



natref

Proudly Natref

NATREF SHE INCIDENT ROOT CAUSE ANALYSIS REPORT



Incident date:

Department:

Area:

Incident type:

21 March 2025

SHERQ

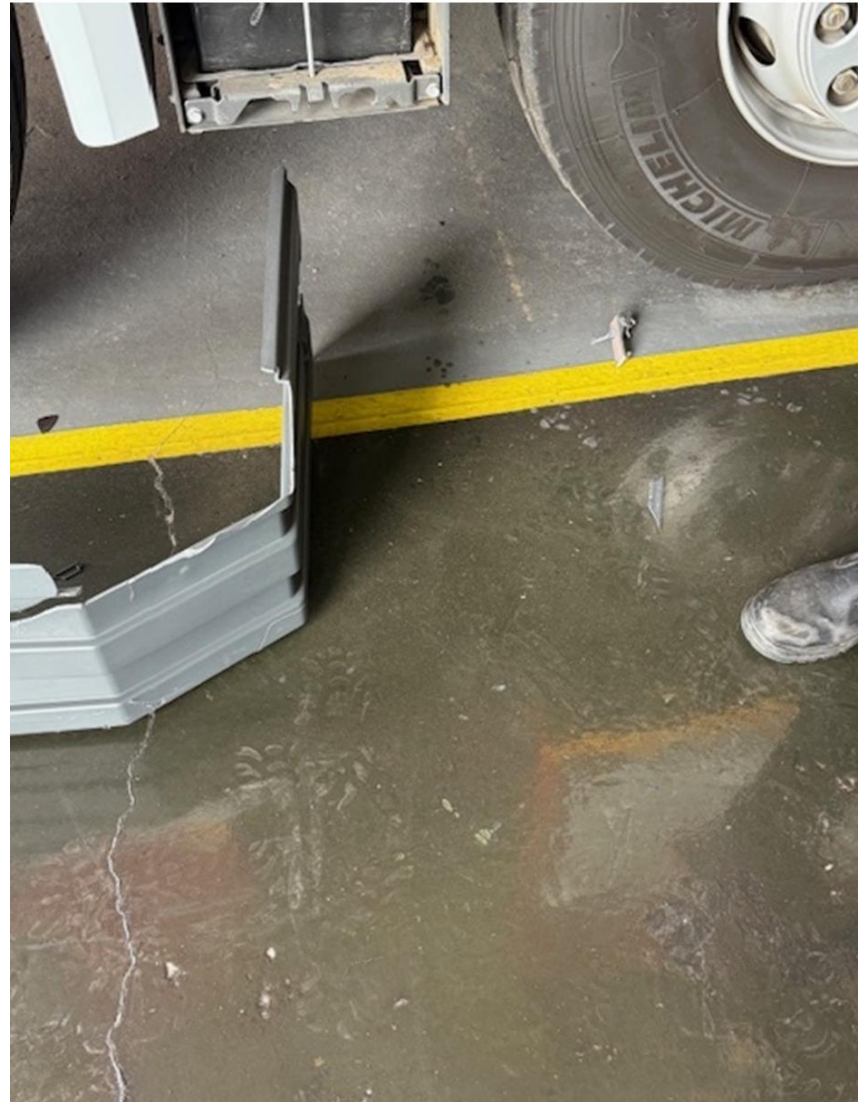
**EMERGENCY
SERVICES**

LOC Burst Battery

SHE Incident description and photos

Date	2025/03/21
Time	16h50
Location	Inside Fire Station
Description	Battery on Sides Fire tender burst during shift hand over while vehicle was been started.
KUE Scenario	
Consequences	Damage to battery and battery cover
	

Additional pics



Immediate Corrective Actions

Immediate actions taken

- Fire tender ignition switched Off
- External Charging cable unplugged
- Officers during shift hand over heard the “bang” and responded
- Area barricaded
- Damage assessment conducted
- Auto Electrician on Standby Called out
- Basic tests performed by Auto Electrician to determine any other damage to circuits.
- Local agent contacted to do investigation on Monday
- Vehicle taken out of commission

Immediate Observations – Failure and damage

Facts gained

- Battery cover in pieces
- Top part of battery burst open
- Battery acid in plus minus 1 litre spread over the other battery and chassis area
- 2nd battery of the 2 x 12 V batteries was found to be faulty.
- Batteries on vehicle have been manufactured in 06/2020
- External Charging System and Alternator was tested and found to be in order.
- Due to being an Emergency vehicle and lead time, immediately 2 new batteries were ordered, pending completion of investigation.

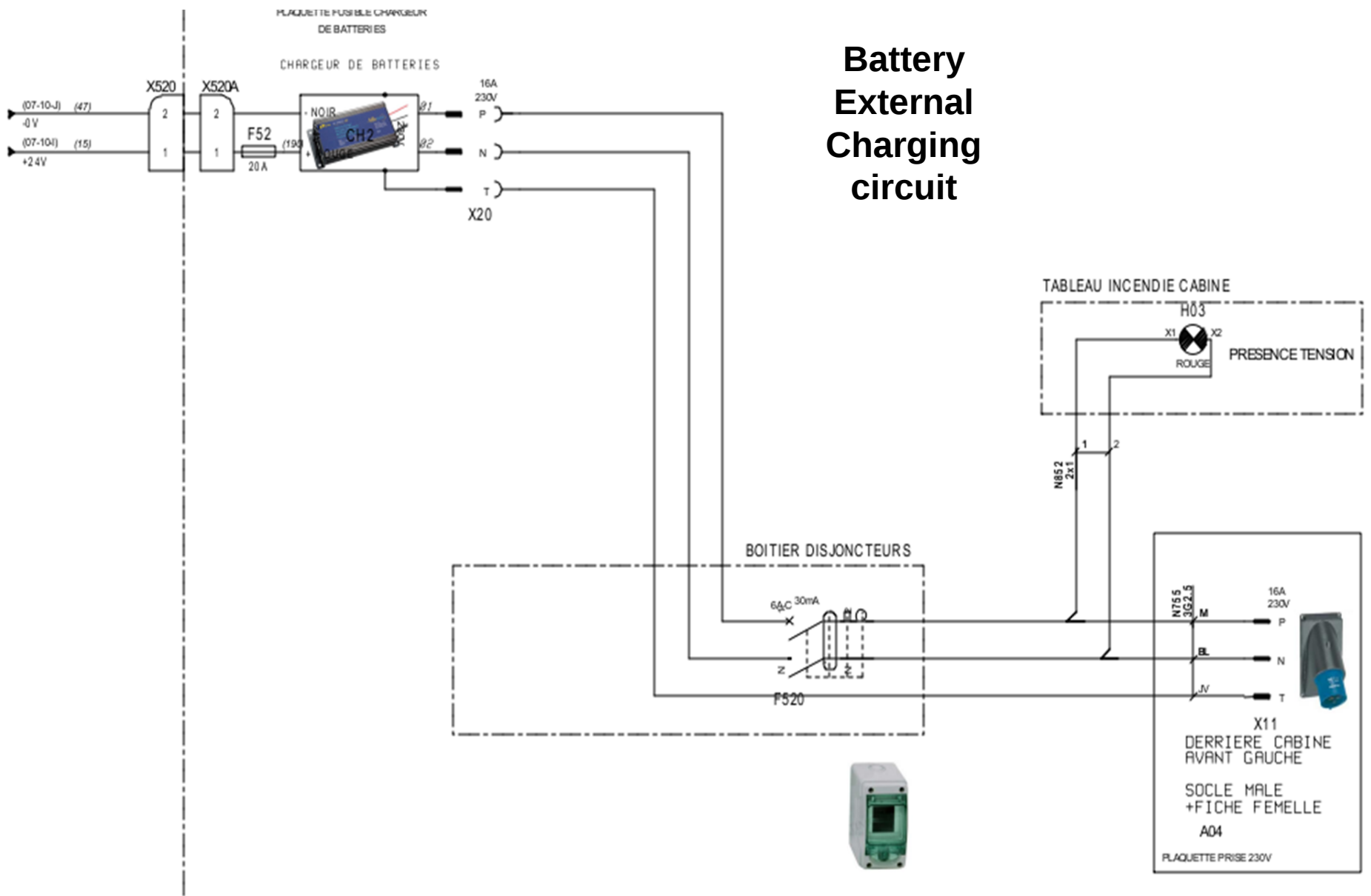
A. BACKGROUND

BACKGROUND

- The Fire Tender is plus minus 5 years old and purchased from SIDES France via a local agent
- The Fire tender is a critical response vehicle and has a dedicated charging system installed by the manufacturer.
- As this vehicle is not driven long enough during the week to charge battery the vehicle needs to be placed regularly on charge.
- The vehicle has 2 x 12V batteries in series making up the required 24V
- Vehicle is plus minus 4 years on site
- Vehicle started twice daily hence the vehicle have been started a minimum 2920 times over the last 4 years
- Selected EMS staff trained by Local agent on vehicle
- Local agent (removed by Sides as an Agent and new Agent was sourced)

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Battery External Charging circuit



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VMR NATREF - AROCS
SCHEMA ELECTRIQUE

sides
182. RUE DE TRIGNAC BP 146

AFFAIRE : 146563V1
ECHELLE / FOLIO 63 / 67
SCALE / SHEET

Common Reasons for batteries bursting

Based on auto Electrician studies a Truck / car battery can "bust" or explode due to several factors, including:

1. Dirty battery posts and cables,
2. Improper jump-starting,
3. Over charging,
4. Extreme temperatures, and
5. Internal damage.
6. Faulty Alternator increasing charge to battery

Based on evidence found only points **3 & 5** are applicable

DIRECT CAUSE

Over charging

Batteries connected in series.

Battery 1 (12V) was faulty resulting in over charge by charger to Battery 2

Instead of spreading the 24V load over two batteries, the faulty battery forced all the load to Battery 2 building up gas.

When ignition was started the alternator added extra charging resulting in bursting of battery.

The energy delivered as overcharge causes gassing. In open batteries this results in water loss. In the truck and vehicle sealed batteries overcharge results in heat being generated inside the battery. Gassing starts before full charge is reached and increases as charging progresses

Overcharging a battery occurs when it continues to be charged for an extended period, even after it has reached its full capacity. While the 12-volt battery is considered to be full at 12.6 volts, it requires a higher voltage to replenish its charge once it drops – say, from a starting event. And a common charging rate is between 13.5 and 14.5 volts. So, when you're attempting to charge a battery with more energy than it's capable of receiving.

Battery 1 expected faulty due to age

ROOT CAUSES

Faulty Battery (Internal Damage)

Battery 1 (12V) was faulty resulting in over charge by charger to Battery 2 which is connected in series

Battery Charger from external supply does not trickle charge

Vehicle regular on external charge and charger found not to be a trickle charger

Note: Trickle charger stops charging when battery is fully charged

NEXT STEPS

Load tests on Batteries to be done on a regular basis by Service provider e.g. every 6 months

Trickle Charger to be purchased and replace present charger which will prevent over charging when one battery is faulty.

Vehicle to be placed less on charge, eg every Wednesday only

Ensure jump starting of Vehicles SOP 140-043 is also reemphasized to ensure correct procedure is followed.

Battery cover to be replaced

Note: No proof is available that jump starting is a cause but needs still to be noted.