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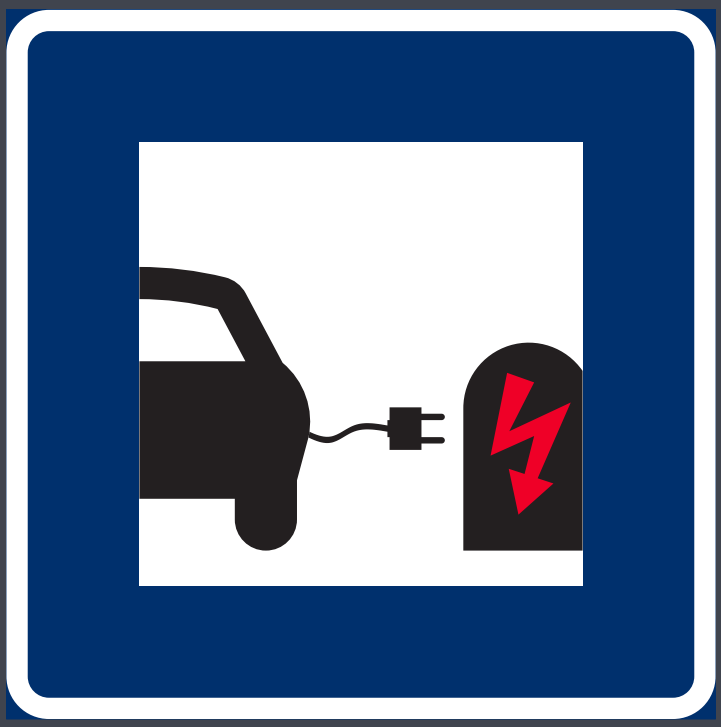

TSG
2018- 3106

Charging electric vehicles

on board Swedish Ropax vessels

Versionshistorik

Version	Datum	Beskrivning	Ansvarig
01	2018-07-04	Charging electric vehicles on board Swedish Ropax vessels	Saeed Mohebbi

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1 Charging electric vehicles on board Swedish Ropax vessels

Charging of electric vehicles is permitted on-board Swedish-flagged Ropax vessels. The operator is responsible for ensuring that appropriate safety measures are taken when handling charging of electric vehicles. The operator (shipping company) is also responsible for any firefighting procedures that may be required due to a problem occurring during the charging process.

Following the fire on-board M/S Pearl of Scandinavia, which broke out on November 16, 2010 it was founded that this was caused by the charging of an electric vehicle. Since then, several Danish Ropax ship operators have stopped with this service and not allowing charging of battery vehicle's on-board their vessels. However, Swedish Transport Agency (STA) does not support this policy and electric vehicles can be charged on-board Swedish flagged Ropax vessels.

2 Safety first when charging

Given the consequences of a fire on board, the Swedish Transport Agency considers that a risk assessment should be carried out. Responsibility for assessing risks and taking appropriate safety measures lies on the operator.

3 Electric vehicles powered by lithium-ion batteries

Hybrid electric and fully electric vehicles are usually fitted with lithium-ion battery cells as source of power. Lithium-ion batteries have different properties regarding voltage, design and size compared to conventional lead acid batteries, resulting in other risks related of fire, explosion and electrical shock. Currently there are several research projects being conducted around the world that are looking into battery powered vehicles and how potential fires that may occur due to their use should be handled. In a transition phase, while electric vehicles are being developed further and more research on lithium-ion battery fires come available, owners should be aware of the risks related to these type of vehicles and take necessary safety measures to mitigate risks and ensure safety on board.

4 Recommendations for the safety measures on board regarding charging of electrically powered vehicles

Swedish Transport Agency's conclusion is that the following should be taken into consideration by the operator and be a part of their ISM (International Safety Management Code in accordance with the IMO resolution MSC.353(92) regarding their responsibility for charging services, offered before an electrically powered vehicle is given access to a ship's car deck.

The Swedish Transport Agency has stipulated a number of recommendations regarding the charging of electrically powered vehicles on Ropax vessels.

https://www.transportstyrelsen.se/globalassets/global/publikationer/sjofart/transportstyrelsens-riktlinjer-for-batteri-och-hybriddrivna-fartyg-2018.pdf

5 Recommendations for charging equipment

Charging may only be carried out using equipment that has been manufactured according to applicable standards or with alternative products providing an equivalent level of safety.

Charging stations require, as a minimum, an enclosure rating of IP 56 (IP 44 if the equipment is placed in a box)

Charging equipment should be protected from mechanical damage.

Charging equipment should be designed so that the power source disconnect automatically in case of error.

6 Recommendations for charging stations

The recommendation of the STA is that charging should be carried out on the vessel's weather deck.

If charging services are available in enclosed areas, the charging station (and the vehicle itself) must meet the requirements in SOLAS II-2/20.3.2.2 (IP 55, T3, 450 mm, 10 cycle air exchange and constant ventilation).

Another alternative for operators is that the charging station is Ex classified (in accordance with SOLAS II-2/20.3.2.1).

No open fires or other equivalent sources of ignition are allowed within the vicinity of the charging station.

No flammable material of any kind should be placed within the vicinity of the charging station.

7 Equipment

Appropriate firefighting equipment must be available in accordance with SOLAS II-2/20.6 (TSFS 2009:98 annex 1). STA recommends that foam extinguishers or water cannons are installed on the weather deck and on open RO-RO decks. These can either be controlled remotely or manually by the crew.

The charging station should be monitored at all time, by for example video surveillance.

8 Warning signs

The charging station shall be marked out with warning signs.

A warning sign shall be visibly placed so that it informs the driver that only approved and factory-standard electrically powered vehicles are allowed on board.

Experimental vehicles are under no circumstances allowed to be charged on board Swedish vessels.

Warning signs or No Entry signs must be mounted so that they are clearly visible to driver.

9 On-board instructions

A well-documented risk assessment shall form the basis for the safety management plans and instructions.

Staff who are responsible for the charging process must be instructed in the handling procedures and be aware of the risks related to electric vehicles.

All equipment and cables must be checked prior to charging (Damaged cables or faulty equipment shall not be used).

The safety instructions shall clearly describe the procedure for rescuing people and fight fire from a burning electric vehicle.

10 Related information

Risks regarding electric vehicles (batteries)

Drivers are permitted to charge their electric vehicles on board Swedish-flagged Ropax vessels. Responsibility for safety lies on the operator. The Swedish Transport Agency has identified the following risk factors associated with charging electric vehicles on board Ropax vessels.

Operators should be aware of and understand the responsibility when installing charging stations on board their vessels.

The following risks should be taken into consideration pertaining electric vehicles compared with fossil fuel powered vehicles.

Electric power	Fossil fuel
High voltage (up to 600 volts)	12 volts
Fire	Fire
Explosion (producing flammable gases)	Explosion (producing flammable gases)
Release of flammable and poisonous gasses	Release of flammable and poisonous gasses

11 Lithium-ion battery fires can be caused by:

- An uncontrolled chemical reaction within the battery.
- Damage and/or deformation of the battery (for example sustained in an accident or if the underside of the vehicle has been damaged).
- Improper handling of the battery, charger and associated equipment
- An overcharging issue (non-functional overcharging protection)
- A short circuit (such as a damaged cable connection or moisture in key systems)
- Charging a damaged battery.
- An incorrectly installed and/or incorrectly calibrated charger
- A charging station that is powered by an incorrectly installed/functionally inadequate connection and/or incorrect voltage settings or frequency
- Overheating (there is a risk for an explosion if a fire occur near the vehicle).

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Norrköping den 1 juli 2018

Saeed Mohebbi

Fartygsingenjör

Elsäkerhet och alternativa bränslen

Sjö och luftfartsavdelningen

Sektionen för sjövärdighet

Direkt +46-10-495 32 65

saeed.mohebbi@transportstyrelsen.se

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Beslut i detta ärende har fattats av Fredrik Jonsson. I den slutliga handläggningen av ärendet deltog Saeed Mohebbi den senare föredragande.

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transportstyrelsen.se
phone +46(0)771-503 503