when a short circuit occurred, the allowable Ipeak value was 116502A, and the pre-arc time of the fuse was 0.000573s.

2 Arc energy

The basic calculation formula is shown as following:

Iem = 0.01×$Vsys$ ×$Iarc$ ×($Tarc$/D^2)×MF (Quoted standard: IEEE 1584-2018)

I$\boldsymbol{em}$: Estimated arc energy in cal/cm2.

V$\boldsymbol{sys}$: System voltage, unit V.

I$\boldsymbol{arc}$: arc current, unit A, $Iarc$=0.5×Ibf, Ibf is the expected fault current of the

battery obtained during the section 01 according to standard IEC 61660.

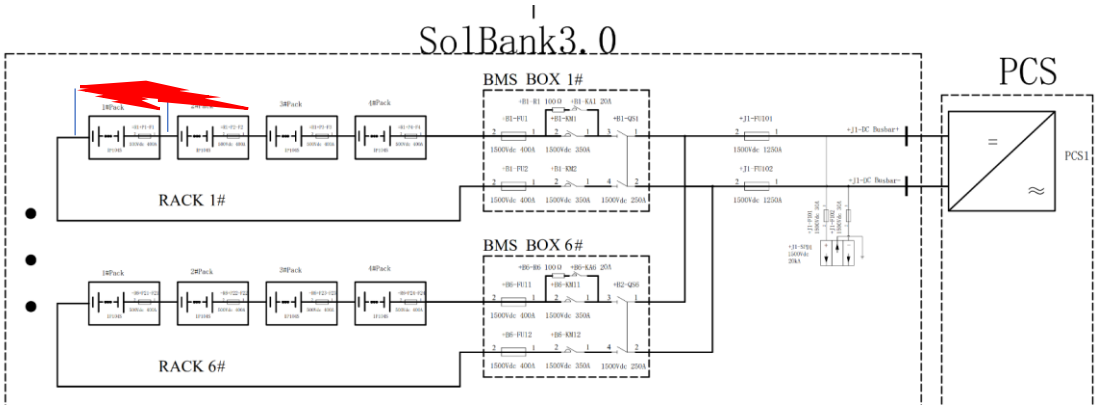
$Tarc$: Arcing time

D: Action distance, unit cm.

2.1 PACK short-circuit arc energy calculation

When a single battery pack is installed and maintained, the MSD is in an effective state, the short circuit event that may occur is the short circuit between the positive and negative electrodes, the SOC of the battery cell is 100%, and the voltage of the battery cell is 3.38V.

D: During the maintenance of the Pack, the positive and negative terminal connectors were accidentally connected in reverse, resulting in a short circuit. At this time, the minimum distance between the operator's hand and the short-circuit point of the connectors was 6 cm, the action distance is set at 5 cm.



Picture 8：The circuit points indicated in the schematic diagram

MF=(Pre-arcing I²t +Clearing I²t)/ Pre-arcing I²t=2.36

When a short circuit occurs as shown in Figure 6 at point ①:

$$Iem\ 1 = 0.01 \times 351.52\ V \times 0.5 \times 11495A \times (0.015s / 25cm^2) \times 2.36 = 6.84cal/cm^2$$

When a short circuit occurs as shown in Figure 8 at point ②:

$$Iem\ 2 \approx Iem\ 1 = 6.84cal/cm^2$$



Picture 9：The circuit points indicated in the physical object

2.2 Rack short-circuit arc energy calculation

When a single rack is installed and maintained, the BMS-BOX is in the closing state, and the short circuit event that may occur is the short circuit between the positive and negative electrodes. the SOC of the battery cell is 100%, and the voltage of the battery cell is 3.38V.

D: When connecting the input cables in DMC, the minimum distance between the personnel's hands and the busbar is 6 cm, the action distance is set at 5 cm.

MF=(Pre-arcing I²t +Clearing I²t)/ Pre-arcing I²t=5.26

$$Iem1 = 0.01\times1406.08\ \mathrm{V}\times0.5\times10953\mathrm{A}\times(0.0015s/25\mathrm{cm}^2)\times5.26= 5.8\mathrm{cal/cm}^2$$

2.3. Solbank3.0 system short-circuit arc energy calculation

Take the single busbar system as an example. Due to the higher arc flash energy and the greater likelihood of occurrence, when the circuit is in a closed state, the operator accidentally drops an object into the cabinet while conducting DMC inspection, resulting in the connection of the positive and negative pole busbars.

the SOC of the battery cell is 100%, and the voltage of the battery cell is 3.38V.

the action distance is set at 17.32 cm.

MF=(Pre-arcing I²t +Clearing I²t)/ Pre-arcing I²t=7.5

$$Iem_split = 0.01 \times 1406.08V \times 0.5 \times 60720\ A \times (0.001s/300cm^2) \times 7.5 = 3.39cal/cm^2$$

$$Iem_single = 0.01 \times 1406.08V \times 0.5 \times 116502\ A \times (0.001s/300cm^2) \times 7.5 = 6.5cal/cm^2$$

3 PPE selection Operators

should select appropriate personal protective equipment according to the calculation results of arc energy (for the dress requirements of operators, see the original standard). Do not wear bracelets, rings, exposed metal zippers, watches and other conductor items when working near exposed energy components and electrical conductors.

Refer to the definition of PPE CATEGORY in IEC 61482-1-2:



Picture 10 : The PPE category in IEC 61482-1-2

When conducting any operation within Solbank3.0, the level of personal protective equipment shall comply with Class 2.

4 Calculation data table

Num.	I_{peak}(A)	T_p(s)	I_{em} (cal/cm²)	PPE
Pack	11495	0.008924	6.84	2
Rack	10953	0.000586	5.8	2
Split system	60720	0.000549	3.39	1
Single system	116502	0.000573	6.5	2

PHASE I ENVIRONMENTAL SITE ASSESSMENT

SEAFLOWER ENERGY LLC - ALTERNATE SITE
FUENTES PARCELS
CASE ROAD
SUN CITY, CA 92585

REPORT DATE: NOVEMBER 15, 2025

REPORT VIABILITY DATE: MAY 13, 2026

PREPARED FOR

Seaflower Energy LLC
&
Samsung C&T Renewables LLC
17785 Center Court Drive, Suite 200
Cerritos, CA 90703

PREPARED BY

PRACTICAL ENVIRONMENTAL SOLUTIONS
Mail: P.O. Box 7402 ■ Gilford, NH 03247
Office: 166 Wild Acres Rd ■ Gilford, NH 03249
TEL: 610-857-1414 ■ FAX: 801-751-3594 ■ www.practicalenvironmentalsolutions.net



Mark Larocque
PRESIDENT

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PRACTICAL ENVIRONMENTAL SOLUTIONS
Mail: P.O. Box 7402 ▪ Gilford, NH 03247
Office: 166 Wild Acres Rd ▪ Gilford, NH 03249
TEL: 610-857-1414 ▪ FAX: 801-751-3594 ▪ www.practicalenvironmentalsolutions.net

DECLARATION NOTICE

Per ASTM standard, this report has been prepared with oversight and final review by an Environmental Professional (EP) as defined in §312.10 of 40 Code of Federal Regulations (CFR) Part 312. I declare that, to the best of my professional knowledge and belief, I meet the definition of EPA-Certified Environmental Professional as defined in §312.10 of 40 Code of Federal Regulations (CFR) Part 312 and we have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed the all appropriate inquiries in general accordance with the standards and practices set forth in 40 CFR Part 312.

Mark Larocque
President

Practical Environmental Solutions LLC

1.0 EXECUTIVE SUMMARY

Practical Environmental Solutions (PES) was authorized by Samsung C&T Renewables LLC (Samsung) and Seaflower Energy LLC to conduct a Phase I Environmental Site Assessment (ESA) update of the Seaflower Energy LLC project - Fuentes Parcels, located along Case Road in Sun City, Riverside County, California ("the Site"). PES has conducted this ESA in general accordance with the scope and limitations of ASTM Designation E1527-21, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process."

The Site consists of two parcels totaling 3.24 acres. The parcel is owned by Carlos Fuentes (Parcel #s 331-250-021 and 331-250-002). Samsung & Seaflower Energy LLC is looking to lease/purchase the parcel. The Site area is construction equipment storage yard with two office trailers, several storage trailers, and misc. equipment storage. Vehicle access to the Site is provided from Case Road to the south of the parcel. No significant environmental conditions were noted on the project.

The Site is situated within an industrial area of Sun City. The Site is bound to the north by an electrical substation; to the south by fields; to the east by a construction equipment storage yard; and to the west by a construction trailer storage yard. Based upon topographic map interpretation and site observations, groundwater flow beneath the Site is inferred to be in a southwesterly direction.

The Site is not listed in the regulatory databases reviewed in Section 4.1.1 of this report.

CONCLUSIONS

PES has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527-21 of the Seaflower Energy LLC project - Fuentes Parcels, located along Case Road in Sun City, Riverside County, California. Any exceptions to or deletions from this practice are described in Section 2.4 of this report. This assessment has revealed no evidence of recognized environmental conditions (RECs) in connection with the Site. No further actions or investigations are warranted at this time.

2.0 INTRODUCTION

Practical Environmental Solutions (PES) was retained by Samsung & Seaflower Energy LLC to conduct a Phase I Environmental Site Assessment of the Seaflower Energy LLC project - Fuentes Parcels, located along Case Road in Sun City, Riverside County, California. The protocol used for this assessment is in general conformance with ASTM E1527-21, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process scope of work for Phase I Environmental Site Assessments."

PES assessed the possible presence of petroleum products and hazardous materials at the Site. PES's investigation included review of aerial photos, review of adjoining properties, background research, and review of available local, state, and federal regulatory records regarding the presence of petroleum products and/or hazardous materials at the Site.

PES contracted Environmental Data Resources of Shelton, CT (EDR) to perform a computer database search for local, state, and Federal regulatory records pertaining to environmental concerns for the Site and properties in the vicinity of the Site (see Section 4.0).

2.1 Purpose

The purpose of this Phase I Environmental Site Assessment (ESA) was to identify existing or potential Recognized Environmental Conditions (RECs) (as defined by ASTM Standard E1527-21) in connection with the Site. PES understands that the findings of this study will be used by Samsung & Seaflower Energy LLC to evaluate a pending financial transaction in connection with the Site.

2.2 Scope of Services

PES has performed a Phase I Environmental Site Assessment on the Site in general conformance with the scope and limitations of ASTM Practice E1527-21. Any exceptions to or deletions from this practice are described in the body of this report.

In general, the scope of this assessment consisted of reviewing readily available information and environmental data relating to the Site; interviewing readily available persons knowledgeable about the Site; reviewing readily available maps, aerial photographs and records maintained by federal, state, and local regulatory agencies.

2.3 Assumptions

There is a possibility that even with the proper application of these methodologies there may exist on the Site conditions that could not be identified within the scope of the assessment or that were not reasonably identifiable from the available information. PES believes that the information obtained from the record review and the interviews concerning the Site is reliable.

2.4 Limitations and Exceptions (Data Gaps)

The findings and conclusions contain all of the limitations inherent in these methodologies that are referred to in ASTM E1527-21. Specific limitations and exceptions to this ESA are more specifically set forth below:

- PES encountered data limitations by not interviewing past Site owners, tenants, or adjoining property owners, as none were available for comment, did not respond to requests to information, or did not exist. This is considered a data gap. However, based on our review of the available municipal, regulatory, and historical information, the absence of information obtained from interviews with these individuals is not considered significant to the findings, conclusions, or recommendations of this assessment.
- PES was unable to review historical documentation every five years for the property dating back to at least 1940. This is considered a data gap. However, based on our review of the available other historical information and that the land had never been developed, the absence of this information is not considered significant to the findings, conclusions, or recommendations of this assessment.

2.5 Special Terms and Conditions

Authorization to perform this work was given by a directive from Samsung & Seaflower Energy LLC. The conclusions and findings set forth in this report are strictly limited in time and scope to the date of the evaluations. The conclusions presented in the report are based solely on the services described therein, and not on scientific tasks or procedures beyond the scope of agreed-upon services or the time and budgeting restraints imposed by the client. No subsurface exploratory drilling or sampling was done under the scope of this work. Unless specifically stated otherwise in the report, no chemical analyses have been performed during the course of this ESA.

Some of the information provided in this report is based upon personal interviews, and research of available documents, records, and maps held by the appropriate government and private agencies. This is subject to the limitations of historical documentation, availability, and accuracy of pertinent records, and the personal recollections of those persons contacted.

The content and conclusions provided by PES in this report are based solely on the information collected during our investigation and activities at the Site, our present understanding of the Site conditions, and our professional judgment in light of such information at the time this report was prepared. Part of the findings in this investigation is based on data provided by others. This report presents PES's professional opinion, and no warranty, expressed or implied, is made.

2.6 User Reliance

Samsung & Seaflower Energy LLC and its affiliates (collectively, "Client") may use and rely upon this Report in connection with a planned loan securitization or planned financial transaction involving the Site.

3.0 SITE DESCRIPTION

3.1 User Provided Information

Pursuant to ASTM E1527-21, PES requested the following site information from Samsung & Seaflower Energy LLC (User of this report) and from the site contact.

3.2 Location and Legal Description

The parcels are located along Case Road in Sun City, Riverside County, California. The Site is located in a industrial area of Sun City. According to the County Tax Assessor's Office, the parcel totals 3.24 acres and owned by Carlos Fuentes (since 2005). Mr. Fuentes leases the lot to Sturgeon Construction. The tax parcel numbers are 331-250-021 and 331-250-002. The legal descriptions are as follows:

Parcel 331-250-021 - 2.66 ACRES IN LOT 952 MB 015/029 ROMOLA FARMS 10

Parcel 331-250-002 - 0.58 ACRES M/L IN POR LOT 951 MB 015/029 ROMOLA FARMS 10

3.3 Site and Vicinity General Characteristics

The Site is situated within an industrial area of Sun City. The Site is bound to the north by an electrical substation; to the south by fields; to the east by a construction equipment storage yard; and to the west by a construction trailer storage yard. Based upon topographic map interpretation and site observations, groundwater flow beneath the Site is inferred to be in a southwesterly direction.

3.4 Current Use of the Site

The Site consists of two parcels totaling 3.24 acres. The parcel is owned by Carlos Fuentes (Parcel #s 331-250-021 and 331-250-002). Samsung & Seaflower Energy LLC is looking to lease/purchase the parcel. The Site area is construction equipment storage yard with two office trailers, several storage trailers, and misc. equipment storage. Vehicle access to the Site is provided from Case Road to the south of the parcel. No significant environmental conditions were noted on the project.

3.5 Description of Site Improvements

The project area consists of construction equipment storage lot. Electricity is provided to the Site by Southern California Edison. There are no sanitary sewer and potable water services on the parcel.

3.6 Current Use of Adjoining Properties

During the vicinity review, PES noted the following land use on properties in the immediate vicinity of the Site.

North:	Areas immediately adjoining to the north of the Site include the following: substation
South:	Areas immediately adjoining to the south of the Site include the following: farm land
East:	Areas immediately adjoining to the east of the Site include the following: construction equipment storage
West:	Areas immediately adjoining to the west of the Site include the following: construction trailer storage
No recognized environmental conditions (RECs) were identified based on the current uses of the adjoining properties.	

4.0 RECORDS REVIEW

4.1 Standard Environmental Record Sources

4.1.1 State and Federal Regulatory Review

Information from standard Federal and state environmental record sources was provided through Environmental Data Resources (EDR). Data from governmental agency lists are updated and integrated into one database, which is updated as these data are released. This integrated database also contains postal service data in order to enhance address matching. Records from one government source are compared to records from another to clarify any address ambiguities. The demographic and geographic information available provides assistance in identifying and managing risk. The accuracy of the geocoded locations is approximately +/-300 feet.

In some cases, location information supplied by the regulatory agencies is insufficient to allow the database companies to geocode facility locations. These facilities are listed under the unmappables section within the EDR report. A review of the unmappable facilities indicated that none of these facilities are within the ASTM minimum search distance from the Site. These facilities are discussed under the appropriate database heading below.

Regulatory information from the following database sources were reviewed for information within the ASTM minimum search distance from the Site. Specific facilities are discussed below if the potential for a recognized environmental condition (REC) has resulted at the Site from the listed facilities. Please refer to Appendix A for a complete listing.

Federal NPL

The National Priorities List (NPL) is the U.S. Environmental Protection Agency (EPA) database of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund Program. *The Site is not listed as a NPL facility. No NPL sites are located within one mile radius of the Site.*

Federal Delisted NPL

The Delisted NPL is the U.S. EPA database of sites that have been deleted from the NPL where no further response is appropriate. *The Site is not listed as a Delisted NPL facility. No Delisted NPL sites are located within one mile radius of the Site.*

Federal CERCLIS List

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list is a compilation of sites that the EPA has investigated or is currently investigating for a release or threatened release of hazardous substances. *The Site is not listed as a CERCLIS facility. No CERCLIS sites are listed within one mile radius of the Site.*

Federal CERCLIS NFRAP Sites List

The CERCLIS No Further Remedial Action Planned (NFRAP) List is a compilation of sites that the EPA has investigated, and has determined do not pose a threat to human health or the environment, under the CERCLA framework. *The Site is not listed as a CERCLIS-NFRAP facility. No CERCLIS-NFRAP sites are listed within one mile radius of Site.*

Federal RCRA CORRACTS Facilities List

The EPA Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The CORRACTS database is the EPA's list of hazardous waste handlers subject to corrective action under RCRA. *The Site is not listed as a RCRA CORRACTS facility. No RCRA CORRACTS sites are listed within one mile radius of the Site.*

Federal RCRA Non-CORRACTS TSD Facilities List

The RCRA Non-CORRACTS Treatment, Storage and Disposal (TSD) database is a compilation by the EPA of reporting facilities that treat, store or dispose of hazardous waste. *The Site is not listed as a RCRA Non-CORRACTS TSD facility. No RCRA Non-CORRACTS TSD sites are listed within one mile radius of the Site.*

Federal RCRA Generators List

The RCRA program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Generators database is a compilation by the EPA of reporting facilities that generate hazardous waste. *The Site is not listed as a RCRA facility. No RCRA Generator sites are listed on the adjoining properties or within the database radius.*

Federal Institutional Control / Engineering Control Registries

The U.S. institutional control (INST CONTROL) and Engineering control (ENG CONTROL) registries include sites with Engineering controls and institutional controls in place. Engineering controls including various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or affect human health. Institutional controls include administrative measures intended to prevent exposure to contaminants remaining on site. *No U.S. INST CONTROL or ENG CONTROL sites are listed on the Site.*

Federal ERNS

The Emergency Response Notification System (ERNS) is a national database used to collect information on reported releases of oil or hazardous substances. *No ERNS sites are listed for the Site.*

State CERCLIS-Equivalent List

The State maintains a State CERCLIS-equivalent list (SCL) of facilities under investigation that could be actually or potentially contaminated and presenting a possible threat to human health and the environment. *The Site is not listed as a SCL facility. Two SCL sites are listed within the one mile radius of the site. The sites are both located at 26100 Menifee Road, 0.46 miles NNE. The sites are for leaking USTs. The database reports both of the listings as "case closed" with no further actions required. Based on the closed nature of the listing and distance from the site, these listings do not pose a risk to the subject Site.*

Solid Waste/Landfill Facilities

A database of Solid Waste and/or Landfill (SWLF) facilities is maintained by the state. *The Site is not listed as a SWLF facility. Two SWLF sites are listed within one mile radius of the Site to the north. The listed sites are not considered hydrologically upgradient or to pose a risk to the Site.*

State Leaking Underground Storage Tank List

The State compiles lists of all leaking underground storage tanks (LUST). *The Site is not listed as a LUST facility. Two LUST sites are listed within one mile radius of the Site. The sites are both located at 26100 Menifee Road, 0.46 miles NNE. The sites are for leaking USTs. The database reports both of the listings as "case closed" with no further actions required. Based on the closed nature of the listing and distance from the site, these listings do not pose a risk to the subject Site.*

State Registered Storage Tank List

The State compiles a list of registered petroleum tank (i.e. underground and aboveground storage tank (UST/AST) locations. *The Site is not listed as a UST/AST facility. No registered UST/AST sites are listed within a one mile radius of the Site.*

State Institutional Control / Engineering Control Registries

The State compiles a list of INST CONTROL and ENG CONTROL sites. *No State INST CONTROL or ENG CONTROL sites are listed for the Site or surrounding sites.*

State Voluntary Cleanup Sites

The State compiles a list of Voluntary Cleanup Program (VCP) sites. *No VCP facilities are listed for the Site. No VCP sites are listed within one mile radius of the Site.*

State Brownfields Sites

The State compiles a list of Brownfield sites. *No Brownfield facilities are listed for the Site. No Brownfield sites are listed within one mile radius of the Site.*

State SPILLS/OTHER sites

No SPILLS/OTHER sites are listed for the Site. No SPILLS sites and eight OTHER sites are listed within one mile radius of the Site. The listed sites are not considered hydrologically upgradient and do not pose a risk to the subject Site.

4.1.2 Regulatory Agency Review

4.1.2.1 State Agency

A file review was performed for the Site with the State. This file review consisted of an online search of the State records by EDR. There are no current records on file for the Site with the State, other than what is described above in the EDR database findings.

4.1.2.2 Assessor

According the Assessor's Office, no environmentally-related liens, activity use limitations (AULs), or deed restrictions have been recorded against the Site.

4.1.2.3 Fire Officials

Records from local Fire Department were reviewed for evidence indicating the presence of petroleum bulk storage tanks and for the use of hazardous materials. No current records were found for the Site address.

4.1.2.4 Planning/Building Department

Records from Planning/Building Department were reviewed for evidence indicating the developmental history of the Site, and for the presence of documentation relative to petroleum bulk storage tanks. Land use was indicated as industrial land.

4.2 Physical Setting Sources

4.2.1 Topography

The United States Geological Survey (USGS), Romoland, CA Quadrangle 7.5 minute series topographic map was reviewed for this ESA. The map was published by the USGS in 2022. According to the contour lines on the topographic map, the Site is located at approximately 1461 feet above mean sea level (MSL). The contour lines in the area of the Site indicate the area is sloping to the southwest.

4.2.2 Soils/Geology

Based on the on-line soil survey maps published by the USDA Soil Conservation Service, the Site soils consist of the following:

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EnA	Exeter sandy loam, 0 to 2 percent slopes	3.5	63.4%
EnC2	Exeter sandy loam, 2 to 8 percent slopes, eroded	2.0	36.6%
Totals for Area of Interest		5.5	100.0%

The estimated depth to bedrock at the Site is >20 feet bgs. The site bedrock consists of Quaternary alluvial sediments deposited from source material in the granitic rocks.

4.2.3 Hydrology

Based on the topography of the Site and vicinity, groundwater flow beneath the Site is inferred to be in a southwesterly direction. No surface water was noted on the Site. Additionally, PES noted no wetland areas on the proposed project area. The National Wetlands Inventory (NWI) map shows no wetland area on the parcel.

The EPA defines a sole or principal source aquifer as an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas may have no alternative drinking water source(s) that could physically, legally and economically supply all those who depend on the aquifer for drinking water. For convenience, all designated sole or principal source aquifers are referred to as "sole source aquifers" (SSA). This designation was made under Section 1424(e) of the Safe Drinking Water Act. The Site is not situated above a SSA.

4.2.4 Flood Zone Information

A review of the Flood Insurance Rate Maps, published by the Federal Emergency Management Agency (FEMA), was performed. According to FEMA, the Site is located in on FIRM #06065C2060H and is mostly in Zone X, outside the 100-year flood zone. There is a portion of the eastern side of the parcel in Zone AE, within the 100-year flood zone.

4.2.5 Oil and Gas Exploration

According to web-based information available from the State, the Site is mapped in an area where there is current or historical exploration or production of oil, gas, or geothermal resources in the area. There are no active oil/gas wells located on the parent parcel. No wells were noted on the lease area during the PES site visit. There is a natural gas pipeline located along the roadway on the south side of the parcel.

4.3 Historical Use Information

The historical use of the Site was determined based on review of aerial photographs. The following briefly summarizes the developmental history of the Site.

4.3.1 Aerial Photographs

Available aerial photographs dated 1946-2025, from Google Earth, were reviewed for this ESA. Copies of selected photographs are included in Appendix C of this report. The site appears as open undeveloped land until 2016 with some vehicle parking was noted on the parcel..

4.3.2 Fire Insurance Maps

No fire insurance map collections were available for the Site area.

4.3.3 City Directories

No historical city directories were available for the Site area.

4.3.4 Chain of Title

A 50-year chain-of-title was not warranted for this study. Historical use of the Site was researched using other standard historical sources. The site has been owned by Carlos Fuentes since 2005. No environmental liens, AULs, or deed restrictions were noted in site records at the assessor or planning department. PES ran a Lien/AUL search through EDR. The results indicated no liens or AULs for the parcels.

4.3.5 Additional Environmental Record Sources

No additional environmental record sources were available for the project area. PES interviewed Mr. Carlos Fuentes. Mr. Fuentes was unaware of any environmental issues on the parcels.

PES completed a Phase 1 Environmental Site Assessment for the parcels in August 2024. PES noted no RECs, CRECs, HRECs at the time of that report. PES did note some minor oil spillage around a waste oil bucket in 2024. This storage area and staining was no longer present during the November 2025 visit.

PES also contact the county health department. The health department had no environmental records or files for the property.

4.3.6 Historical Use Information on Adjoining Properties

By review of the standard historical sources referenced above, the historical uses of the adjoining properties were similar to the current usage in all aerial photos.

5.0 SITE REVIEW

5.1 General Site Characteristics

The project area consists of a construction equipment storage yard with two office trailers, several storage box trailers and misc. vehicles and equipment areas. Vehicle access to the Site is provided off of Case Road. No significant surface features or environmental issues were noted on the Site during the review.

5.1.1 Solid Waste Disposal

No solid waste disposal was noted on the Site. There are two 15-yard dumpsters on the property that were empty. These are moved from site to site by the tenant for work projects. There was numerous area of debris, such as tires, cardboard, and scrap metal on the site. PES noted that the former waste oil/antifreeze storage area was no longer present. According to Mr. Fuentes, all storage is now inside one of the box trailers. No staining was noted.

5.1.2 Surface Water Drainage

There are no surface water bodies on the lease parcel. Surface drainage flows to the southwest.

5.1.3 Wells and Cisterns

No aboveground evidence of cisterns or wells were noted during the Site review.

5.1.4 Wastewater

No indications of industrial wastewater disposal or treatment facilities were noted during the Site review. PES noted that in between the trailers there are two septic holding tanks for sanitary waste water. These tanks are emptied as needed by a local vendor.

5.1.5 Additional Site Observations

No additional relevant general Site characteristics were noted.

5.2 Potential Environmental Conditions

5.2.1 Hazardous Materials and Petroleum Products Used or Stored at the Site

No evidence of the use of hazardous materials or wastes was noted on the Site during the site review.

5.2.1.1 Unlabeled Containers and Drums

No unlabeled containers or drums were noted during the Site review.

5.2.1.2 Disposal Locations of Regulated/ Hazardous Waste

No obvious indications of hazardous waste generation, storage or disposal were noted on the Site or were indicated during interviews.

5.2.2 Evidence of Releases

No obvious indications of stressed vegetation, was noted during the Site review.

5.2.3 Polychlorinated Biphenyls (PCBs)

Older transformers and other electrical equipment could contain polychlorinated biphenyls (PCBs) at a level that subjects them to regulation by the U.S. EPA. PCBs in electrical equipment are controlled by United States Environmental Protection Agency regulations 40 CFR, Part 761. Under the regulations, there are three categories into which electrical equipment can be classified:

- Less than 50 parts per million (PPM) of PCBs – "*Non-PCB" transformer*
- 50 ppm-500 ppm – "PCB-Contaminated" electrical equipment
- Greater than 500 ppm – "*PCB" transformer*

PES noted one pole mounted electrical transformer on the Site parcel. The unit is labeled as non-PCB containing. No staining or leakage was noted. No other electrical equipment expected to contain PCBs was noted on the Site during PES's review.

5.2.4 Landfills

No evidence of on-Site landfills were noted or reported during the Site review.

5.2.5 Pits, Ponds, Lagoons, Sumps, and Catch Basins

No evidence of on-Site pits, ponds, or lagoons was noted or reported during the Site review. No evidence of sumps or catch basins were noted or reported during the Site review.

5.2.6 On-Site ASTs and USTs

No evidence of underground storage tanks (USTs) or aboveground storage tanks (ASTs) was noted on the Site area during the Site review.

5.2.7 Vapor Migration

During PES's Site observations, review of historical sources, and review of regulatory databases, no current or historical usage of chemicals of concern at the Site or reported release or other indication of subsurface contamination from an onsite source was evident. Additionally, no release or material threat of a release to the subsurface from an offsite source was identified. As such, a vapor migration concern was not identified for the Site during the course of this assessment.

5.2.8 Radiological Hazards

No radiological substances or equipment was noted or reported to be stored on the Site.

5.2.9 Drinking Water

No on-site water wells were noted on the parcel. Mr. Fuentes indicated that there are no water wells on the parcel. The office trailers are serviced by municipal water.

5.2.10 Additional Hazard Observations and Polyfluorinated Substances (PFAS)

No additional hazards were observed on the Site. There was no indication of the use of PFASs on or near the site.

5.2.11 Asbestos-Containing Materials (ACM)

No suspected areas of ACMs were noted on the parcel.

5.2.12 Radon

The U.S. EPA has prepared a map to assist National, State, and local organizations to target their resources and to implement radon-resistant building codes. The map divides the country into three Radon Zones, based on the EPA Action limit of 4.0 picoCuries per Liter (pCi/L). Review of the EPA Map of Radon Zones has the Site in Zone 2, where average predicted radon levels are between 2.0 and 4.0 pCi/L. Additionally, based on the undeveloped nature of the site and proposed use for a battery storage system, radon is not considered to be a concern for the Site.

5.2.13 Lead-Based Paint

No suspected areas of lead-based paints were noted on the parcel.

5.2.14 Mold

No suspected areas of mold were noted on the parcel.

6.0 INTERVIEWS

Interviews were conducted with the following individuals. Findings from these interviews are discussed in the appropriate sections in this report.

Contact Name	Affiliation	Telephone No	Date Interviewed	Comments
Peter Aldana	County Assessor	951-955-6200	11-13-25	No issues known
Mark Scoville	Fire Department	951-246-6215	11-13-25	No issues known
Craig Carlson	Building-Planning	951-672-6777	11-13-25	No issues known
Brent Casey	County Health Dept	888-722-4234	11-13-25	No issues known
Carolos Fuentes	Property owner	909-239-7557	11-13-25	No issues known

7.0 FINDINGS AND CONCLUSIONS

7.1 Findings

7.1.1 On-Site Recognized Environmental Conditions (RECs)

No on-Site RECs were identified during the course of this assessment.

7.1.2 Off-Site Recognized Environmental Conditions (RECs)

No off-Site RECs were identified during the course of this assessment.

7.1.3 Historical/Controlled Recognized Environmental Conditions (HRECs/CRECs)

No HRECs or CRECs were identified on the Site during the course of this assessment.

7.1.4 De Minimis Environmental Conditions (DECs)

No DECs were identified on the Site during the course of this assessment.

7.2 Opinion

During the performance of this ESA, no environmental conditions were identified that likely would impact the Site. It should be noted that the eastern section of the parcel is within the 100-year flood zone.

7.3 Conclusions

PES has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527-21 of the Seaflower Energy LLC project - Fuentes Parcels, located along Case Road in Sun City, Riverside County, California (the Site). Any exceptions to or deletions from this practice are described in Section 2.4 of this report. This assessment has revealed no evidence of recognized environmental conditions (RECs) in connection with the Site.

7.4 Recommendations

No further actions or investigations are recommended at this time.

7.5 Deviations

This Phase I ESA substantially complies with the scope of services and E1527-21, as amended, except for exceptions and/or limiting conditions as discussed in Section 2.4.

8.0 REFERENCES

REPORTS, PLANS, AND OTHER DOCUMENTS REVIEWED:

Aerial Photographs – EDR - 1946-2025

EDR Radius Map Report 11-14-25

Federal Emergency Management Agency, Federal Insurance Administration, National Flood Insurance Program, Flood Insurance Map, Community Panel Number 06065C2060H

State Groundwater or Water Well Maps

State Oil and Gas Map

National Pipeline Map

USEPA National Radon Survey

USGS - 7.5 Minute Topographic Quadrangle

USGS Soil Survey

PES Site Visit - 11-14-25

Owner Interview - 11-13-25

AGENCIES CONTACTED:

Local - Fire Department

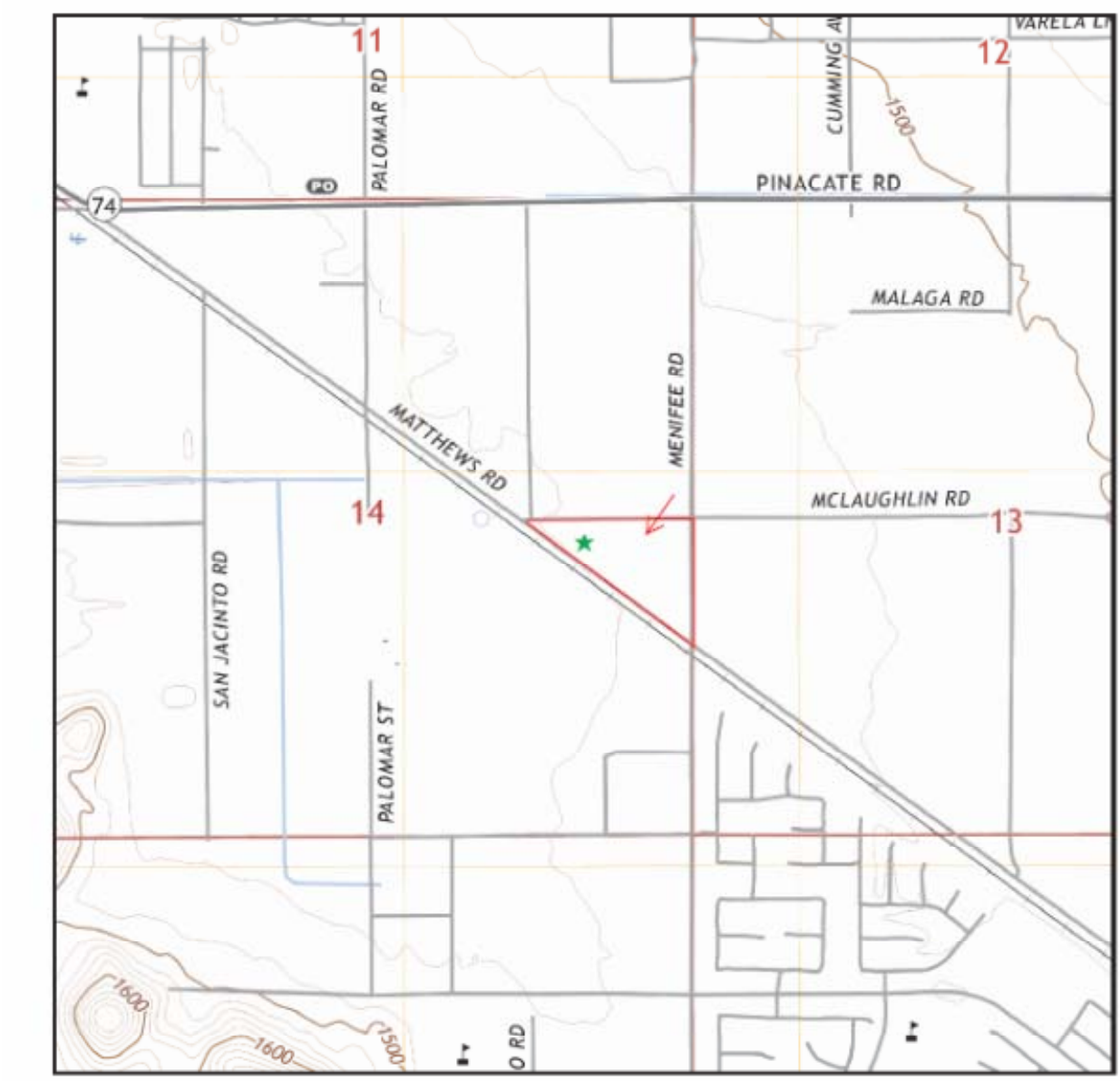
Local - Building/Planning Dept.

County - Tax Assessor

County - Health Dept.

FIGURES

Figure 1 - Topo



Map Image Position: TP
Map Reference Code & Name: 50005839 Romoland
Map State(s): CA
Version Date: 2022

Figure 2 - Site Location

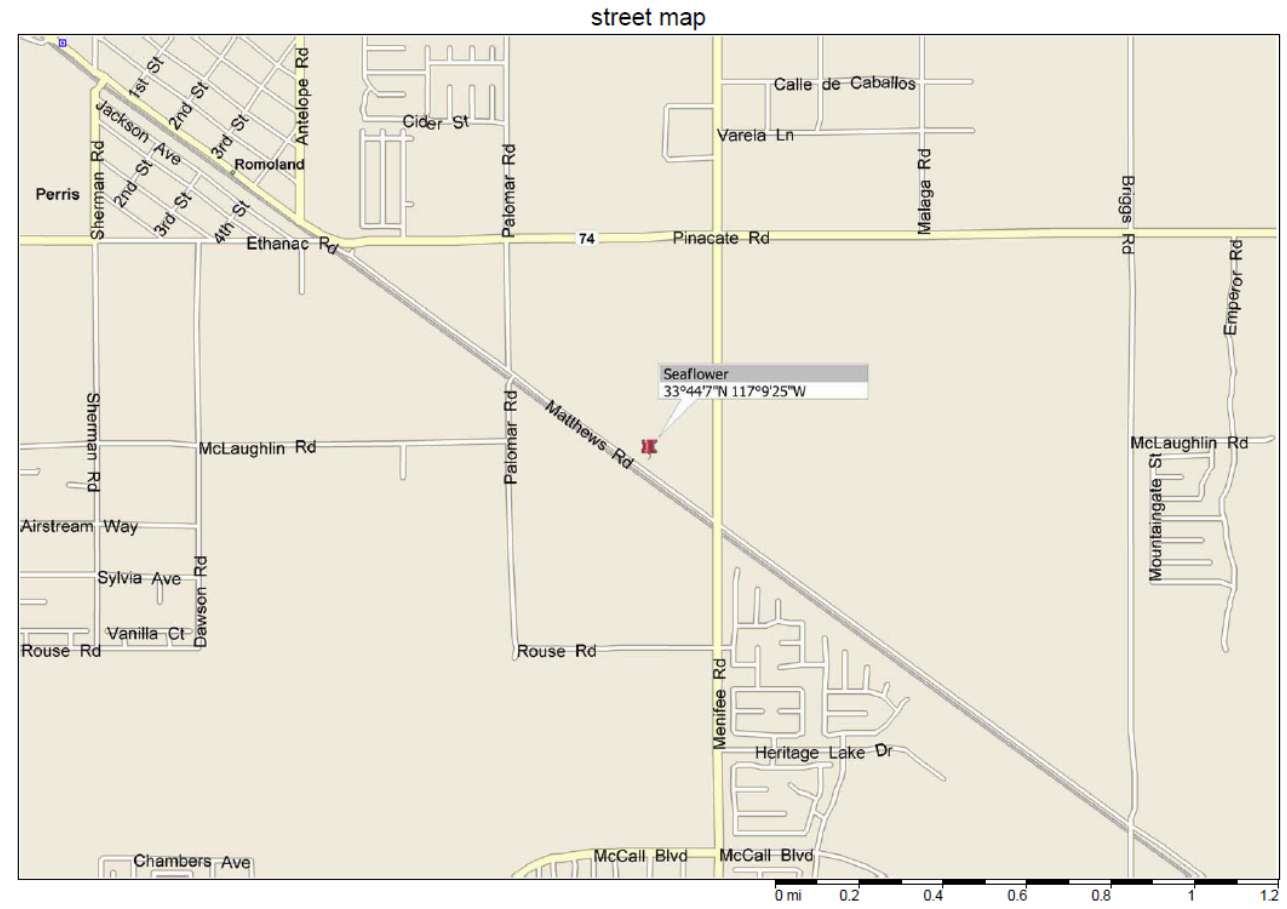
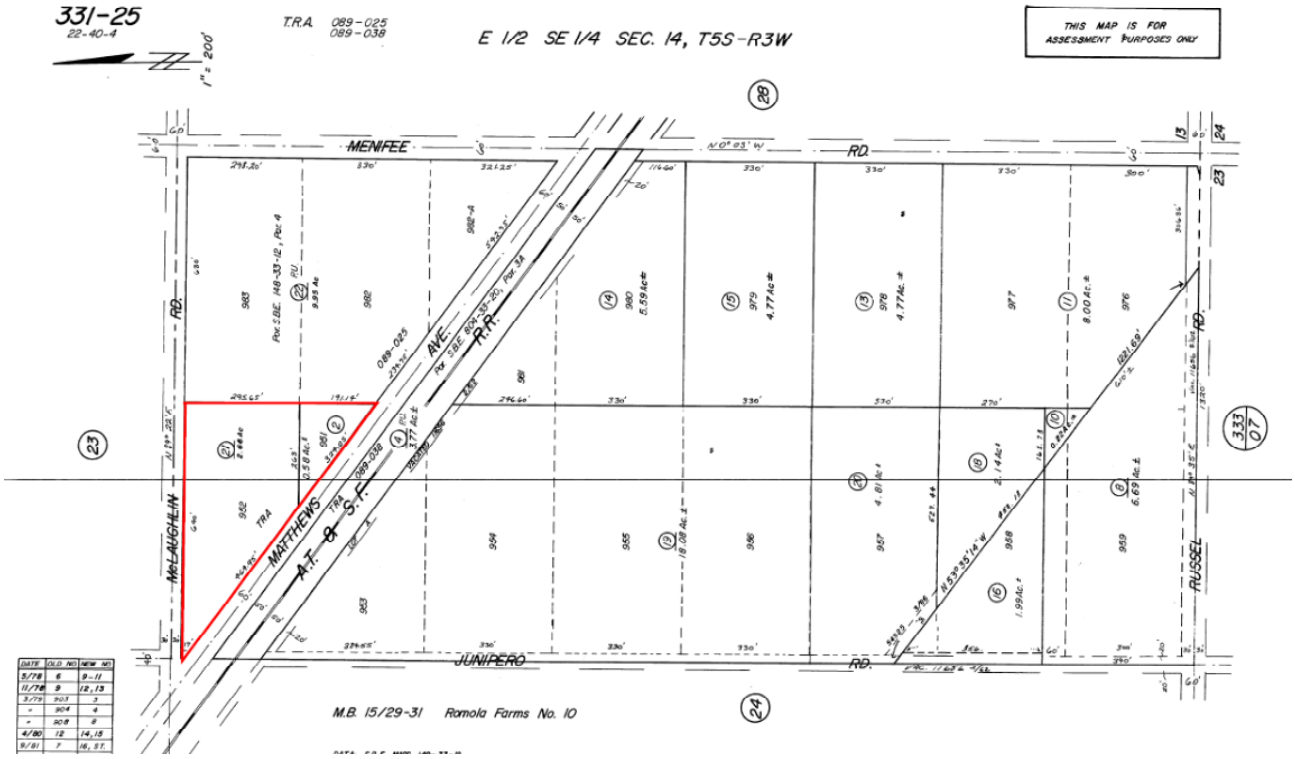


Figure 3 - Site Map



Figure 4 - Tax Parcel Map



APPENDIX A

ENVIRONMENTAL DATABASE

SEAFLOWER ENERGY LLC - ALTERNATE SITE
FUENTES PARCELS, CASE ROAD
Sun City, CA 92585

Inquiry Number: 8173667.2s
November 14, 2025

FirstSearch Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Search Summary Report

TARGET SITE **FUENTES PARCELS, CASE ROAD**
SUN CITY, CA 92585

Category	Sel	Site	1/8	1/4	1/2	> 1/2	ZIP	TOTALS
NPL	Y	0	0	0	0	0	0	0
NPL Delisted	Y	0	0	0	0	0	0	0
CERCLIS	Y	0	0	0	0	-	0	0
NFRAP	Y	0	0	0	0	-	0	0
RCRA COR ACT	Y	0	0	0	0	0	0	0
RCRA TSD	Y	0	0	0	0	-	0	0
RCRA GEN	Y	0	0	0	-	-	0	0
Federal IC / EC	Y	0	0	0	0	-	0	0
ERNS	Y	0	-	-	-	-	0	0
State/Tribal NPL	Y	0	0	0	0	0	0	0
State/Tribal CERCLIS	Y	0	0	0	0	2	0	2
State/Tribal SWL	Y	0	0	2	0	-	0	2
State/Tribal LTANKS	Y	0	0	0	2	-	0	2
State/Tribal Tanks	Y	0	0	0	-	-	0	0
State/Tribal VCP	Y	0	0	0	0	-	0	0
US Brownfields	Y	0	0	0	0	-	0	0
Other SWF	Y	0	0	0	0	-	0	0
Other Haz Sites	Y	0	0	0	-	-	0	0
Other Tanks	Y	0	0	0	-	-	0	0
Local Land Records	Y	0	0	0	0	-	0	0
Spills	Y	0	-	-	-	-	0	0
Other	Y	0	0	6	2	-	0	8
	- Totals --	0	0	8	4	2	0	14

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Search Summary Report

TARGET SITE: **FUENTES PARCELS, CASE ROAD**
SUN CITY, CA 92585

Category	Database	Update	Radius	Site	1/8	1/4	1/2	> 1/2	ZIP	TOTALS
NPL	NPL	09/29/2025	1.000	0	0	0	0	0	0	0
	Proposed NPL	09/29/2025	1.000	0	0	0	0	0	0	0
NPL Delisted	Delisted NPL	09/29/2025	1.000	0	0	0	0	0	0	0
CERCLIS	SEMS	09/29/2025	0.500	0	0	0	0	-	0	0
NFRAP	SEMS-ARCHIVE	09/29/2025	0.500	0	0	0	0	-	0	0
RCRA COR ACT	CORRACTS	06/02/2025	1.000	0	0	0	0	0	0	0
RCRA TSD	RCRA-TSDF	06/02/2025	0.500	0	0	0	0	-	0	0
RCRA GEN	RCRA-LQG	06/02/2025	0.250	0	0	0	-	-	0	0
	RCRA-SQG	06/02/2025	0.250	0	0	0	-	-	0	0
	RCRA-VSQG	06/02/2025	0.250	0	0	0	-	-	0	0
Federal IC / EC	US ENG CONTROLS	10/30/2025	0.500	0	0	0	0	-	0	0
	US INST CONTROLS	10/30/2025	0.500	0	0	0	0	-	0	0
ERNS	ERNS	06/10/2025	TP	0	-	-	-	-	0	0
State/Tribal NPL	RESPONSE	07/17/2025	1.000	0	0	0	0	0	0	0
State/Tribal CERCLIS	ENVIROSTOR	07/17/2025	1.000	0	0	0	0	2	0	2
State/Tribal SWL	SWF/LF	07/31/2025	0.500	0	0	2	0	-	0	2
State/Tribal LTANKS	LUST	06/02/2025	0.500	0	0	0	2	-	0	2
	INDIAN LUST	04/21/2025	0.500	0	0	0	0	-	0	0
	CPS-SLIC	06/02/2025	0.500	0	0	0	0	-	0	0
State/Tribal Tanks	UST	06/02/2025	0.250	0	0	0	-	-	0	0
	AST	07/06/2016	0.250	0	0	0	-	-	0	0
	INDIAN UST	04/21/2025	0.250	0	0	0	-	-	0	0
State/Tribal VCP	VCP	07/17/2025	0.500	0	0	0	0	-	0	0
US Brownfields	US BROWNFIELDS	09/09/2024	0.500	0	0	0	0	-	0	0

Search Summary Report

TARGET SITE: **FUENTES PARCELS, CASE ROAD**
SUN CITY, CA 92585

Category	Database	Update	Radius	Site	1/8	1/4	1/2	> 1/2	ZIP	TOTALS
Other SWF	WMUDS/SWAT	04/01/2000	0.500	0	0	0	0	-	0	0
Other Haz Sites	SCH	07/17/2025	0.250	0	0	0	-	-	0	0
	US CDL	04/04/2025	TP	0	-	-	-	-	0	0
Other Tanks	SWEEPS UST	06/01/1994	0.250	0	0	0	-	-	0	0
	CA FID UST	10/31/1994	0.250	0	0	0	-	-	0	0
Local Land Records	DEED	08/21/2025	0.500	0	0	0	0	-	0	0
Spills	HMIRS	06/11/2025	TP	0	-	-	-	-	0	0
	CHMIRS	05/31/2025	TP	0	-	-	-	-	0	0
	SPILLS 90	06/06/2012	TP	0	-	-	-	-	0	0
Other	RCRA NonGen / NLR	06/02/2025	0.250	0	0	4	-	-	0	4
	TSCA	12/31/2020	TP	0	-	-	-	-	0	0
	TRIS	12/31/2023	TP	0	-	-	-	-	0	0
	SSTS	07/14/2025	TP	0	-	-	-	-	0	0
	RAATS	04/17/1995	TP	0	-	-	-	-	0	0
	PRP	06/26/2025	TP	0	-	-	-	-	0	0
	PADS	07/01/2024	TP	0	-	-	-	-	0	0
	ICIS	11/18/2016	TP	0	-	-	-	-	0	0
	FTTS	04/09/2009	TP	0	-	-	-	-	0	0
	MLTS	08/11/2025	TP	0	-	-	-	-	0	0
	RADINFO	07/01/2019	TP	0	-	-	-	-	0	0
	INDIAN RESERV	12/31/2014	1.000	0	0	0	0	0	0	0
	US AIRS	10/12/2016	TP	0	-	-	-	-	0	0
	FINDS	04/22/2025	TP	0	-	-	-	-	0	0
	PFAS NPL	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS FEDERAL SITES	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS TRIS	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS TSCA	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS RCRA MANIFEST	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS ATSDR	11/12/2024	0.250	0	0	0	-	-	0	0
	PFAS WQP	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS PROJECT	05/15/2024	0.250	0	0	0	-	-	0	0
	PFAS NPDES	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS ECHO	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS ECHO FIRE TRAIN	06/23/2025	0.250	0	0	0	-	-	0	0
	PFAS PT 139 AIRPORT	06/23/2025	0.250	0	0	0	-	-	0	0
	AQUEOUS FOAM NRC	06/23/2025	0.250	0	0	0	-	-	0	0
	UST FINDER RELEASE	06/08/2023	0.500	0	0	0	1	-	0	1

Search Summary Report

TARGET SITE: **FUENTES PARCELS, CASE ROAD**
SUN CITY, CA 92585

Category	Database	Update	Radius	Site	1/8	1/4	1/2	> 1/2	ZIP	TOTALS
	UST FINDER	06/08/2023	0.250	0	0	0	-	-	0	0
	PFAS	06/02/2025	0.250	0	0	0	-	-	0	0
	AQUEOUS FOAM	06/02/2025	0.250	0	0	0	-	-	0	0
	Cortese	06/12/2025	0.500	0	0	0	1	-	0	1
	CUPA Listings		0.250	0	0	0	-	-	0	0
	HAZNET	12/31/2024	0.250	0	0	2	-	-	0	2
	WDS	06/19/2007	TP	0	-	-	-	-	0	0
	- Totals --			0	0	8	4	2	0	14

Site Information Report

Request Date: NOVEMBER 14, 2025
Search Type: COORD
Request Name: MARK LAROCQUE
Job Number: 2025-204

Target Site: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

Site Location

	Degrees (Decimal)	Degrees (Min/Sec)		UTMs
Longitude:	117.156989	117.1569890 - 117° 9' 25.16''	Easting:	485457.2
Latitude:	33.735308	33.7353080 - 33° 44' 7.10''	Northing:	3732625.5
Elevation:	1461 ft. above sea level		Zone:	Zone 11

Demographics

Sites: 14 **Non-Geocoded:** 0 **Population:** N/A

RADON

Federal EPA Radon Zone for RIVERSIDE County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for RIVERSIDE COUNTY, CA

Number of sites tested: 12

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.117 pCi/L	100%	0%	0%
Living Area - 2nd Floor	0.450 pCi/L	100%	0%	0%
Basement	1.700 pCi/L	100%	0%	0%

Site Information Report

RADON

State Database: CA Radon

Radon Test Results

Zipcode	Num Tests	> 4 pCi/L
92585	6	0

Target Site Summary Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

TOTAL: 14 GEOCODED: 14 NON GEOCODED: 0

Map ID	DB Type --ID/Status	Site Name	Address	Dist/Dir	ElevDiff	Page No.

No sites found for target address

Sites Summary Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

TOTAL: 14 GEOCODED: 14 NON GEOCODED: 0

Map ID	DB Type --ID/Status	Site Name	Address	Dist/Dir	ElevDiff	Page No.
A1	SWF/LF --Active --Notification --33-AA-0301	B.P. JOHN RECYCLING INC.	28700 MATHEWS ROAD MENIFEE, CA 92585	0.20 NW	- 2	1
A2	RCRA NonGen / NLR --CAL000475452	BAJA CAR WASH INC DBA BP JOHN	28700 MATTHEWS RD MENIFEE, CA 92585	0.20 NW	- 2	5
A3	RCRA NonGen / NLR --CAL000177408	BP JOHN HAULING	28700 MATTHEWS RD ROMOLAND, CA 92580	0.20 NW	- 2	8
A4	RCRA NonGen / NLR --CAC003039637	WILSON UTILITY CONSTRUCTION CO	26125 MENIFEE ROAD SUN CITY, CA 92585	0.20 NW	- 2	11
A5	HAZNET --CAL000177408	BP JOHN HAULING	28700 MATTHEWS RD ROMOLAND, CA 92580	0.20 NW	- 2	14
A6	HAZNET --CAC003122825	WILSON UTILITY CONSTRUCTION CO	28700 MATTHEWS RD SUN CITY, CA 92585	0.20 NW	- 2	21
A6	SWF/LF --Active --2744	WILSON UTILITY CONSTRUCTION CO	28700 MATTHEWS RD SUN CITY, CA 92585	0.20 NW	- 2	22
A7	RCRA NonGen / NLR --CAC003122825	WILSON UTILITY CONSTRUCTION CO	28700 MATTHEWS RD SUN CITY, CA 92585	0.20 WNW	- 3	23
B8	LUST --Completed - Case Closed --T0606500038	SAN JACINTO VALLEY DISTRI	26100 MENIFEE ROMOLAND, CA 92380	0.46 NNE	+ 18	26
B9	Cortese --COMPLETED - CASE CLOSED	SAN JACINTO VALLEY DISTRICT OF	26100 MENIFEE ROAD ROMOLAND, CA 92380	0.46 NNE	+ 18	29
B9	LUST --Case Closed --T0606500038	SAN JACINTO VALLEY DISTRICT OF	26100 MENIFEE ROAD ROMOLAND, CA 92380	0.46 NNE	+ 18	30

Sites Summary Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

TOTAL: 14 GEOCODED: 14 NON GEOCODED: 0

Map ID	DB Type --ID/Status	Site Name	Address	Dist/Dir	ElevDiff	Page No.
B10	UST FINDER RELEASE	SAN JACINTO VALLEY DISTRICT OF	26100 MENIFEE ROAD ROMOLAND, CA 92380	0.46 NNE	+ 18	32
11	ENVIROSTOR --33010066 --No Further Action	MCCALL MESA K-8 SCHOOL	MCCALL BOULEVARD/JUNIPERO ROMOLAND, CA 92586	0.96 South	+ 36	33
12	ENVIROSTOR --33010076 --No Further Action	MENIFEE VALLEY RANCH SCHOOL NO	MCCALL BOULEVARD/MENIFEE ROMOLAND, CA 92585	0.97 South	+ 7	35

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

SWF/LF

EDR ID: S126327278 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A1

NAME: B.P. JOHN RECYCLING INC.

ADDRESS: 28700 MATHEWS ROAD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: CA Department of Resources Recycling and Recovery

Rev: 07/31/2025
ID/Status: Active
ID/Status: Notification
ID/Status: 33-AA-0301

SWF/LF (SWIS):
Name: B.P. JOHN RECYCLING INC.
Address: 28700 MATHEWS ROAD
City,State,Zip: MENIFEE, CA 92585
Region: STATE
Facility ID: 33-AA-0301
SWIS Number: 33-AA-0301
Point of Contact: Theodore Tasiopoulos
Is Archived: No
Is Closed Illegal Abandoned: No
Is Site Inert Debris Engineered Fill: No
Is Financial Assurances Responsible: No
Absorbed On: Not reported
Operational Status: Active
Absorbed By: Not reported
Closed Illegal Abandoned Category: Not reported
EPA Federal Registry ID: Not reported
ARB District: South Coast
SWRCB Region: Santa Ana
Local Government: Menifee
Reporting Agency Legal Name: County of Riverside
Reporting Agency Department: Department of Environmental Health
Enforcing Agency Legal Name: County of Riverside
Enforcing Agency Department: Department of Environmental Health
Regulation Status: Notification

Activity:
SWIS Number: 33-AA-0301
Site Name: B.P. John Recycling Inc.
Activity: Green Material Composting Operation
Activity Is Archived: No
Category: Composting
Activity Classification: Solid Waste Operation
WDR Number: Not reported
WDR Landfill Class: Not reported
Cease Operation: Not reported
Cease Operation Type: Not reported
Inspection Frequency: Quarterly
Throughput: 700
Throughput Units: Cubic Yards per Day
Remaining Capacity: Not reported
Remaining Capacity Date: Not reported
Capacity: 34285
Capacity Units: Cubic Yards per year
Total Acreage: 6

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

SWF/LF

EDR ID: S126327278 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A1

NAME: B.P. JOHN RECYCLING INC.

ADDRESS: 28700 MATHEWS ROAD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: CA Department of Resources Recycling and Recovery

Rev: 07/31/2025
ID/Status: Active
ID/Status: Notification
ID/Status: 33-AA-0301

Disposal Acreage: Not reported
Permitted Elevation: Not reported
Permitted Elevation Type: Not reported
Permitted Depth: Not reported
Permitted Depth Type: Not reported
Point of Contact: Theodore Tasiopoulos
Site Operational Status: Active
Site Regulatory Status: Notification
Site Is Archived: No
Is Closed Illegal Abandoned: No
Is Site Inert Debris Engineered Fill: No
Is Financial Assurances Responsible: No
Absorbed On: Not reported
Absorbed By: Not reported
Closed Illegal Abandoned Category: Not reported
EPA Federal Registry ID: Not reported
County: Riverside
ARB District: South Coast
SWRCB Region: Santa Ana
Local Government: Menifee
Street Address: 28700 Mathews Road
City: Menifee
State: CA
ZIP Code: 92585
Reporting Agency Legal Name: County of Riverside
Reporting Agency Department: Department of Environmental Health
Enforcing Agency Legal Name: County of Riverside
Enforcing Agency Department: Department of Environmental Health

Operator:
SWIS Number: 33-AA-0301
Site Name: B.P. John Recycling Inc.
Site Operational Status: Active
Site Type: Non-Disposal Only
Site Regulatory Status: Notification
Latitude: 33.73732
Longitude: -117.15928
Is Archived: No
Operator: Baja Car Wash Inc. DBA B.P. John Recycling
Started On: 10/25/2023
Contact Name: Robert Lodahl
Contact Title: Owner
Contact Email: info.bpjohnrecycling@gmail.com
Contact Phone: (909) 627-8288

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

SWF/LF

EDR ID: S126327278 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A1

NAME: B.P. JOHN RECYCLING INC.

ADDRESS: 28700 MATHEWS ROAD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: CA Department of Resources Recycling and Recovery

Rev: 07/31/2025
ID/Status: Active
ID/Status: Notification
ID/Status: 33-AA-0301

Street Address: 4299 State St
Operator City: Montclair
Operator State: CA
Operator Zip: 91763

Owner:
SWIS Number: 33-AA-0301
Owner: Baja Car Wash Inc. DBA B.P. John Recycling
Owner Address: 4299 State St
Owner City: Montclair
Owner State: CA
Owner Zip: 91763
Site Name: B.P. John Recycling Inc.
Site Operational Status: Active
Site Type: Non-Disposal Only
Site Regulatory Status: Notification
Latitude: 33.73732
Longitude: -117.15928
Is Archived: No
Started On: 10/25/2023
Contact Name: Robert Lodahl
Contact Title: Owner
Contact Email: info.bpjohnrecycling@gmail.com
Contact Phone: (909) 627-8288

Waste:
SWIS Number: 33-AA-0301
Site Name: B.P. John Recycling Inc.
Activity: Green Material Composting Operation
Waste Type: Green Materials
Site Is Archived: No
Site Operational Status: Active
Site Regulatory Status: Notification
Site Type: Non-Disposal Only
Point of Contact: Theodore Tasiopoulos
Activity Is Archived: No
Activity Operational Status: Active
Activity Regulatory Status: Notification
Activity Category: Composting
Activity Classification: Solid Waste Operation

SWIS Number: 33-AA-0301
Site Name: B.P. John Recycling Inc.
Activity: Green Material Composting Operation

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

SWF/LF

EDR ID: S126327278 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A1

NAME: B.P. JOHN RECYCLING INC.

ADDRESS: 28700 MATHEWS ROAD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: CA Department of Resources Recycling and Recovery

Rev: 07/31/2025
ID/Status: Active
ID/Status: Notification
ID/Status: 33-AA-0301

Waste Type: Wood Waste
Site Is Archived: No
Site Operational Status: Active
Site Regulatory Status: Notification
Site Type: Non-Disposal Only
Point of Contact: Theodore Tasiopoulos
Activity Is Archived: No
Activity Operational Status: Active
Activity Regulatory Status: Notification
Activity Category: Composting
Activity Classification: Solid Waste Operation

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1027529213 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A2

NAME: BAJA CAR WASH INC DBA BP JOHN RECYCLING
Rev: 06/02/2025
ID/Status: CAL000475452

ADDRESS: 28700 MATTHEWS RD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: US Environmental Protection Agency

RCRA Listings:
Date Form Received by Agency: 20221223
Handler Name: Baja Car Wash Inc Dba Bp John Recycling
Handler Address: 28700 Matthews Rd
Handler City,State,Zip: MENIFEE, CA 92585
EPA ID: CAL000475452
Contact Name: ROBERT LODAHL
Contact Address: 4299 STATE ST
Contact City,State,Zip: MONTLCAIR, CA 91763
Contact Telephone: 626-626-5743
Contact Fax: Not reported
Contact Email: INFO.BPJOHNRECYLING@GMAIL.COM
Contact Title: Not reported
EPA Region: 09
Land Type: Not reported
Federal Waste Generator Description: Not a generator, verified
Non-Notifier: Not reported
Biennial Report Cycle: Not reported
Accessibility: Not reported
Active Site Indicator: Not reported
State District Owner: Not reported
State District: Not reported
Mailing Address: 4299 STATE ST
Mailing City,State,Zip: MONTLCAIR, CA 91763
Owner Name: Baja Car Wash Inc
Owner Type: Other
Operator Name: Robert Lodahl
Operator Type: Other
Short-Term Generator Activity: No
Importer Activity: No
Mixed Waste Generator: No
Transporter Activity: No
Transfer Facility Activity: No
Recycler Activity with Storage: No
Small Quantity On-Site Burner Exemption: No
Smelting Melting and Refining Furnace Exemption: No
Underground Injection Control: No
Off-Site Waste Receipt: No
Universal Waste Indicator: No
Universal Waste Destination Facility: No
Federal Universal Waste: No
Active Site State-Reg Handler: ---
Federal Facility Indicator: Not reported
Hazardous Secondary Material Indicator: N

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1027529213 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A2

NAME: BAJA CAR WASH INC DBA BP JOHN RECYCLING
ADDRESS: 28700 MATTHEWS RD
MENIFEE, CA 92585
RIVERSIDE
SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAL000475452

Sub-Part K Indicator: Not reported
2018 GPRA Permit Baseline: Not on the Baseline
2018 GPRA Renewals Baseline: Not on the Baseline
202 GPRA Corrective Action Baseline: No
Subject to Corrective Action Universe: No
Non-TSDFs Where RCRA CA has Been Imposed Universe: No
Corrective Action Priority Ranking: No NCAPS ranking
Environmental Control Indicator: No
Institutional Control Indicator: No
Human Exposure Controls Indicator: N/A
Groundwater Controls Indicator: N/A
Significant Non-Complier Universe: No
Unaddressed Significant Non-Complier Universe: No
Addressed Significant Non-Complier Universe: No
Significant Non-Complier With a Compliance Schedule Universe: No
Financial Assurance Required: Not reported
Handler Date of Last Change: 20230102
Recognized Trader-Importer: No
Recognized Trader-Exporter: No
Importer of Spent Lead Acid Batteries: No
Exporter of Spent Lead Acid Batteries: No
Recycler Activity Without Storage: No
Manifest Broker: No
Sub-Part P Indicator: No

Handler - Owner Operator:
Owner/Operator Indicator: Operator
Owner/Operator Name: ROBERT LODAHL
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported
Owner/Operator Address: 4299 STATE ST
Owner/Operator City,State,Zip: MONTLCAIR, CA 91763
Owner/Operator Telephone: 626-626-5743
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Owner/Operator Indicator: Owner
Owner/Operator Name: BAJA CAR WASH INC
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1027529213 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A2

NAME: BAJA CAR WASH INC DBA BP JOHN RECYCLING
Rev: 06/02/2025
ID/Status: CAL000475452

ADDRESS: 28700 MATTHEWS RD
MENIFEE, CA 92585
RIVERSIDE

SOURCE: US Environmental Protection Agency

Owner/Operator Address: 4299 STATE ST
Owner/Operator City,State,Zip: MONTLCAIR, CA 91763
Owner/Operator Telephone: 626-626-5743
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Historic Generators:
Receive Date: 20221223
Handler Name: BAJA CAR WASH INC DBA BP JOHN RECYCLING
Federal Waste Generator Description: Not a generator, verified
State District Owner: Not reported
Large Quantity Handler of Universal Waste: No
Recognized Trader Importer: No
Recognized Trader Exporter: No
Spent Lead Acid Battery Importer: No
Spent Lead Acid Battery Exporter: No
Current Record: Yes
Non Storage Recycler Activity: No
Electronic Manifest Broker: No

List of NAICS Codes and Descriptions:
NAICS Code: 562920
NAICS Description: Materials Recovery Facilities

Facility Has Received Notices of Violations:
Violations: No Violations Found

Evaluation Action Summary:
Evaluations: No Evaluations Found

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1024796588 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A3

NAME: BP JOHN HAULING

ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE

SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAL000177408

RCRA Listings:
Date Form Received by Agency: 19951025
Handler Name: Bp John Hauling
Handler Address: 28700 Matthews Rd
Handler City,State,Zip: ROMOLAND, CA 92580-0000
EPA ID: CAL000177408
Contact Name: ED METZLER
Contact Address: 38875 AVENIDA LA CRESTA
Contact City,State,Zip: MURRIETA, CA 92562
Contact Telephone: 951-696-1144
Contact Fax: 951-696-1139
Contact Email: BPJOHNRECYCLING@YAHOO.COM
Contact Title: Not reported
EPA Region: 09
Land Type: Not reported
Federal Waste Generator Description: Not a generator, verified
Non-Notifier: Not reported
Biennial Report Cycle: Not reported
Accessibility: Not reported
Active Site Indicator: Handler Activities
State District Owner: Not reported
State District: Not reported
Mailing Address: 38875 AVENIDA LA CRESTA
Mailing City,State,Zip: MURRIETA, CA 92562-9155
Owner Name: B.P. John Recycling, Inc.
Owner Type: Other
Operator Name: Ed Metzler
Operator Type: Other
Short-Term Generator Activity: No
Importer Activity: No
Mixed Waste Generator: No
Transporter Activity: No
Transfer Facility Activity: No
Recycler Activity with Storage: No
Small Quantity On-Site Burner Exemption: No
Smelting Melting and Refining Furnace Exemption: No
Underground Injection Control: No
Off-Site Waste Receipt: No
Universal Waste Indicator: Yes
Universal Waste Destination Facility: Yes
Federal Universal Waste: No
Active Site State-Reg Handler: ---
Federal Facility Indicator: Not reported
Hazardous Secondary Material Indicator: N

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1024796588 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A3

NAME: BP JOHN HAULING

ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE

SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAL000177408

Sub-Part K Indicator: Not reported
2018 GPRA Permit Baseline: Not on the Baseline
2018 GPRA Renewals Baseline: Not on the Baseline
202 GPRA Corrective Action Baseline: No
Subject to Corrective Action Universe: No
Non-TSDFs Where RCRA CA has Been Imposed Universe: No
Corrective Action Priority Ranking: No NCAPS ranking
Environmental Control Indicator: No
Institutional Control Indicator: No
Human Exposure Controls Indicator: N/A
Groundwater Controls Indicator: N/A
Significant Non-Complier Universe: No
Unaddressed Significant Non-Complier Universe: No
Addressed Significant Non-Complier Universe: No
Significant Non-Complier With a Compliance Schedule Universe: No
Financial Assurance Required: Not reported
Handler Date of Last Change: 20180905
Recognized Trader-Importer: No
Recognized Trader-Exporter: No
Importer of Spent Lead Acid Batteries: No
Exporter of Spent Lead Acid Batteries: No
Recycler Activity Without Storage: No
Manifest Broker: No
Sub-Part P Indicator: No

Handler - Owner Operator:
Owner/Operator Indicator: Owner
Owner/Operator Name: B.P. JOHN RECYCLING, INC.
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported
Owner/Operator Address: 28700 MATTHEWS RD.
Owner/Operator City,State,Zip: SUN CITY, CA 92585-0000
Owner/Operator Telephone: 951-696-1144
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Owner/Operator Indicator: Operator
Owner/Operator Name: ED METZLER
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1024796588 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A3

NAME: BP JOHN HAULING

ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE

SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAL000177408

Owner/Operator Address: 38875 AVENIDA LA CRESTA
Owner/Operator City,State,Zip: MURRIETA, CA 92562
Owner/Operator Telephone: 951-696-1144
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Historic Generators:
Receive Date: 19951025
Handler Name: BP JOHN HAULING
Federal Waste Generator Description: Not a generator, verified
State District Owner: Not reported
Large Quantity Handler of Universal Waste: No
Recognized Trader Importer: No
Recognized Trader Exporter: No
Spent Lead Acid Battery Importer: No
Spent Lead Acid Battery Exporter: No
Current Record: Yes
Non Storage Recycler Activity: Not reported
Electronic Manifest Broker: Not reported

List of NAICS Codes and Descriptions:
NAICS Code: 42193
NAICS Description: Recyclable Material Wholesalers

Facility Has Received Notices of Violations:
Violations: No Violations Found

Evaluation Action Summary:
Evaluations: No Evaluations Found

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1025859103 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A4

NAME: WILSON UTILITY CONSTRUCTION COMPANY
ADDRESS: 26125 MENIFEE ROAD
SUN CITY, CA 92585
RIVERSIDE
SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAC003039637

RCRA Listings:
Date Form Received by Agency: 20191021
Handler Name: Wilson Utility Construction Company
Handler Address: 26125 Menifee Road
Handler City,State,Zip: SUN CITY, CA 92585
EPA ID: CAC003039637
Contact Name: HANNAH COLLETTE
Contact Address: 1190 N.W. THIRD
Contact City,State,Zip: CANBY, OR 97013
Contact Telephone: 913-708-3350
Contact Fax: Not reported
Contact Email: HCOLLETTE@WILSONCONST.COM
Contact Title: Not reported
EPA Region: 09
Land Type: Not reported
Federal Waste Generator Description: Not a generator, verified
Non-Notifier: Not reported
Biennial Report Cycle: Not reported
Accessibility: Not reported
Active Site Indicator: Not reported
State District Owner: Not reported
State District: Not reported
Mailing Address: 1190 N.W. THIRD
Mailing City,State,Zip: CANBY, OR 97013
Owner Name: Hannah Collette
Owner Type: Other
Operator Name: Hannah Collette
Operator Type: Other
Short-Term Generator Activity: No
Importer Activity: No
Mixed Waste Generator: No
Transporter Activity: No
Transfer Facility Activity: No
Recycler Activity with Storage: No
Small Quantity On-Site Burner Exemption: No
Smelting Melting and Refining Furnace Exemption: No
Underground Injection Control: No
Off-Site Waste Receipt: No
Universal Waste Indicator: No
Universal Waste Destination Facility: No
Federal Universal Waste: No
Active Site State-Reg Handler: ---
Federal Facility Indicator: Not reported
Hazardous Secondary Material Indicator: N

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1025859103 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A4

NAME: WILSON UTILITY CONSTRUCTION COMPANY
ADDRESS: 26125 MENIFEE ROAD
SUN CITY, CA 92585
RIVERSIDE
SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAC003039637

Sub-Part K Indicator: Not reported
2018 GPRA Permit Baseline: Not on the Baseline
2018 GPRA Renewals Baseline: Not on the Baseline
202 GPRA Corrective Action Baseline: No
Subject to Corrective Action Universe: No
Non-TSDFs Where RCRA CA has Been Imposed Universe: No
Corrective Action Priority Ranking: No NCAPS ranking
Environmental Control Indicator: No
Institutional Control Indicator: No
Human Exposure Controls Indicator: N/A
Groundwater Controls Indicator: N/A
Significant Non-Complier Universe: No
Unaddressed Significant Non-Complier Universe: No
Addressed Significant Non-Complier Universe: No
Significant Non-Complier With a Compliance Schedule Universe: No
Financial Assurance Required: Not reported
Handler Date of Last Change: 20191025
Recognized Trader-Importer: No
Recognized Trader-Exporter: No
Importer of Spent Lead Acid Batteries: No
Exporter of Spent Lead Acid Batteries: No
Recycler Activity Without Storage: No
Manifest Broker: No
Sub-Part P Indicator: No

Handler - Owner Operator:
Owner/Operator Indicator: Operator
Owner/Operator Name: HANNAH COLLETTE
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported
Owner/Operator Address: 1190 N.W. THIRD
Owner/Operator City,State,Zip: CANBY, OR 97013
Owner/Operator Telephone: 913-708-3350
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Owner/Operator Indicator: Owner
Owner/Operator Name: HANNAH COLLETTE
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1025859103 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A4

NAME: WILSON UTILITY CONSTRUCTION COMPANY
ADDRESS: 26125 MENIFEE ROAD
SUN CITY, CA 92585
RIVERSIDE
SOURCE: US Environmental Protection Agency

Rev: 06/02/2025
ID/Status: CAC003039637

Owner/Operator Address: 1190 N.W. THIRD
Owner/Operator City,State,Zip: CANBY, OR 97013
Owner/Operator Telephone: 913-708-3350
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Historic Generators:
Receive Date: 20191021
Handler Name: WILSON UTILITY CONSTRUCTION COMPANY
Federal Waste Generator Description: Not a generator, verified
State District Owner: Not reported
Large Quantity Handler of Universal Waste: No
Recognized Trader Importer: No
Recognized Trader Exporter: No
Spent Lead Acid Battery Importer: No
Spent Lead Acid Battery Exporter: No
Current Record: Yes
Non Storage Recycler Activity: Not reported
Electronic Manifest Broker: Not reported

List of NAICS Codes and Descriptions:
NAICS Code: 56299
NAICS Description: All Other Waste Management Services

Facility Has Received Notices of Violations:
Violations: No Violations Found

Evaluation Action Summary:
Evaluations: No Evaluations Found

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING
ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

HAZNET:
Name: BP JOHN HAULING
Address: 28700 MATTHEWS RD
Address 2: Not reported
City,State,Zip: ROMOLAND, CA 925800000
Contact: OSCAR OHNESORGEN
Telephone: 9519703207
Mailing Name: Not reported
Mailing Address: 28700 MATTHEWS RD.

Year: 2020
Gepaid: CAL000177408
TSD EPA ID: CAT080025711
CA Waste Code: 221 - Waste oil and mixed oil
Disposal Method: H141 - Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Tons: 0.76

Year: 2020
Gepaid: CAL000177408
TSD EPA ID: CAD099452708
CA Waste Code: 221 - Waste oil and mixed oil
Disposal Method: H039 - Other Recovery Of Reclamation For Reuse Including Acid Regeneration, Organics Recovery Ect
Tons: 0.76

Year: 2019
Gepaid: CAL000177408
TSD EPA ID: CAT080025711
CA Waste Code: 221 - Waste oil and mixed oil
Disposal Method: H141 - Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Tons: 0.00000

Year: 2018
Gepaid: CAL000177408
TSD EPA ID: AZR000003681
CA Waste Code: 223 - Unspecified oil-containing waste
Disposal Method: H039 - Other Recovery Of Reclamation For Reuse Including Acid Regeneration, Organics Recovery Ect
Tons: 0.10000

Year: 2018
Gepaid: CAL000177408

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING
ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

TSD EPA ID: CAT080025711
CA Waste Code: 221 - Waste oil and mixed oil
Disposal Method: H141 - Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Tons: 0.00000

Year: 2006
Gepaid: CAL000177408
TSD EPA ID: CAD981696420
CA Waste Code: 352 - Other organic solids
Disposal Method: -
Tons: 0.5

Year: 2004
Gepaid: CAL000177408
TSD EPA ID: CAD028409019
CA Waste Code: 352 - Other organic solids
Disposal Method: H01 - Transfer Station
Tons: 0.25

Year: 1999
Gepaid: CAL000177408
TSD EPA ID: CAD982444481
CA Waste Code: 331 - Off-specification, aged or surplus organics
Disposal Method: H01 - Transfer Station
Tons: 0.2

Additional Information:
Year: 2020
EM Manifest ID: Not reported
Shipment Date: 10/26/2020
Shipment Date: 10/26/2020
Receipt Date: 10/27/2020
Manifest Number: 007810580SKS
Generator EPA ID: CAL000177408
Name: BP JOHN RECYCLING
Address: 28700 MATHEWS RD
Address 2: Not reported
City,State,Zip: ROMOLAND 92584
Telephone: Not reported
Contact: Oscar N/A
Contact Telephone: 951-295-2927
Contact Email: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING
ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

Transporter 1 EPA ID: TXR000081205
Transporter Name: Not reported
Transporter 1 Emergency Number: Not reported
Transporter 2 EPA ID: Not reported
Transporter Name 2: Not reported
Transporter 2 Emergency Number: Not reported
TSDF EPA ID: CAD099452708
TSDF Name: Industrial Services Oil Company Inc
TSDF Address 1: 1700 South Soto Street
TSDF Address 2: Not reported
TSDF City,State,Zip: Los Angeles 90023
TSDF Telephone: Not reported
TSDFA EPA ID: Not reported
Waste Code Description: - Not reported
RCRA Code: Not reported
Meth Code: - Not reported
Quantity Tons: Not reported
Waste Quantity: Not reported
Quantity Unit: Not reported

Year: 2020
EM Manifest ID: Not reported
Shipment Date: 1/13/2020
Shipment Date: 1/13/2020
Receipt Date: 1/15/2020
Manifest Number: 007285703SKS
Generator EPA ID: CAL000177408
Name: BP JOHN HAULING
Address: 28700 MATTHEWS RD
Address 2: Not reported
City,State,Zip: ROMOLAND 92580-0000
Telephone: Not reported
Contact: Not reported
Contact Telephone: 951-696-1144
Contact Email: Not reported
Transporter 1 EPA ID: TXR000081205
Transporter Name: Not reported
Transporter 1 Emergency Number: Not reported
Transporter 2 EPA ID: Not reported
Transporter Name 2: Not reported
Transporter 2 Emergency Number: Not reported
TSDF EPA ID: CAT080025711
TSDF Name: ADVANCED ENVIRONMENTAL, INC. DBA WORLD OIL ENVIRONMENTAL SERVICES
TSDF Address 1: WHITTRAM AVENUE
TSDF Address 2: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING

ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE

SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

TSDF City,State,Zip: FONTANA 92335-0000
TSDF Telephone: Not reported
TSDFA EPA ID: Not reported
Waste Code Description: - Not reported
RCRA Code: Not reported
Meth Code: - Not reported
Quantity Tons: Not reported
Waste Quantity: Not reported
Quantity Unit: Not reported

Additional Information:
Year: 2018
EM Manifest ID: 006223619SKS20180423_D_1
Shipment Date: 4/23/2018
Shipment Date: 4/23/2018
Receipt Date: 5/8/2018
Manifest Number: 006223619SKS
Generator EPA ID: CAL000177408
Name: BP JOHN RECYCLING
Address: Not reported
Address 2: Not reported
City,State,Zip: Not reported
Telephone: Not reported
Contact: Not reported
Contact Telephone: Not reported
Contact Email: Not reported
Transporter 1 EPA ID: TXR000081205
Transporter Name: Not reported
Transporter 1 Emergency Number: Not reported
Transporter 2 EPA ID: MAD039322250
Transporter Name 2: Not reported
Transporter 2 Emergency Number: Not reported
TSDF EPA ID: AZR000003681
TSDF Name: THERMO FLUIDS INC
TSDF Address 1: Not reported
TSDF Address 2: Not reported
TSDF City,State,Zip: Not reported
TSDF Telephone: Not reported
TSDFA EPA ID: Not reported
Waste Code Description: - Not reported
RCRA Code: Not reported
Meth Code: - Not reported
Quantity Tons: Not reported
Waste Quantity: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING
ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

Quantity Unit: Not reported

State:
Year: 2018
EM Manifest ID: 006223619SKS20180423_D_1
Generator EPA ID: CAL000177408
Shipment Date: 2018-04-23
Manifest Number: 006223619SKS
Line Number: 1
Method Code: H039
Quantity Tons: 0.10000
Quantity Waste: 200.000000
Quantity Unit: P
Number of Containers: 2
Type of Container: NULL
Quantity Type: NULL
State Code: 223

Additional Information:
Year: 2006
Gen EPA ID: CAL000177408

Shipment Date: 20060412
Creation Date: 8/25/2006 18:30:24
Receipt Date: 20060417
Manifest ID: 25003925
Trans EPA ID: CAD982413262
Trans Name: EVERGREEN ENVIRONMENTAL SOUTH
Trans 2 EPA ID: Not reported
Trans 2 Name: Not reported
TSDF EPA ID: CAD981696420
Trans Name: EVERGREEN ENVIRONMENTAL SERVICES
TSDF Alt EPA ID: Not reported
TSDF Alt Name: Not reported
Waste Code Description: 352 - Other organic solids
RCRA Code: Not reported
Meth Code: - Not reported
Quantity Tons: 0.5
Waste Quantity: 1000
Quantity Unit: P
Additional Code 1: Not reported
Additional Code 2: Not reported
Additional Code 3: Not reported
Additional Code 4: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING
ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

Additional Code 5: Not reported

Additional Information:
Year: 2004
Gen EPA ID: CAL000177408

Shipment Date: 20041215
Creation Date: 3/17/2005 18:34:39
Receipt Date: 20041217
Manifest ID: 23487015
Trans EPA ID: CAD982413262
Trans Name: EVERGREEN ENVIRONMENTAL SERV
Trans 2 EPA ID: Not reported
Trans 2 Name: Not reported
TSDF EPA ID: CAD028409019
Trans Name: CROSBY & OVERTON
TSDF Alt EPA ID: CAD028409019
TSDF Alt Name: Not reported
Waste Code Description: 352 - Other organic solids
RCRA Code: NONE
Meth Code: H01 - Transfer Station
Quantity Tons: 0.25
Waste Quantity: 500
Quantity Unit: P
Additional Code 1: Not reported
Additional Code 2: Not reported
Additional Code 3: Not reported
Additional Code 4: Not reported
Additional Code 5: Not reported

Additional Information:
Year: 1999
Gen EPA ID: CAL000177408

Shipment Date: 19990106
Creation Date: 4/5/1999 0:00:00
Receipt Date: 19990201
Manifest ID: 98269225
Trans EPA ID: CAD982413262
Trans Name: Not reported
Trans 2 EPA ID: Not reported
Trans 2 Name: Not reported
TSDF EPA ID: CAD982444481
Trans Name: Not reported

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Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S113093668 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A5

NAME: BP JOHN HAULING

ADDRESS: 28700 MATTHEWS RD
ROMOLAND, CA 92580
RIVERSIDE

SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAL000177408

TSDF Alt EPA ID: Not reported
TSDF Alt Name: Not reported
Waste Code Description: 331 - Off-specification, aged, or surplus organics
RCRA Code: Not reported
Meth Code: H01 - Transfer Station
Quantity Tons: 0.2
Waste Quantity: 400
Quantity Unit: P
Additional Code 1: Not reported
Additional Code 2: Not reported
Additional Code 3: Not reported
Additional Code 4: Not reported
Additional Code 5: Not reported

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

HAZNET

EDR ID: S109287145 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A6

NAME: WILSON UTILITY CONSTRUCTION CO.
ADDRESS: 28700 MATTHEWS RD
SUN CITY, CA 92585
RIVERSIDE
SOURCE: CA California Environmental Protection Agency

Rev: 12/31/2024
ID/Status: CAC003122825

HAZNET:
Name: WILSON UTILITY CONSTRUCTION CO.
Address: 28700 MATTHEWS RD
Address 2: Not reported
City,State,Zip: SUN CITY, CA 92585
Contact: HANNAH COLLETTE
Telephone: 9137083350
Mailing Name: Not reported
Mailing Address: 1190 N.W. THIRD

Year: 2021
Gepaid: CAC003122825
TSD EPA ID: AZR000003681
CA Waste Code: 223 - Unspecified oil-containing waste
Disposal Method: H039 - Other Recovery Of Reclamation For Reuse Including Acid Regeneration, Organics Recovery Ect
Tons: 0.14

Year: 2021
Gepaid: CAC003122825
TSD EPA ID: CAD044429835
CA Waste Code: 221 - Waste oil and mixed oil
Disposal Method: H141 - Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Tons: 0.25

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

SWF/LF

EDR ID: S109287145 **DIST/DIR:** 0.197 NW **ELEVATION:** 1459 **MAP ID:** A6

NAME: WILSON UTILITY CONSTRUCTION CO.

ADDRESS: 28700 MATTHEWS RD
SUN CITY, CA 92585
RIVERSIDE

SOURCE: CA Department of Resources Recycling and Recovery

Rev: 07/31/2025
ID/Status: Active
ID/Status: 2744

LOS ANGELES CO. LF:
Name: B.P. JOHN RECYCLING, INC.
Address: 28700 MATTHEWS RD
City,State,Zip: ROMOLAND, CA 92585
Site ID: 2744
Alt. Site Name: N/A
Alt. Address: N/A
Site Contact: Not reported
Site Contact Phone: (951) 696-1144
Site Email: Not reported
Site Website: N/A
Site Type: Out-of-County Facility
Site SWIS Number: 33-AA-0301
Beginning Operation Date: N/A
Ending Operation Date: N/A
Local Enforcement Agency: County of Riverside Community Health Agency
Maximun Depth Fill(Ft): Not reported
Permitted Capacity: 1000
Present Use: Chipping and Grinding Activity Fac./ Op.
Remaining Capacity(Million): N/A
Status: Active
Waste Accepted: Green Materials;
Hours of Operation: Monday - Friday 7 am - 4:30 pm; Saturday 7 am - 1 pm
Disposal Area (Acre): Not reported

Detail As Of 01/2014:
Operator Name: Unknown
Operator Address: Not reported
Operator City/State/Zip: Not reported
Operator Contact: Not reported
Operator Telephone: Not reported
Operator Email: Not reported
Owner Name: Unknown
Owner Address: Not reported
Owner City/State/Zip: Not reported
Owner Contact: Not reported
Owner Telephone: Not reported
Owner Email: Not reported
District: Not reported
Site Mailing Address: N/A

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1026810406 **DIST/DIR:** 0.200 WNW **ELEVATION:** 1458 **MAP ID:** A7

NAME: WILSON UTILITY CONSTRUCTION CO
ADDRESS: 28700 MATTHEWS RD
SUN CITY, CA 92585

Rev: 06/02/2025
ID/Status: CAC003122825

SOURCE: US Environmental Protection Agency

RCRA Listings:
Date Form Received by Agency: 20210603
Handler Name: Wilson Utility Construction Co.
Handler Address: 28700 Matthews Rd
Handler City,State,Zip: SUN CITY, CA 92585
EPA ID: CAC003122825
Contact Name: HANNAH COLLETTE
Contact Address: 255 E RINCON STREET
Contact City,State,Zip: CORNOA, CA 92880
Contact Telephone: 913-708-3350
Contact Fax: Not reported
Contact Email: HCOLLETTE@WILSONCONST.COM
Contact Title: Not reported
EPA Region: 09
Land Type: Not reported
Federal Waste Generator Description: Not a generator, verified
Non-Notifier: Not reported
Biennial Report Cycle: Not reported
Accessibility: Not reported
Active Site Indicator: Not reported
State District Owner: Not reported
State District: Not reported
Mailing Address: 1190 N.W. THIRD
Mailing City,State,Zip: CANBY, OR 97013
Owner Name: Hannah Collette
Owner Type: Other
Operator Name: Hannah Collette
Operator Type: Other
Short-Term Generator Activity: No
Importer Activity: No
Mixed Waste Generator: No
Transporter Activity: No
Transfer Facility Activity: No
Recycler Activity with Storage: No
Small Quantity On-Site Burner Exemption: No
Smelting Melting and Refining Furnace Exemption: No
Underground Injection Control: No
Off-Site Waste Receipt: No
Universal Waste Indicator: No
Universal Waste Destination Facility: No
Federal Universal Waste: No
Active Site State-Reg Handler: ---
Federal Facility Indicator: Not reported
Hazardous Secondary Material Indicator: N

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1026810406 **DIST/DIR:** 0.200 WNW **ELEVATION:** 1458 **MAP ID:** A7

NAME: WILSON UTILITY CONSTRUCTION CO
ADDRESS: 28700 MATTHEWS RD
SUN CITY, CA 92585

Rev: 06/02/2025
ID/Status: CAC003122825

SOURCE: US Environmental Protection Agency

Sub-Part K Indicator: Not reported
2018 GPRA Permit Baseline: Not on the Baseline
2018 GPRA Renewals Baseline: Not on the Baseline
202 GPRA Corrective Action Baseline: No
Subject to Corrective Action Universe: No
Non-TSDFs Where RCRA CA has Been Imposed Universe: No
Corrective Action Priority Ranking: No NCAPS ranking
Environmental Control Indicator: No
Institutional Control Indicator: No
Human Exposure Controls Indicator: N/A
Groundwater Controls Indicator: N/A
Significant Non-Complier Universe: No
Unaddressed Significant Non-Complier Universe: No
Addressed Significant Non-Complier Universe: No
Significant Non-Complier With a Compliance Schedule Universe: No
Financial Assurance Required: Not reported
Handler Date of Last Change: 20210604
Recognized Trader-Importer: No
Recognized Trader-Exporter: No
Importer of Spent Lead Acid Batteries: No
Exporter of Spent Lead Acid Batteries: No
Recycler Activity Without Storage: No
Manifest Broker: No
Sub-Part P Indicator: No

Handler - Owner Operator:
Owner/Operator Indicator: Operator
Owner/Operator Name: HANNAH COLLETTE
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported
Owner/Operator Address: 255 E RINCON STREET
Owner/Operator City,State,Zip: CORNOA, CA 92880
Owner/Operator Telephone: 913-708-3350
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Owner/Operator Indicator: Owner
Owner/Operator Name: HANNAH COLLETTE
Legal Status: Other
Date Became Current: Not reported
Date Ended Current: Not reported

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

RCRA NonGen / NLR

EDR ID: 1026810406 **DIST/DIR:** 0.200 WNW **ELEVATION:** 1458 **MAP ID:** A7

NAME: WILSON UTILITY CONSTRUCTION CO
ADDRESS: 28700 MATTHEWS RD
SUN CITY, CA 92585

Rev: 06/02/2025
ID/Status: CAC003122825

SOURCE: US Environmental Protection Agency

Owner/Operator Address: 1190 N.W. THIRD
Owner/Operator City,State,Zip: CANBY, OR 97013
Owner/Operator Telephone: 913-708-3350
Owner/Operator Telephone Ext: Not reported
Owner/Operator Fax: Not reported
Owner/Operator Email: Not reported

Historic Generators:
Receive Date: 20210603
Handler Name: WILSON UTILITY CONSTRUCTION CO.
Federal Waste Generator Description: Not a generator, verified
State District Owner: Not reported
Large Quantity Handler of Universal Waste: No
Recognized Trader Importer: No
Recognized Trader Exporter: No
Spent Lead Acid Battery Importer: No
Spent Lead Acid Battery Exporter: No
Current Record: Yes
Non Storage Recycler Activity: No
Electronic Manifest Broker: No

List of NAICS Codes and Descriptions:
NAICS Code: 56299
NAICS Description: All Other Waste Management Services

Facility Has Received Notices of Violations:
Violations: No Violations Found

Evaluation Action Summary:
Evaluations: No Evaluations Found

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

LUST

EDR ID: 1001614264 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B8

NAME: SAN JACINTO VALLEY DISTRI

ADDRESS: 26100 MENIFEE
ROMOLAND, CA 92380
RIVERSIDE

SOURCE: CA State Water Resources Control Board

Rev: 06/02/2025
ID/Status: Completed - Case Closed
ID/Status: T0606500038

LUST:
Name: SAN JACINTO VALLEY DISTRICT OF
Address: 26100 MENIFEE ROAD
City,State,Zip: ROMOLAND, CA 92380
Lead Agency: RIVERSIDE COUNTY
Case Type: LUST Cleanup Site
Geo Track: http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0606500038
Global Id: T0606500038
Latitude: 33.75024
Longitude: -117.1671504
Status: Completed - Case Closed
Status Date: 04/04/1989
Case Worker: RIV
RB Case Number: 083300334T
Local Agency: RIVERSIDE COUNTY
File Location: Not reported
Local Case Number: Not reported
Potential Media Affect: Soil
Potential Contaminants of Concern: Gasoline
EPA Region: 9
Coordinate Source: * Historical Geocode - Zip Code Match
Cuf Case: Not reported
Quantity Released Gallons: Not reported
Begin Date: 12/05/1986
Leak Reported Date: 12/11/1986
How Discovered: Subsurface Monitoring
How Discovered Description: Not reported
Discharge Source: Other
Discharge Cause: Unknown
Stop Method: Not reported
Stop Description: Not reported
No Further Action Date: 04/04/1989
CA Water Watershed Name: San Jacinto Valley - Perris - Perris Valley (802.11)
Dwr Groundwater Subbasin Name: San Jacinto (8-005)
Disadvantaged Community: Not reported
CA Enviroscreen 3 Score: 66-70%
CA Enviroscreen 4 Score: 55-60%
Military DOD Site: No
Facility Project Subtype: Not reported
RWQCB Region: SANTA ANA RWQCB (REGION 8)
Site History: Not reported

LUST:
Global Id: T0606500038
Contact Type: Local Agency Caseworker - Primary Caseworker

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

LUST

EDR ID: 1001614264 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B8

NAME: SAN JACINTO VALLEY DISTRI
ADDRESS: 26100 MENIFEE
ROMOLAND, CA 92380
RIVERSIDE
SOURCE: CA State Water Resources Control Board

Rev: 06/02/2025
ID/Status: Completed - Case Closed
ID/Status: T0606500038

Contact Name: Riverside County LOP
Organization Name: RIVERSIDE COUNTY
Address: 3880 LEMON ST SUITE 200
City: RIVERSIDE
Email: Not reported
Phone Number: 9519558980

LUST:
Global Id: T0606500038
Action Type: ENFORCEMENT
Date: 04/03/1989
Action: Other Report - #UST Sample Analytical Report

Global Id: T0606500038
Action Type: Other
Date: 12/05/1986
Action: Leak Discovery

Global Id: T0606500038
Action Type: Other
Date: 12/11/1986
Action: Leak Reported

Global Id: T0606500038
Action Type: ENFORCEMENT
Date: 04/04/1989
Action: Closure/No Further Action Letter

Global Id: T0606500038
Action Type: ENFORCEMENT
Date: 04/03/1989
Action: Other Report - #UST Sample Analytical Report

LUST:
Global Id: T0606500038
Status: Open - Case Begin Date
Status Date: 12/05/1986

Global Id: T0606500038
Status: Open - Site Assessment
Status Date: 03/01/1987

Global Id: T0606500038
Status: Completed - Case Closed

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

LUST

EDR ID: 1001614264 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B8

NAME: SAN JACINTO VALLEY DISTRI

ADDRESS: 26100 MENIFEE
ROMOLAND, CA 92380
RIVERSIDE

SOURCE: CA State Water Resources Control Board

Rev: 06/02/2025
ID/Status: Completed - Case Closed
ID/Status: T0606500038

Status Date: 04/04/1989

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

Cortese

EDR ID: S100993816 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B9

NAME: SAN JACINTO VALLEY DISTRICT OF

ADDRESS: 26100 MENIFEE ROAD
ROMOLAND, CA 92380
RIVERSIDE

SOURCE: CA CAL EPA/Office of Emergency Information

Rev: 06/12/2025
ID/Status: COMPLETED - CASE CLOSED

CORTESE:
Name: SAN JACINTO VALLEY DISTRICT OF
Address: 26100 MENIFEE ROAD
City,State,Zip: ROMOLAND, CA 92380
Region: CORTESE
Envirostor Id: Not reported
Global ID: T0606500038
Site/Facility Type: LUST CLEANUP SITE
Cleanup Status: COMPLETED - CASE CLOSED
Status Date: Not reported
Site Code: Not reported
Latitude: Not reported
Longitude: Not reported
Owner: Not reported
Enf Type: Not reported
Swat R: Not reported
Flag: active
Order No: Not reported
Waste Discharge System No: Not reported
Effective Date: Not reported
Region 2: Not reported
WID Id: Not reported
Solid Waste Id No: Not reported
Waste Management Uit Name: Not reported
File Name: Active Open

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

LUST

EDR ID: S100993816 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B9

NAME: SAN JACINTO VALLEY DISTRICT OF
ADDRESS: 26100 MENIFEE ROAD
ROMOLAND, CA 92380
RIVERSIDE
SOURCE: CA State Water Resources Control Board

Rev: 06/02/2025
ID/Status: Case Closed
ID/Status: T0606500038

LUST REG 8:
Name: SAN JACINTO VALLEY DISTRICT OF
Address: 26100 MENIFEE ROAD
City: ROMOLAND
Region: 8
County: Riverside
Regional Board: Santa Ana Region
Facility Status: Case Closed
Case Number: 083300334T
Local Case Num: Not reported
Case Type: Soil only
Substance: Gasoline
Qty Leaked: Not reported
Abate Method: Not reported
Cross Street: HWY 74
Enf Type: Not reported
Funding: Not reported
How Discovered: Subsurface Monitoring
How Stopped: Not reported
Leak Cause: UNK
Leak Source: UNK
Global ID: T0606500038
How Stopped Date: Not reported
Enter Date: 12/31/1986
Date Confirmation of Leak Began: Not reported
Date Preliminary Assessment Began: Not reported
Discover Date: 12/5/1986
Enforcement Date: Not reported
Close Date: 4/4/1989
Date Prelim Assessment Workplan Submitted: Not reported
Date Pollution Characterization Began: 3/1/1987
Date Remediation Plan Submitted: Not reported
Date Remedial Action Underway: Not reported
Date Post Remedial Action Monitoring: Not reported
Enter Date: 12/31/1986
GW Qualifies: Not reported
Soil Qualifies: Not reported
Operator: Not reported
Facility Contact: Not reported
Interim: Not reported
Oversite Program: LUST
Latitude: 33.75024
Longitude: -117.1671504
MTBE Date: Not reported

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

LUST

EDR ID: S100993816 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B9

NAME: SAN JACINTO VALLEY DISTRICT OF

ADDRESS: 26100 MENIFEE ROAD
ROMOLAND, CA 92380
RIVERSIDE

SOURCE: CA State Water Resources Control Board

Rev: 06/02/2025
ID/Status: Case Closed
ID/Status: T0606500038

Max MTBE GW: Not reported
MTBE Concentration: 0
Max MTBE Soil: Not reported
MTBE Fuel: 1
MTBE Tested: Site NOT Tested for MTBE.Includes Unknown and Not Analyzed.
MTBE Class: *
Staff: PAH
Staff Initials: UNK
Lead Agency: Local Agency
Local Agency: 33000L
Hydr Basin #: SAN JACINTO (8-5)
Beneficial: Not reported
Priority: Not reported
Cleanup Fund Id: Not reported
Work Suspended: Not reported
Summary: Not reported

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

UST FINDER RELEASE

EDR ID: 1029101667 **DIST/DIR:** 0.458 NNE **ELEVATION:** 1479 **MAP ID:** B10

NAME: SAN JACINTO VALLEY DISTRICT OF **Rev:** 06/08/2023

ADDRESS: 26100 MENIFEE ROAD
ROMOLAND, CA 92380

SOURCE: US Environmental Protecton Agency

UST FINDER RELEASE:
Object ID: 72057
Facility ID: Not reported
Lust ID: CAT0606500038
Name: SAN JACINTO VALLEY DISTRICT OF
Address: 26100 MENIFEE ROAD
City,State,Zip: ROMOLAND, CA 92380
Address Match Type: PointAddress
Reported Date: Not reported
Status: No Further Action
Substance: Not reported
Population within 1500ft: 7
Domestic Wells within 1500ft: 0
Land Use: Developed, Medium Intensity
Within SPA: No
SPA PWS Facility ID: Not reported
SPA Water Type: Not reported
SPA Facility Type: Not reported
SPA HUC12: Not reported
Within WHPA: Yes
WHPA PWS Facility ID: CA3310009_10625
WHPA Water Type: GW - Ground water
WHPA Facility Type: WL - Well
WHPA HUC12: 180702020306
Within 100yr Floodplain: No
Tribe: Not reported
EPA Region: 9
NFA Letter 1: Not reported
NFA Letter 2: Not reported
NFA Letter 3: Not reported
NFA Letter 4: Not reported
Closed With Residual Contaminate: Not reported
Coordinate Source: Geocode
X Coord: -117.15407
Y Coord: 33.7418700000001
Latitude: 33.7418699999999
Longitude: -117.15407

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

ENVIROSTOR

EDR ID: S105628773 **DIST/DIR:** 0.964 South **ELEVATION:** 1497 **MAP ID:** 11

NAME: MCCALL MESA K-8 SCHOOL
ADDRESS: MCCALL BOULEVARD/JUNIPERO ROAD
ROMOLAND, CA 92586
RIVERSIDE
SOURCE: CA Department of Toxic Substances Control

Rev: 07/17/2025
ID/Status: 33010066
ID/Status: No Further Action

ENVIROSTOR:
Name: MCCALL MESA K-8 SCHOOL
Address: MCCALL BOULEVARD/JUNIPERO ROAD
City,State,Zip: ROMOLAND, CA 92586
Facility ID: 33010066
Status: No Further Action
Status Date: 04/18/2003
Site Code: 404388
Site Type: School Investigation
Site Type Detailed: School
Acres: 30.04
NPL: NO
Regulatory Agencies: SMBRP
Lead Agency: SMBRP
Program Manager: Not reported
Supervisor: Javier Hinojosa
Division Branch: Southern California Schools & Brownfields Outreach
Assembly: 63
Senate: 32
Special Program: Not reported
Restricted Use: NO
Site Mgmt Req: NONE SPECIFIED
Funding: School District
Latitude: 33.71149
Longitude: -117.1956
APN: NONE SPECIFIED
Past Use: AGRICULTURAL - ROW CROPS
Potential COC: Lead Zinc
Confirmed COC: 30013-NO 30594-NO
Potential Description: SOIL, SV
Alias Name: MCCALL MESA K-8 SCHOOL
Alias Type: Alternate Name
Alias Name: ROMOLAND ELEMENTARY SCHOOL DISTRICT
Alias Type: Alternate Name
Alias Name: ROMOLAND SD-MCCALL-MESA K-8
Alias Type: Alternate Name
Alias Name: 404388
Alias Type: Project Code (Site Code)
Alias Name: 33010066
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Endangerment Assessment Report

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

ENVIROSTOR

EDR ID: S105628773 **DIST/DIR:** 0.964 South **ELEVATION:** 1497 **MAP ID:** 11

NAME: MCCALL MESA K-8 SCHOOL
ADDRESS: MCCALL BOULEVARD/JUNIPERO ROAD
ROMOLAND, CA 92586
RIVERSIDE
SOURCE: CA Department of Toxic Substances Control

Rev: 07/17/2025
ID/Status: 33010066
ID/Status: No Further Action

Completed Date: 04/17/2003
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Phase 1
Completed Date: 09/27/2002
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Technical Report
Completed Date: 12/24/2002
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Environmental Oversight Agreement
Completed Date: 10/28/2002
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Cost Recovery Closeout Memo
Completed Date: 04/18/2003
Comments: Not reported

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

ENVIROSTOR

EDR ID: S106044339 **DIST/DIR:** 0.973 South **ELEVATION:** 1468 **MAP ID:** 12

NAME: MENIFEE VALLEY RANCH SCHOOL NO. 1
ADDRESS: MCCALL BOULEVARD/MENIFEE LOOP W
ROMOLAND, CA 92585
RIVERSIDE
SOURCE: CA Department of Toxic Substances Control

Rev: 07/17/2025
ID/Status: 33010076
ID/Status: No Further Action

ENVIROSTOR:
Name: MENIFEE VALLEY RANCH SCHOOL NO. 1
Address: MCCALL BOULEVARD/MENIFEE LOOP W
City,State,Zip: ROMOLAND, CA 92585
Facility ID: 33010076
Status: No Further Action
Status Date: 12/10/2004
Site Code: 404479
Site Type: School Investigation
Site Type Detailed: School
Acres: 15
NPL: NO
Regulatory Agencies: DTSC
Lead Agency: DTSC
Program Manager: Amit Pathak
Supervisor: Shahir Haddad
Division Branch: Southern California Schools & Brownfields Outreach
Assembly: 63
Senate: 32
Special Program: Not reported
Restricted Use: NO
Site Mgmt Req: NONE SPECIFIED
Funding: School District
Latitude: 33.7214
Longitude: -117.1540
APN: NONE SPECIFIED
Past Use: AGRICULTURAL - ROW CROPS
Potential COC: Arsenic DDD DDE DDT
Confirmed COC: NONE SPECIFIED
Potential Description: SOIL
Alias Name: MENIFEE VALLEY RANCH SCHOOL NO. 1
Alias Type: Alternate Name
Alias Name: ROMOLAND ELEMENTARY SCHOOL DISTRICT
Alias Type: Alternate Name
Alias Name: ROMOLAND SD-PRPSD MNIFEE VLY RNCH SCL #1
Alias Type: Alternate Name
Alias Name: 404479
Alias Type: Project Code (Site Code)
Alias Name: 33010076
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Endangerment Assessment Report

- Continued on next page -

Site Detail Report

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

ENVIROSTOR

EDR ID: S106044339 **DIST/DIR:** 0.973 South **ELEVATION:** 1468 **MAP ID:** 12

NAME: MENIFEE VALLEY RANCH SCHOOL NO. 1
ADDRESS: MCCALL BOULEVARD/MENIFEE LOOP W
ROMOLAND, CA 92585
RIVERSIDE
SOURCE: CA Department of Toxic Substances Control

Rev: 07/17/2025
ID/Status: 33010076
ID/Status: No Further Action

Completed Date: 09/24/2004
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Endangerment Assessment Workplan
Completed Date: 04/21/2004
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Cost Recovery Closeout Memo
Completed Date: 12/10/2004
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Environmental Oversight Agreement
Completed Date: 09/18/2003
Comments: Not reported

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

Database Descriptions

NPL: NPL National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices. NPL - National Priority List Proposed NPL - Proposed National Priority List Sites.

NPL Delisted: Delisted NPL The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate. Delisted NPL - National Priority List Deletions

CERCLIS: SEMS SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL. SEMS - Superfund Enterprise Management System

NFRAP: SEMS-ARCHIVE SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site. SEMS-ARCHIVE - Superfund Enterprise Management System Archive

RCRA COR ACT: CORRACTS CORRACTS identifies hazardous waste handlers with RCRA corrective action activity. CORRACTS - Corrective Action Report

RCRA TSD: RCRA-TSDF RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste. RCRA-TSDF - RCRA - Treatment, Storage and Disposal

RCRA GEN: RCRA-LQG RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. RCRA-LQG - RCRA - Large Quantity Generators RCRA-SQG - RCRA - Small Quantity Generators. RCRA-VSQG - RCRA - Very Small Quantity Generators (Formerly Conditionally Exempt Small Quantity Generators).

Federal IC / EC: US ENG CONTROLS A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health. US ENG CONTROLS - Engineering Controls Sites List US INST CONTROLS - Institutional Controls Sites List.

Database Descriptions

ERNS: ERNS Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances. ERNS - Emergency Response Notification System

State/Tribal NPL: RESPONSE Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk. RESPONSE - State Response Sites

State/Tribal CERCLIS: ENVIROSTOR The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites. ENVIROSTOR - EnviroStor Database

State/Tribal SWL: SWF/LF (SWIS) Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites. SWF/LF (SWIS) - Solid Waste Information System

State/Tribal LTANKS: NAPA CO. LUST SAN MATEO CO. LUST - Fuel Leak List. SAN DIEGO CO. SAM - Environmental Case Listing. LUST - Leaking Underground Fuel Tank Report (GEOTRACKER). VENTURA CO. LUST - Listing of Underground Tank Cleanup Sites. SAN FRAN CO. LUST - Local Oversite Facilities. LUST SANTA CLARA - LOP Listing. LUST REG 9 - Leaking Underground Storage Tank Report. LUST REG 8 - Leaking Underground Storage Tanks. LUST REG 7 - Leaking Underground Storage Tank Case Listing. LUST REG 5 - Leaking Underground Storage Tank Database. LUST REG 4 - Underground Storage Tank Leak List. LUST REG 3 - Leaking Underground Storage Tank Database. LUST REG 2 - Fuel Leak List. LUST REG 1 - Active Toxic Site Investigation. LUST REG 6V - Leaking Underground Storage Tank Case Listing. LUST REG 6L - Leaking Underground Storage Tank Case Listing. RIVERSIDE CO. LUST - Listing of Underground Tank Cleanup Sites. ORANGE CO. LUST - List of Underground Storage Tank Cleanups. SOLANO CO. LUST - Leaking Underground Storage Tanks. SONOMA CO. LUST - Leaking Underground Storage Tank Sites. A listing of leaking underground storage tank sites located in San Francisco county. SONOMA CO. LUST - Local Oversite Facilities INDIAN LUST R7 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R9 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R5 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R8 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R10 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R1 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R4 - Leaking Underground Storage Tanks on Indian Land. INDIAN LUST R6 - Leaking Underground Storage Tanks on Indian Land. CPS-SLIC - Statewide SLIC Cases (GEOTRACKER). SLIC REG 1 - Active Toxic Site Investigations. SLIC REG 2 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. SLIC REG 3 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. SLIC REG 4 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. SLIC REG 5 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. SLIC REG 6V - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. SLIC REG 6L - SLIC Sites. SLIC REG 7 - SLIC List. SLIC REG 8 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing. Sacramento Co. CS - Toxic Site Clean-Up List. SLIC REG 9 - Spills, Leaks, Investigation & Cleanup Cost Recovery Listing.

State/Tribal Tanks: UST CLOSURE UST - Active UST Facilities. MILITARY UST SITES - Military UST Sites (GEOTRACKER). UST cases that are being considered for closure by either the State Water Resources Control Board or the Executive Director have been posted for a 60-day public comment period. UST Case Closures being proposed for consideration by the State Water Resources Control Board. These are primarily UST cases that meet closure criteria under the decisional framework in State Water Board Resolution No. 92-49 and other Board orders. UST Case Closures proposed for consideration by the Executive Director pursuant to State Water Board Resolution No. 2012-0061. These are cases that meet the criteria of the Low-Threat UST Case Closure Policy. UST Case Closure Review Denials and Approved Orders. MILITARY UST SITES - Proposed Closure of Underground Storage Tank (UST) Cases AST - Aboveground Petroleum Storage Tank Facilities. INDIAN UST R10 - Underground Storage Tanks on Indian Land. INDIAN UST R9 - Underground Storage Tanks on Indian Land. INDIAN UST R1 - Underground Storage Tanks on Indian Land. INDIAN UST R6 - Underground Storage Tanks on Indian Land. INDIAN UST R8 - Underground Storage Tanks on Indian Land. INDIAN UST R7 - Underground Storage Tanks on Indian Land. INDIAN UST R5 - Underground Storage Tanks on Indian Land. INDIAN UST R4 - Underground Storage Tanks on Indian Land.

Database Descriptions

State/Tribal VCP: VCP Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs. VCP - Voluntary Cleanup Program Properties SAN FRANCISCO MAHER - Maher Ordinance Property Listing.

US Brownfields: US BROWNFIELDS Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs. US BROWNFIELDS - A Listing of Brownfields Sites

Other SWF: WMUDS/SWAT SAN DIEGO CO. LF - Solid Waste Facilities. VENTURA CO. LF - Inventory of Illegal Abandoned and Inactive Sites. CA LA LF - City of Los Angeles Landfills. LOS ANGELES CO. LF - List of Solid Waste Facilities. Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites. LOS ANGELES CO. LF - Inventory of Illegal Abandoned and Inactive Sites

Other Haz Sites: SCH This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose. SCH - School Property Evaluation Program SAN DIEGO CO. HMMD - Hazardous Materials Management Division Database. CERS HAZ WASTE - California Environmental Reporting System Hazardous Waste. US CDL - Clandestine Drug Labs.

Other Tanks: SWEEPS UST Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list. SWEEPS UST - SWEEPS UST Listing ALAMEDA CO. UST - Underground Tanks. KERN CO. UST - Underground Storage Tank Sites & Tank Listing. MARIN CO. UST - Underground Storage Tank Sites. NAPA CO. UST - Closed and Operating Underground Storage Tank Sites. ORANGE CO. UST - List of Underground Storage Tank Facilities. RIVERSIDE CO. UST - Underground Storage Tank Tank List. SAN FRAN CO. UST - Underground Storage Tank Information. SOLANO CO. UST - Underground Storage Tanks. SUTTER CO. UST - Underground Storage Tanks. VENTURA CO. UST - Underground Tank Closed Sites List. YOLO CO. UST - Underground Storage Tank Comprehensive Facility Report. LOS ANGELES UST - Active & Inactive UST Inventory. EL SEGUNDO UST - City of El Segundo Underground Storage Tank. LONG BEACH UST - City of Long Beach Underground Storage Tank. UST SAN JOAQUIN - San Joaquin Co. UST. UST MENDOCINO - Mendocino County UST Database. TORRANCE UST - City of Torrance Underground Storage Tank. SAN FRANCISCO AST - Aboveground Storage Tank Site Listing. LOS ANGELES AST - Active & Inactive AST Inventory. CA FID UST - Facility Inventory Database. CERS TANKS - California Environmental Reporting System (CERS) Tanks.

Local Land Records: DEED Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners. DEED - Deed Restriction Listing

Database Descriptions

Spills: HMIRS Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT. HMIRS - Hazardous Materials Information Reporting System CHMIRS - California Hazardous Material Incident Report System. Orange Co. Ind Site - List of Industrial Site Cleanups Orange County. SPILLS 90 - SPILLS90 data from FirstSearch.

Other: RCRA NonGen / NLR RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste. RCRA NonGen / NLR - RCRA - Non Generators / No Longer Regulated FEDLAND - Federal and Indian Lands. TSCA - Toxic Substances Control Act. TRIS - Toxic Chemical Release Inventory System. SSTS - Section 7 Tracking Systems. RAATS - RCRA Administrative Action Tracking System. PRP - Potentially Responsible Parties. PADS - PCB Activity Database System. ICIS - Integrated Compliance Information System. FTTS - FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act). FTTS INSP - FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act). MLTS - Material Licensing Tracking System. RADINFO - Radiation Information Database. BRS - Biennial Reporting System. INDIAN RESERV - Indian Reservations. US AIRS (AFS) - Aerometric Information Retrieval System Facility Subsystem (AFS). US AIRS MINOR - Air Facility System Data. MINES MRDS - Mineral Resources Data System. FINDS - Facility Index System/Facility Registry System. PFAS NPL - Superfund Sites with PFAS Detections Information. PFAS FEDERAL SITES - Federal Sites PFAS Information. PFAS TRIS - List of PFAS Added to the TRI. PFAS TSCA - PFAS Manufacture and Imports Information. PFAS RCRA MANIFEST - PFAS Transfers Identified In the RCRA Database Listing. PFAS ATSDR - PFAS Contamination Site Location Listing. PFAS WQP - Ambient Environmental Sampling for PFAS. PFAS PROJECT - NORTHEASTERN UNIVERSITY PFAS PROJECT. PFAS NPDES - Clean Water Act Discharge Monitoring Information. PFAS ECHO - Facilities in Industries that May Be Handling PFAS Listing. PFAS ECHO FIRE TRAIN - Facilities in Industries that May Be Handling PFAS Listing. PFAS PT 139 AIRPORT - All Certified Part 139 Airports PFAS Information Listing. AQUEOUS FOAM NRC - Aqueous Foam Related Incidents Listing. PCS - Permit Compliance System. PCS ENF - Enforcement data. BIOSOLIDS - ICIS-NPDES Biosolids Facility Data. UST FINDER RELEASE - UST Finder Releases Database. UST FINDER - UST Finder Database. E MANIFEST - Hazardous Waste Electronic Manifest System. PFAS - PFAS Contamination Site Location Listing. AQUEOUS FOAM - Former Fire Training Facility Assessments Listing.
CHROME PLATING - Chrome Plating Facilities Listing. CORTESE - "Cortese" Hazardous Waste & Substances Sites List. CUPA - CUPA Resources List. CUPA AMADOR - CUPA Facility List. CUPA BUTTE - CUPA Facility Listing. CUPA CALVERAS - CUPA Facility Listing. CUPA COLUSA - CUPA Facility List. CUPA DEL NORTE - CUPA Facility List. CUPA EL DORADO - CUPA Facility List. CUPA FRESNO - CUPA Resources List. CUPA HUMBOLDT - CUPA Facility List. CUPA LIV-PLE - CUPA Facility Listing. CUPA IMPERIAL - CUPA Facility List. CUPA PLUMAS - CUPA Facility List. CUPA STANISLAUS - CUPA Facility List. CUPA SAN BENITO - CUPA Facility List. CUPA SAN FRAN CO - CUPA Facility Listing. CUPA GLENN - CUPA Facility List. CUPA LASSEN - CUPA Facility List. CUPA TRINITY - CUPA Facility List. CUPA TULARE - CUPA Facility List. CUPA TEHAMA - CUPA Facility List. CUPA INYO - CUPA Facility List. CUPA KINGS - CUPA Facility List. CUPA LAKE - CUPA Facility List. CUPA MADERA - CUPA Facility List. CUPA MERCED - CUPA Facility List. CUPA MONO - CUPA Facility List. CUPA MONTEREY - CUPA Facility Listing. CUPA NEVADA - CUPA Facility List. CUPA SAN LUIS OBISPO - CUPA Facility List. CUPA SANTA BARBARA - CUPA Facility Listing. CUPA SANTA CLARA - Cupa Facility List. CUPA SANTA CRUZ - CUPA Facility List. CUPA SHASTA - CUPA Facility List. CUPA SONOMA - Cupa Facility List. CUPA TUOLUMNE - CUPA Facility List. KERN CO CUPA - CUPA Facility List. CUPA YUBA - CUPA Facility List. HWTS - Hazardous Waste Tracking System. HAZNET - Facility and Manifest Data. LA CO LF METHANE - Methane Producing Landfills. Sacramento Co. ML - Master Hazardous Materials Facility List. San Bern. Co. Permit - Hazardous Material Permits. LOS ANGELES HM - Active & Inactive Hazardous Materials Inventory.

Database Sources

NPL: EPA

Updated Quarterly

NPL Delisted: EPA

Updated Quarterly

CERCLIS: EPA

Updated Quarterly

NFRAP: EPA

Updated Quarterly

RCRA COR ACT: EPA

Updated Quarterly

RCRA TSD: Environmental Protection Agency

Updated Quarterly

RCRA GEN: Environmental Protection Agency

Updated Quarterly

Federal IC / EC: Environmental Protection Agency

Varies

ERNS: National Response Center, United States Coast Guard

Updated Quarterly

State/Tribal NPL: Department of Toxic Substances Control

Updated Quarterly

State/Tribal CERCLIS: Department of Toxic Substances Control

Updated Quarterly

State/Tribal SWL: Department of Resources Recycling and Recovery

Updated Quarterly

State/Tribal LTANKS: San Mateo County Environmental Health Services Division

Updated Semi-Annually

Database Sources

State/Tribal Tanks: State Water Resources Control Board

Varies

State/Tribal VCP: Department of Toxic Substances Control

Updated Quarterly

US Brownfields: Environmental Protection Agency

Updated Semi-Annually

Other SWF: La County Department of Public Works

Varies

Other Haz Sites: Department of Toxic Substances Control

Updated Quarterly

Other Tanks: State Water Resources Control Board

No Update Planned

Local Land Records: DTSC and SWRCB

Updated Semi-Annually

Spills: U.S. Department of Transportation

Updated Quarterly

Other: Environmental Protection Agency

Updated Quarterly

Street Name Report for Streets near the Target Property

Target Property: FUENTES PARCELS, CASE ROAD
SUN CITY, CA 92585

JOB: 2025-204

Street Name	Dist/Dir	Street Name	Dist/Dir
Junipero Rd	0.10 WNW		
Matthews Rd	0.03 SW		
McLaughlin Rd	0.05 North		
Menifee Rd	0.17 East		

Environmental FirstSearch

1.000 Mile Radius

ASTM MAP: NPL, RCRACOR, STATES Sites

FUENTES PARCELS, CASE ROAD SUN CITY, CA 92585



Black Rings Represent Qtr. Mile Radius; Red Ring Represents 500 ft. Radius

★ Target Property (Latitude: 33.735308 Longitude: 117.156989)

▲ Identified Sites

National Priority List Sites

Indian Reservations BIA

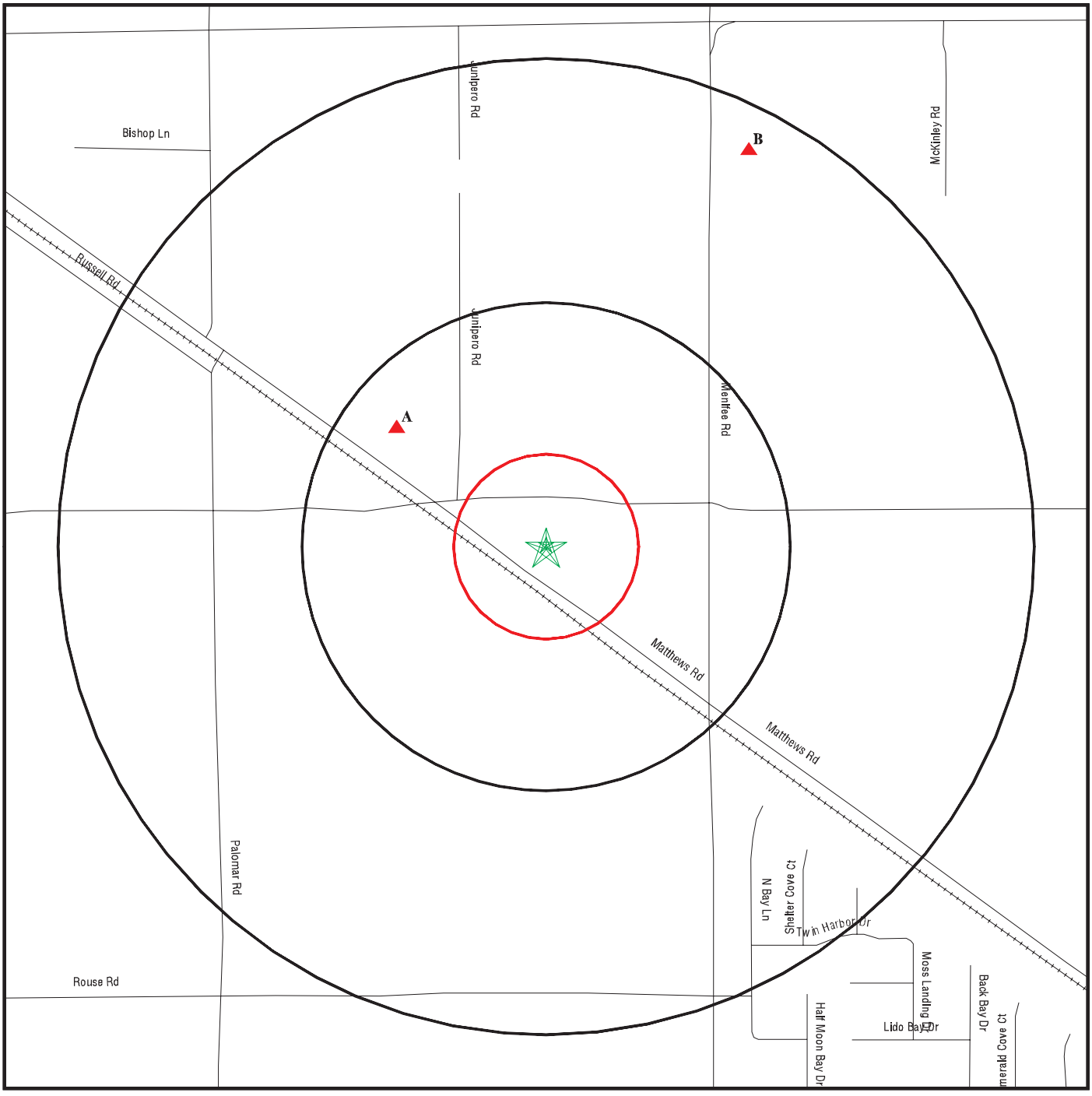
EDR Reference Code (EDR internal use only): 8173667.2s
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Environmental FirstSearch

0.500 Mile Radius

ASTM MAP: CERCLIS, RCRATSD, LUST, SWL

FUENTES PARCELS, CASE ROAD SUN CITY, CA 92585



Black Rings Represent Qtr. Mile Radius; **Red Ring Represents 500 ft. Radius**

★ **Target Property (Latitude: 33.735308 Longitude: 117.156989)**

▲ **Identified Sites**

National Priority List Sites

Indian Reservations BIA

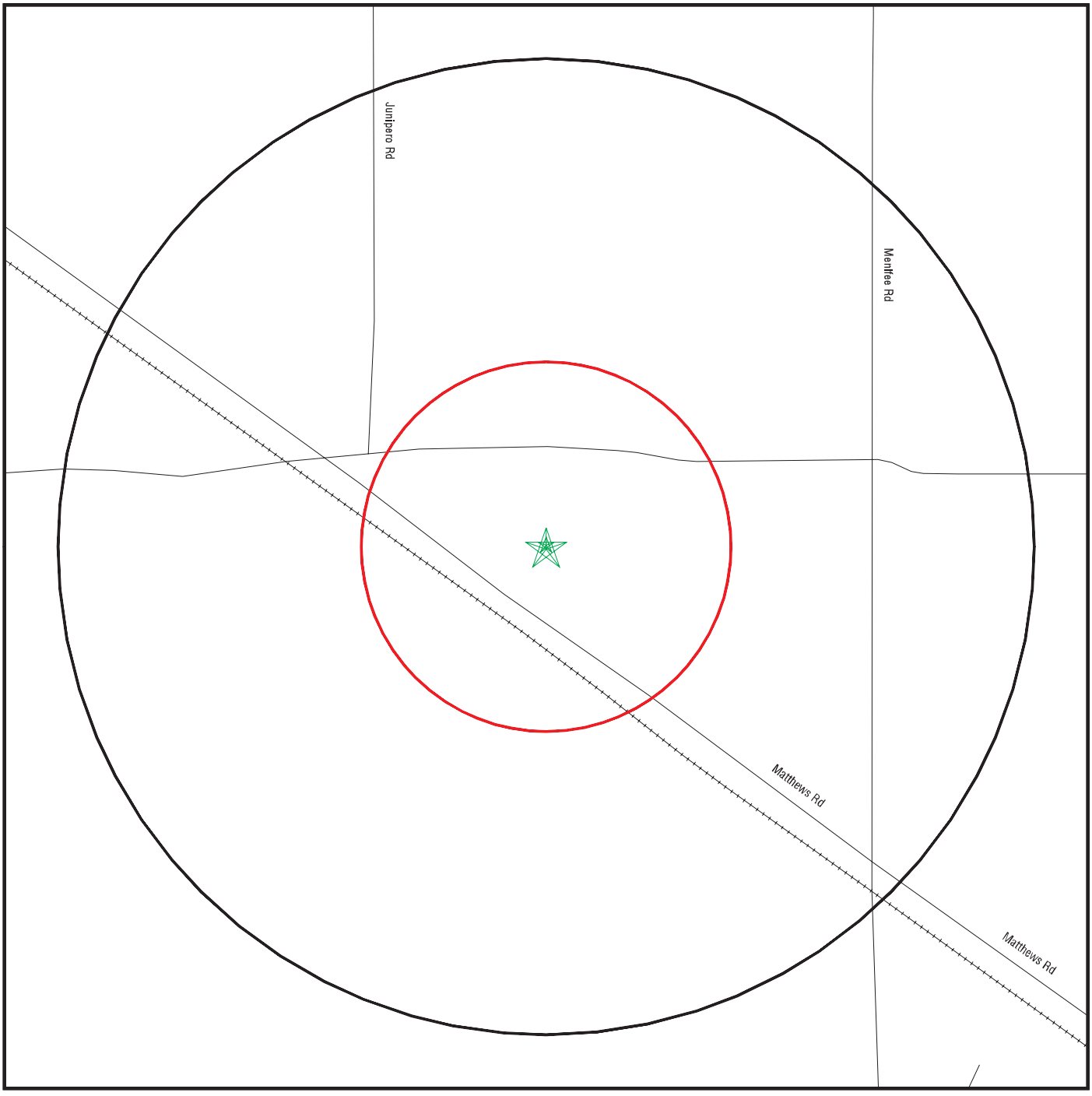
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Environmental FirstSearch

0.25 Mile Radius

ASTM MAP: RCRAGEN, ERNS, UST, FED IC/EC, METH LABS

FUENTES PARCELS, CASE ROAD SUN CITY, CA 92585



Black Rings Represent Qtr. Mile Radius; Red Ring Represents 500 ft. Radius

★ Target Property (Latitude: 33.735308 Longitude: 117.156989)

▲ Identified Sites

National Priority List Sites

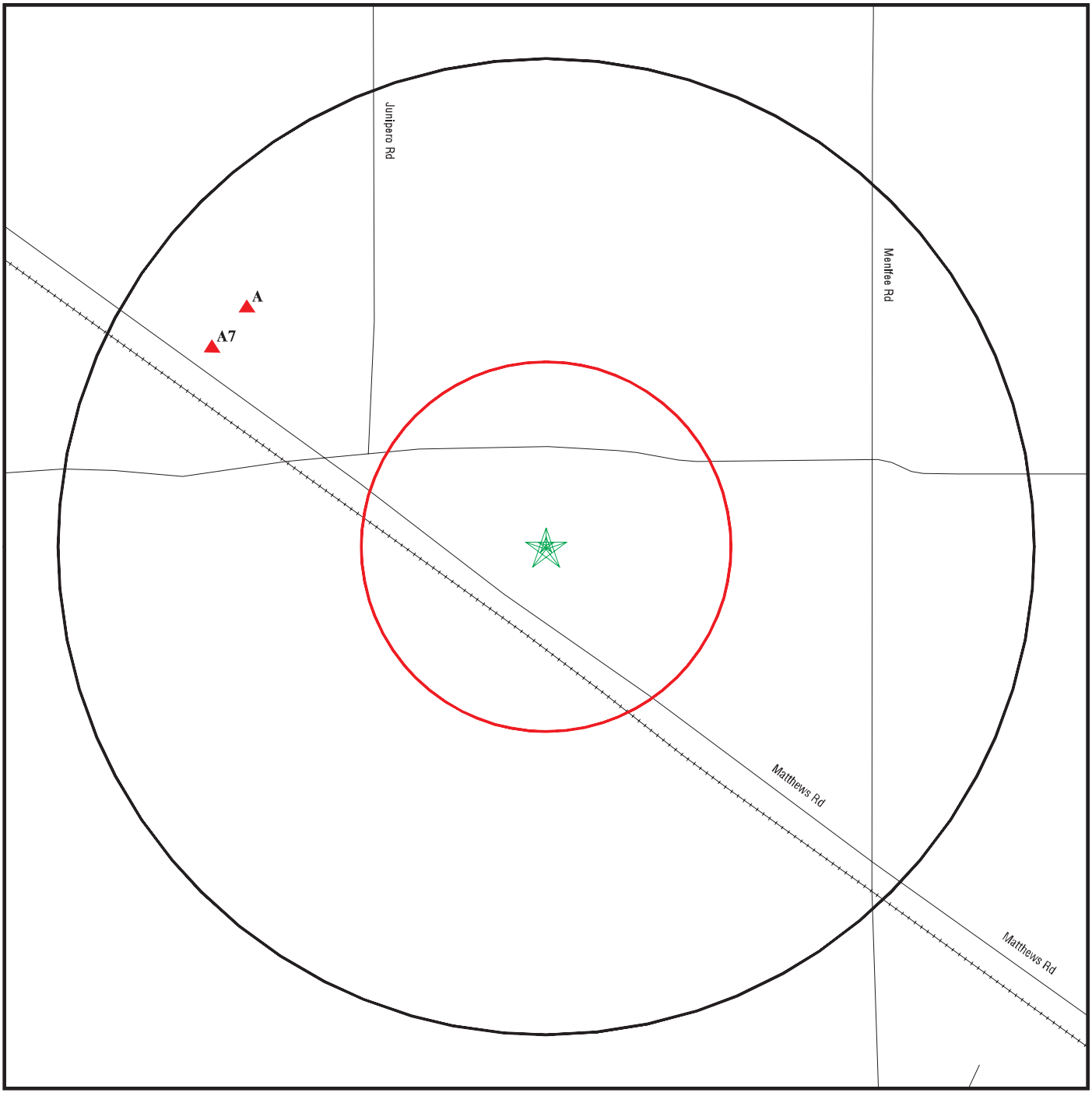
Indian Reservations BIA

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Environmental FirstSearch

0.25 Mile Radius
Non ASTM Map, Spills, FINDS

FUENTES PARCELS, CASE ROAD SUN CITY, CA 92585



Black Rings Represent Qtr. Mile Radius; Red Ring Represents 500 ft. Radius

★ Target Property (Latitude: 33.735308 Longitude: 117.156989)

▲ Identified Sites

Sensitive Receptors

National Priority List Sites

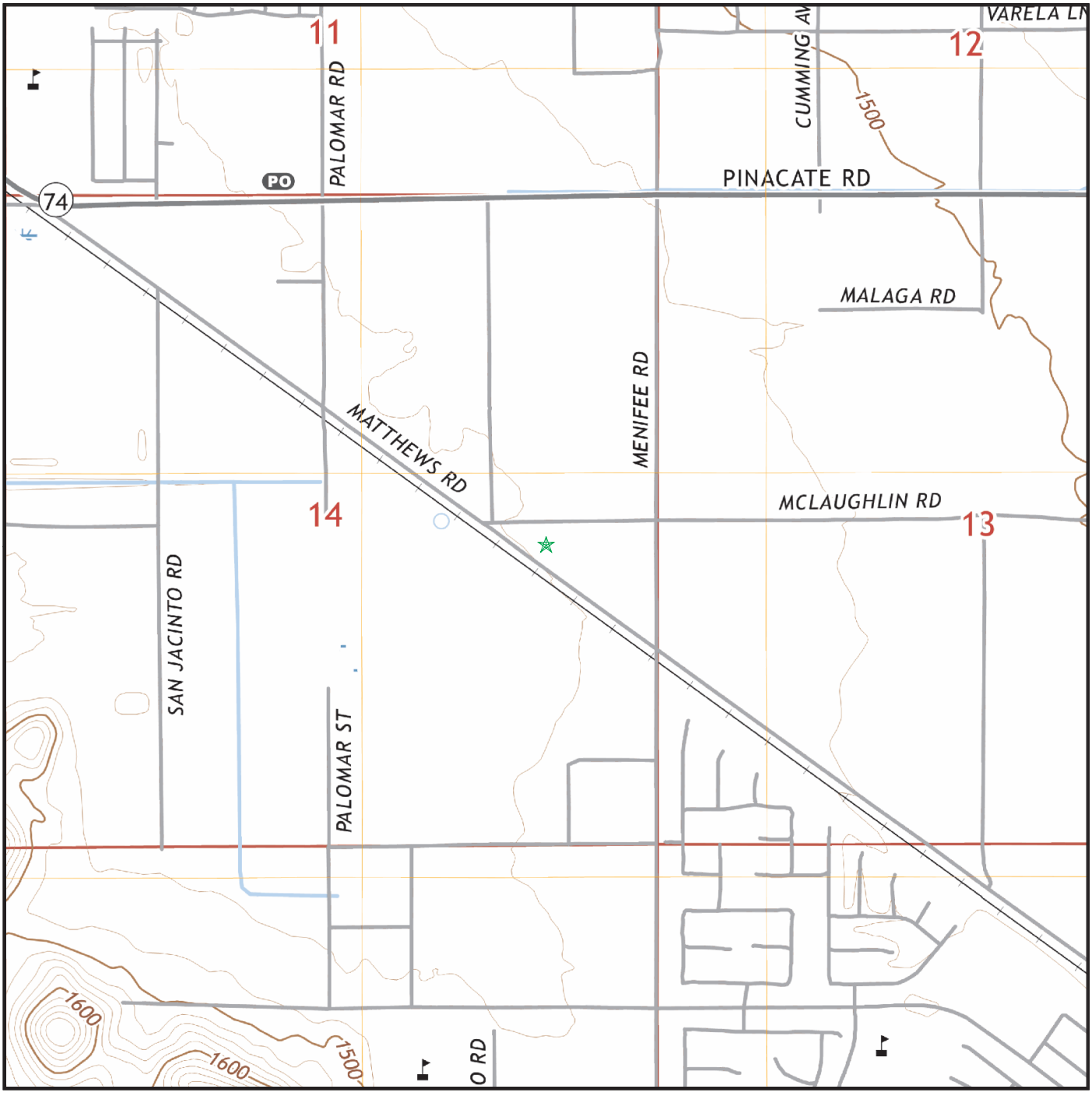
Indian Reservations BIA

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Site location Map

Topo: 0.75 Mile Radius

FUENTES PARCELS, CASE ROAD SUN CITY, CA 92585



Map Image Position: TP
Map Reference Code & Name: 50005839 Romoland
Map State(s): CA
Version Date: 2022

Seaflower Alt Site
Case Rd
Sun City, CA 92585

Inquiry Number: 8173667.4s
November 14, 2025

EDR Environmental Lien and AUL Search

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Environmental Lien and AUL Search

The EDR Environmental Lien Search Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied address and/or parcel information to:

- search for parcel information and/or legal description
- search for ownership information
- research official land title documents recorded at jurisdictional agencies such as recorders' offices, registries of deeds, county clerks' offices, etc
- search for publicly available environmental encumbering instrument(s) filed on or after the recording of the current deed; between the recording of the current deed and present
- provide a copy of any environmental encumbrance(s)

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EDR Environmental Lien and AUL Search

TARGET PROPERTY INFORMATION

ADDRESS

Seaflower ALT Site
Case Rd
Sun City, CA 92585

EDR Environmental Lien and AUL Search

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

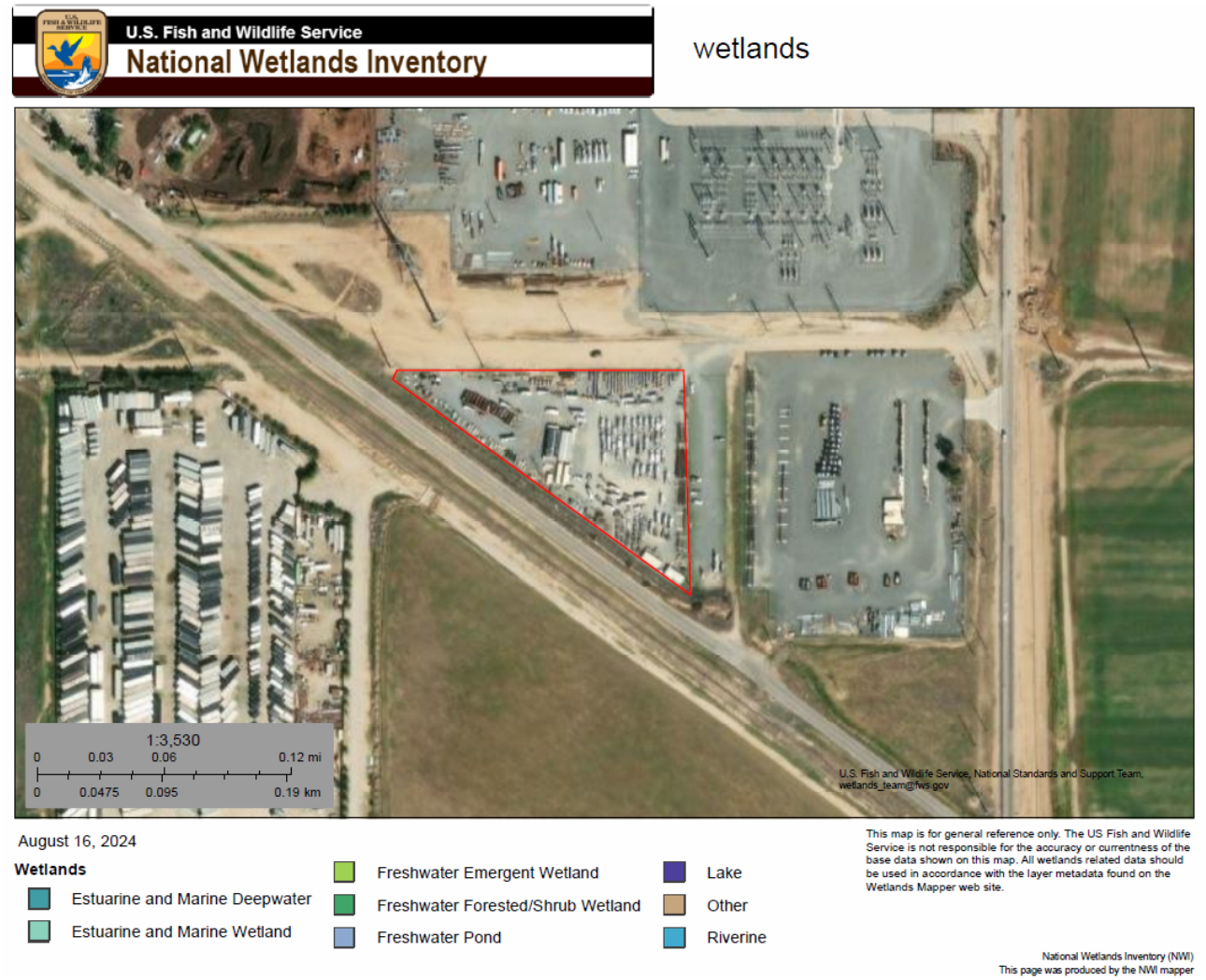
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OTHER ACTIVITY AND USE LIMITATIONS (AULS)

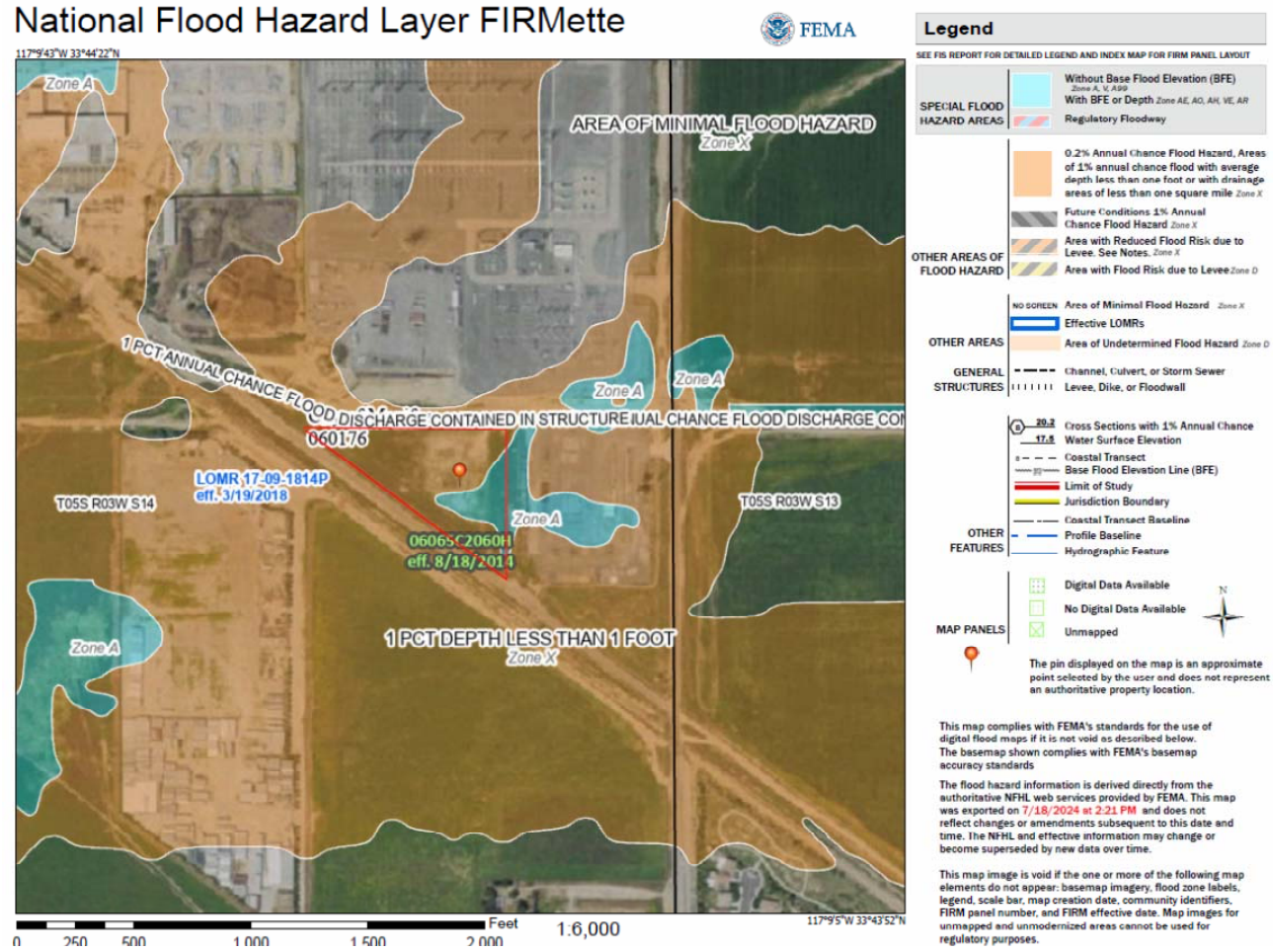
Other AUL's: Found ☐ Not Found ☒

Comments: NONE IDENTIFIED.

National Wetlands Map



Flood Zone Map



Oil & Gas Well Map



0 0.055 0.11 mi
0 0.065 0.13 km

Powered by

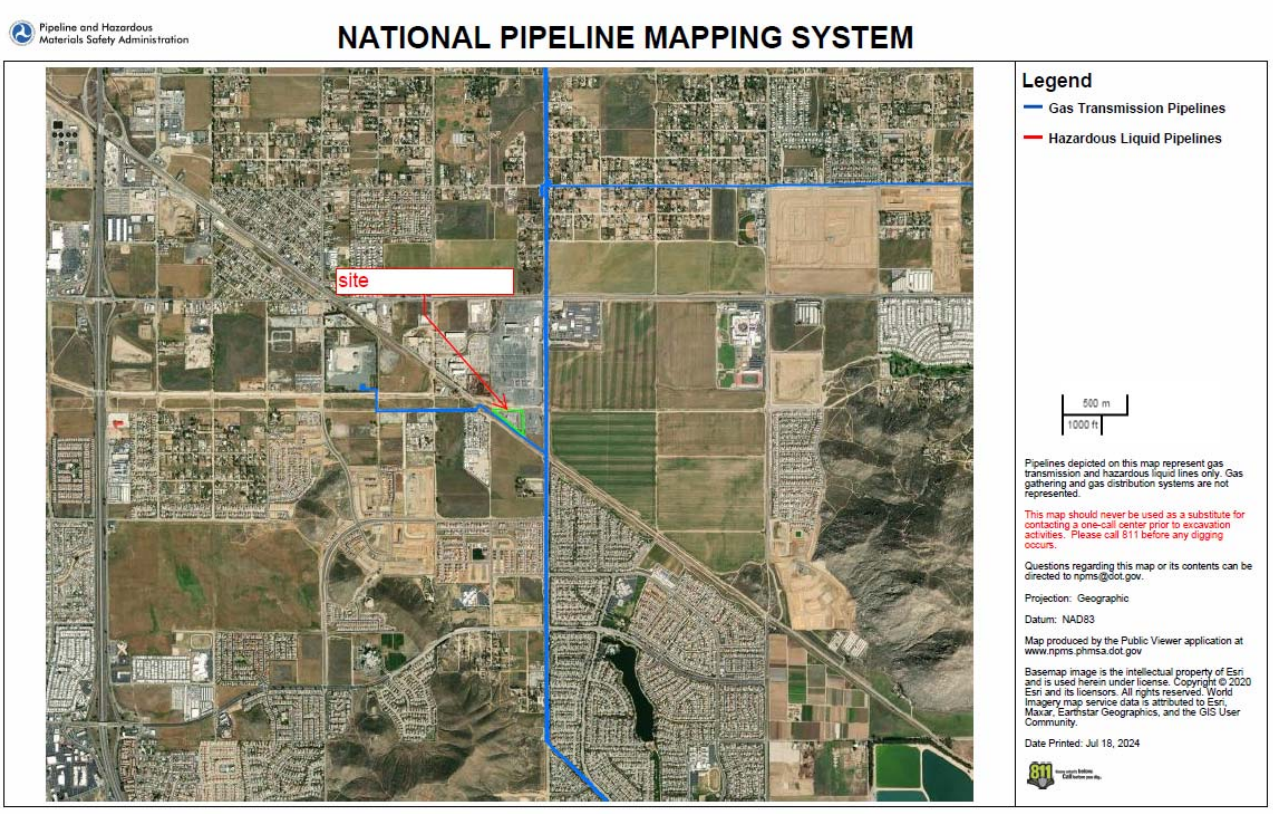
7/18/2024

Well Status & Type

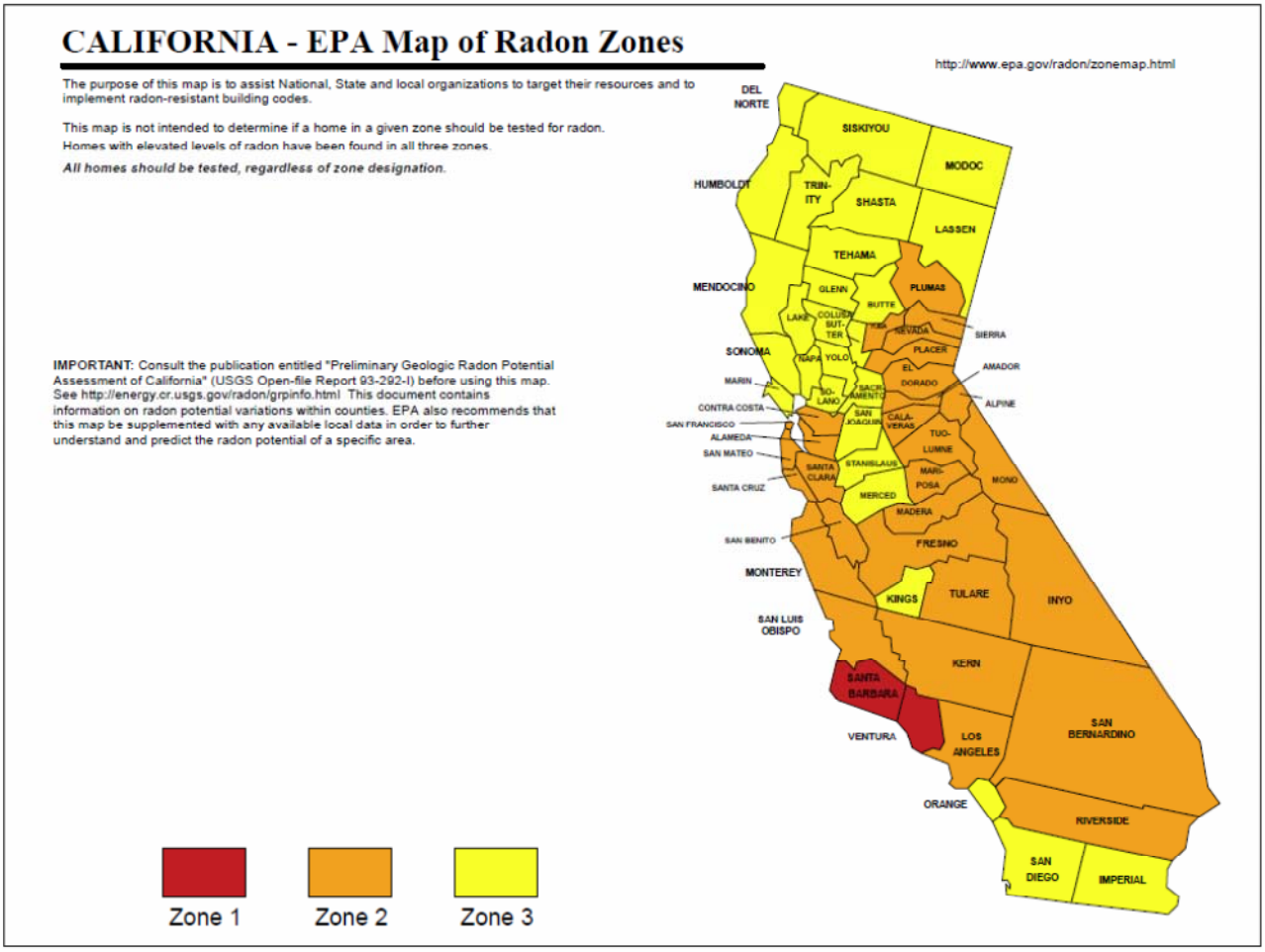
Geologic Energy Management Division
715 P Street, MS 1803
Sacramento, CA 95814
Phone: (916) 445-9686
Email: calgem_webmaster@conservation.ca.gov
www.conservation.ca.gov/calgem

California Natural Resources Agency
Department of Conservation

National Pipeline Map



Radon Map


CALIFORNIA - EPA Map of Radon Zones
http://www.epa.gov/radon/zonemap.html
The purpose of this map is to assist National, State and local organizations to target their resources and to implement radon-resistant building codes.
This map is not intended to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones.
All homes should be tested, regardless of zone designation.
IMPORTANT: Consult the publication entitled "Preliminary Geologic Radon Potential Assessment of California" (USGS Open-file Report 93-292-I) before using this map. See http://energy.cr.usgs.gov/radon/grpinfo.html This document contains information on radon potential variations within counties. EPA also recommends that this map be supplemented with any available local data in order to further understand and predict the radon potential of a specific area.
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRIN-ITY
SHASTA
LASSEN
TEHAMA
MENDOCINO
GLENN
PLUMAS
BUTTE
LAKE
COLUSA
SUT-TER
NEVADA
SIERRA
SONOMA
NAPA
YOLO
PLACER
EL DORADO
AMADOR
MARIN
SO-LANO
SACRA-MENTO
ALPINE
CONTRA COSTA
SAN JOAQUIN
CALA-VERAS
SAN FRANCISCO
ALAMEDA
TUO-LUMNE
SAN MATEO
SANTA CLARA
STANISLAUS
MARI-POSA
MONO
SANTA CRUZ
MERCED
MADERA
SAN BENITO
FRESNO
MONTEREY
KINGS
TULARE
INYO
SAN LUIS OBISPO
KERN
SANTA BARBARA
SAN BERNARDINO
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL
Zone 1
Zone 2
Zone 3

Soils Map


Soil Map—Western Riverside Area, California
EnC2
EhA
Cajalco Rd
Map Scale: 1:1,610 if printed on A landscape (11" x 8.5") sheet.
Meters
0 20 40 80 120
Feet
0 50 100 200 300
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
USDA Natural Resources Conservation Service
Web Soil Survey
National Cooperative Soil Survey
7/18/2024
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APPENDIX B

RESUME OF ENVIRONMENTAL PROFESSIONAL

MARK J. LAROCQUE

EDUCATION

Bachelor of Sciences in Environmental Science/Biology, University of Massachusetts, Amherst, Massachusetts, 1980 - 1984.

EXPERIENCE

Practical Environmental Solutions, Gilford, NH (1998 to present), President and Owner.
Dames & Moore, Willow Grove, PA (1995 to 1998), Senior Project Manager
Lexicon Environmental Associates, Inc., West Chester, PA (1994 to 1995) - Project Manager/Environmental Scientist IV.
Groundwater & Environmental Services, Inc. in Exton, PA (1990 - 1994) - Project Manager/Senior Environmental Scientist.
IEP, Inc. in Northboro, Massachusetts (1984 - 1990) - Environmental Scientist

PROFESSIONAL COURSES

Resource Education Institute, Inc. - Northwest Regional Underground Storage Tank Management and Hydrocarbon Cleanup Conferences 1988 and 1989
University of Massachusetts/Massachusetts Department of Environmental Quality - Hydrocarbon Contaminated Soils Conferences 1991 and 1992
Shell Oil Development - Soil Remediation Workshop 1992
Government Institutes, Inc. - Resource Compensation Recovery Act (RCRA) Regulations Workshop 1994.
Occupational Health and Safety Training 1988 through 1995 - Including 40-hour, 8-hour Refreshers, and Supervisor Training.

CERTIFICATIONS & AFFILIATIONS

National Water Well Association
New Jersey Underground Storage Tank & Subsurface Investigator Certification No. 0013515
Texas Corrective Action Project Manager No.CAPM00197
California Registered Environmental Assessors Class I – No. 07357

EXPERIENCE SUMMARY

Over 30 years of experience in various aspects of environmental assessments and remediation projects. Currently owns his own firm, which conducts due diligence and property transfer assessments nationally and internationally. Conducted and managed numerous single and multi-site Phase I and Phase II pre-purchase assessments on a variety of large and small-scale manufacturing facilities across the United States. Has performed over 2,000 Phase I & NEPA/NHPA assessments for several cellular tower firms across US. NEPA compliance work has included Section 106 reviews, Fish & Wildlife Endangered Species Surveys, FONZI applications, and negotiations with Tribal Historical Officers. He has conducted and prepared several ACM O&M Programs for several radio stations, hotels, and golf courses.

He has also designed and managed over 100 ground water and soil remediation projects utilizing a variety of remedial techniques. Implemented various remedial techniques including ground water pump & treat, soil vapor extraction, air sparging, and bioremediation on numerous sites in MA, MD, NY, NJ, DE, and PA. Conducted soil and ground water sampling, quality control, and decontamination procedures on Super Fund projects in MA and Environmental Compensation Recovery Act (ECRA) projects in NJ.

REPRESENTATIVE PROJECT EXPERIENCE

- Has performed over 2000 Phase 1 and NEPA compliance projects throughout the USA including WA, CA, OR, UT, AZ, NV, FL. GA, SC, NC, MO, IL, IN, MI, MA, CT, RI, VA, OH, MS, AL, TX, and CO. This work has been completed for various cellular tower carriers (Nextel, Sprint, Cingular, AT&T Verizon) and owners (Crown, ATC, AAT).
- Conducts single and multi-site Phase I, Phase II, and Compliance assessments across the USA and internationally on behalf of various law firms for Hick, Muse, Tate & Furst, International Home Foods, Olympus Real Estate Corporation, and Arnold Palmer Golf.
- Conducts Phase I & NEPA/NHPA assessments for several national cell tower firms. Provides full compliance with NHPA and Section 106 of NEPA.
- Conducted Phase I and Compliance Assessments of General Cable Corporation - telecommunication cable manufacturing facilities in MI, IL, GA, and NJ.
- Conducted a Phase I and Compliance Assessment of Simonds Industries, a file manufacturing facility which is actively under a RCRA cleanup in OH.
- Conducted several Phase I assessments of Flex-O-Lite - glass bead manufacturing facilities in IA, KY, TN, and MS.
- Conducted numerous Phase I, Phase II, and Compliance assessments in CA, NC, SC, MS, MA, and AL for various industries including radio station acquisitions, headware manufacturers, computer cable/harness manufacturers, and brass regulating equipment manufacturers.
- Senior Project Manager/Director for Engineering firm on a multi-site investigation program for Exxon, that included additional subsurface delineation and preparation of CEAs and RAWs for the NJDEP.
- Designed and managed numerous in-situ ground water remediation projects using bioremediation for Bell Atlantic and NYNEX.

APPENDIX C

PHOTOGRAPHS



1996 aerial



2006 aerial



2015 aerial



2025 aerial

Photo Locations





Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13

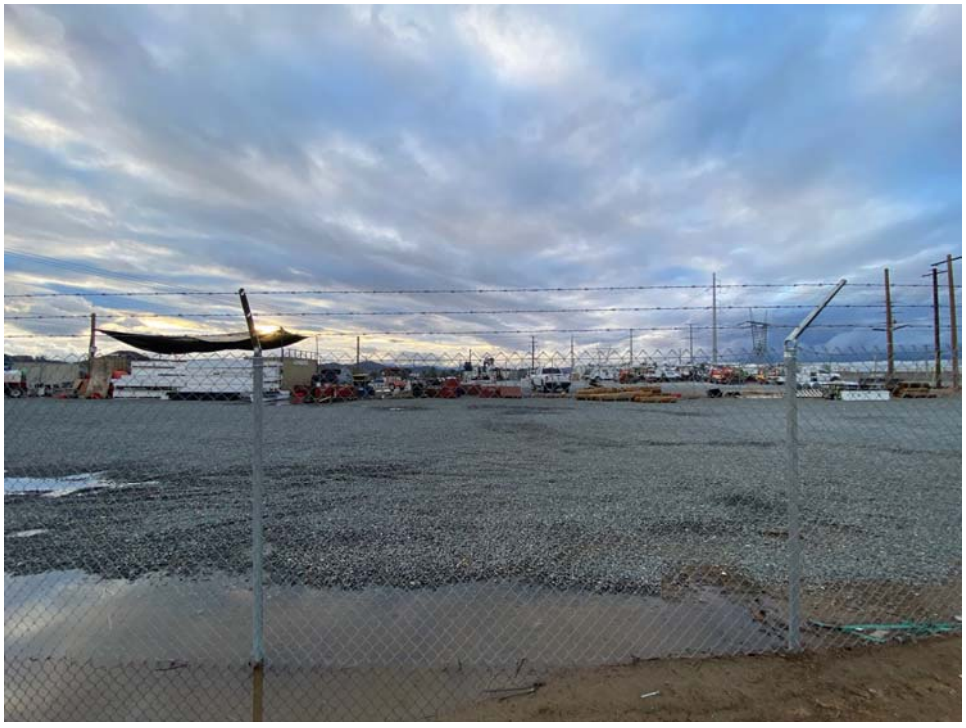


Photo 14



Photo 15



Photo 16



Photo 17



Photo 18