



På Brint over Fjorden

MSC.1/cirl 1455

200510.1005.02 Battery HAZID IMO 1455



Client:

Client Name: Brint over fjorden
Contact person: Ole Jacobsen
Mail: oj@DanskEnergiRaadgivning.dk
Phone:
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OSK:

Author: URT
Approved: JEJ
Contact person: Ulrik Tander
Mail: urt@osk-shiptech.com
Phone: .+45 5045 0370
Department: Bryggervangen 55 - 1st. Floor
DK - 2100 Copenhagen OE

Summary:

Notes: Please observe the report is preliminary.

Document History

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Battery HAZID IMO 1455					
0	Final	10.12.2020	URT	JEJ	
Rev.	Status	Date	Sign.	Check	Note



FORELØBIG IMO 1455 Light for M/F Sleipner-Fur & M/F Feggesund					
			Initial Hazard rating		
ID	Hazard	Possible cause	Likelihood	Consequence	Risk
H1	Fire in batteries	Thermal runaway caused by a production defect in the batteri	Very unlikely	Major effect	Medium
H2	Fire in batteries	Failure in the installation	Very unlikely	Major effect	Medium
H3	Fire in batteries	Bad maintenence	Very unlikely	Major effect	Medium
H4	Fire in batteries	Wrong use of batteries	Very unlikely	Major effect	Medium
H5	Fire in battery room	Increased heat in battery room. Damage of cables. Thermal runaway	Very unlikely	Major effect	Medium
H8	Fire in battery room	Gas leakage	Very unlikely	Major effect	Medium
H9	Batteries out of service	Batteries switch off. No power supply	Very unlikely	Moderate effect	Medium

H10	Loss of communication between PMS and BMS	PMS shutdown. Damaged cables. Undetected abuse. Software errors.	Very unlikely	Moderate effect	Medium
H11	EMC noise	Lack of filtering or wiring	Unlikely	Moderate effect	Medium
H12	EMC noise	EMC noise - Bad Earth connection - due to bad maintenance	Unlikely	Moderate effect	Medium
H13	Loss of communication internal in the BMS	Cable disconnection. Cable damage. Software damage. Undetected abuse.	Unlikely	Moderate effect	Medium
H14	Loss of communication internal in the BMS	Software settings or failure	Likely	Moderate effect	Medium
H15	Loss of ventilation for the battery room, Wrong operation. Fan failure.	Temperature increase. No air circulation and airchange in the room for crew entering the room	Likely	Moderate effect	Medium
H16	Loss of ventilation for the battery room, Wrong operation. Fan failure.	No venting of the room	Likely	Minor effect	Medium

H17	Loss of emergency exhaust ventilation for the battery racks, Outlet can be blocked	Gas in batteryrack/module/Battery room	Likely	Major effect	High
H18	Loss of ventilation for the battery room, Naturally inlet and	No venting of batteries and no air change for the crew	Unlikely	Moderate effect	Medium
H19	Loss of cooling/heating, Wrong operation. Cooling system failure.	Increased heat in battery room	Unlikely	Moderate effect	Medium
H20	Gas leakage in the batteryroom, Explosion in the batteryroom	Gas leakage	Very unlikely	Major effect	Medium



Additional Safety Measures				
		Revised Hazard rating		
Additional controls		Likelihood	Consequence	Risk
H1	Early warning at 60 degree celcius from the BMS. Battery will shut down above the working temperatur (70 degrees celcius). Battery will disconnect at 65 degrees, the BMS will make sure of it. At 70 ddegrees a physical diconnection will take place.	Very unlikely	Minor effect	Low
H2	Test, CAT/HAT/SAT. Early warning at 60 degree from the BMS. Battery will shut down above the working temperature (70 degrees). Gas is vented out if any.	Very unlikely	Minor effect	Low
H3	Manuals, instructions & training of Crew. The suggested regular maintenance is non intrusive and low risk.	Very unlikely	Minor effect	Low
H4	Manuals, instructions & training of crews. BMS detects over-voltage and over-temperature and uses hardware based interrupt loop to stop current prior to thermal runaway.	Very unlikely	Minor effect	Low
H5	Fire detection, fire fighting, cooling, ventilation and Fire suppression in room. The ESS will not increase the overall fire risk level due to the ventilation piping for any escaped gases. Thermal mass of ESS necessitates that an external fire would have to be unsuppressed and sustained for extended period of time in order to present a risk to the battery modules.	Very unlikely	Minor effect	Low
H8	Battery rooms is A60 insulated towards Technical room and cardeck with 450 mm boundry insulation. The battery rooms is equipped with fire detection, fire fighting system and ventilation. Outlet from the exhaust system will be led out through the ship side.	Very unlikely	Minor effect	Low
H9	Each battery pack is redundant for each other and can therefore work as a backup supply.	Very unlikely	Minor effect	Low

H10	The PMS will give an alarm and shut down the inverter / battery package. Corvus BMS detects over-voltage and over-temperature, and uses hardware based interrupt loop to stop current prior to thermal runaway.	Very unlikely	Minor effect	Low
H11	There will be mounted EMC filters in the DC system. EMC noise will be checked and tested during HAT and SAT	Very unlikely	Minor effect	Low
H12	There will be mounted EMC filters in the DC system. EMC noise will be checked and tested during HAT and SAT.	Very unlikely	Minor effect	Low
H13	The specific pack will disconnect, the system will continue to operate on the other packs. There is hardware shut off at 70 degrees. Each package have their own address. The PMS will switch off the DC/DC inverter for the disconnected battery package.	Very unlikely	Minor effect	Low
H14	The specific pack will disconnect and the system will continue to operate on the other packs. There is hardware shut off at 70 degrees and high/low voltage. Only Corvus have access to the software. Software settings will be tested during CAT/HAT. PMS will switch off the DC/DC inverter for the disconnected battery package.	Very unlikely	Minor effect	Low
H15	Still got natural ventilation. Temperature sensor will give Alarm, at 27 degrees to the ships ICAM system. Corvus BMS detects over-voltage and over-temperature, and uses hardware based interrupt loop to stop current prior to thermal runaway.	Very unlikely	Minor effect	Low
H16	Still got natural ventilation. Alarm for no running fan. Corvus BMS detects over-voltage and over-temperature, and uses hardware based interrupt loop to stop current prior to thermal runaway.	Very unlikely	No effect	Low

H17	Outlet from the exhaust system will be led out through the ship side. End of pipe will be mounted with air bell with flame screen and closing device for water. Alarm will go to the ships ICAM system.	Very unlikely	Minor effect	Low
H18	There will come an alarm for no running fan	Very unlikely	Minor effect	Low
H19	Still have natural ventilation. Temperature sensor will give Alarm, at 27 degrees to the ships ICAM system. Corvus BMS detects over-voltage and over-temperature, and uses hardware based interrupt loop to stop current prior to thermal runaway. Hardware based over-voltage and over-temperature safeties (redundant to BMS).	Very unlikely	Minor effect	Low
H20	There is installed an Gas detector in battery room, with alarm signal to the bridge. Electrical equipment in EX area should be EX approved. Power and communication cables are contained and protected within the rack.	Very unlikely	Minor effect	Low



OSK-ShipTech A/S

Severity	Consequence	Persons	Asset damage	Likelihood				
				A	B	C	D	E
				Rare	Very unlikely	Unlikely	Likely	Very likely
				Failure is not expected	Not common in ship industry	Incidents has occurred in ship industry	Experienced by most ship operators	Occurs several times per year per ship
1	No effect	No or superficial injuries	The failure does not affect normal operation of the system, possibility of further operation.	Low	Low	Low	Medium	Medium
2	Minor effect	Slight injury, a few lost work days	System breakdown, temporarily disabled (< 2 weeks)	Low	Low	Medium	Medium	Medium
3	Moderate effect	Major injury, long term absence	System breakdown, temporarily disabled for a longer period (< 2 months)	Low	Medium	Medium	Medium	High
4	Major effect	Single fatality or permanent disability	Major damage/loss of the system (> 2 months)	Medium	Medium	Serious	High	High
5	Hazardous effect	Multiple fatalities	Total loss of system, as well as damage/loss of other nearby systems	Medium	Serious	High	High	High