



TRANSPORT OF DANGEROUS GOODS ON RO-RO FERRIES Work Package 2.1

ALBERO Project

WP 2.1 Analysis of the special on board transport conditions

Institut für Sicherheitstechnik / Schiffssicherheit e.V.

Transport of dangerous good on ro-ro ferries

The transport of packaged dangerous goods by ship is generally regulated by the IMDG Code (International Dangerous Goods Code). For the transport of packed dangerous goods via the Baltic Sea, the *Memorandum of Understanding for the Transport of Packaged Dangerous Goods on Ro-Ro Ships in the Baltic Sea (MoU)* applies, which adapts certain regulations from the IMDG Code to the special features of ro-ro ferry traffic [1]. The MoU is not a binding agreement. The shipping companies can decide at their own discretion whether to apply the MoU or to operate according to the IMDG Code. [2]

The MoU defines the following terms:

On-deck stowage means the stowage on the weather deck.

Below-deck stowage means stowage in a hold; in an open ro-ro hold, unless a competent authority considers it to be a weather deck; and/or in a closed ro-ro hold, if applicable.

A Low Wave Height Area (LWHA) is a sea area where the significant wave height of 2.3 m is not exceeded in more than 10% of the year.

- A container/vehicle packing certificate (CTU packing certificate) must be issued for each transport unit (CTU) with dangerous goods.
- In general, the regulations of the IMDG Code also apply on ro-ro ships. This concerns in particular the marking of dangerous goods transports.
- Certain types of packaging (fine sheet metal packaging) are only permitted in LWHA areas, contrary to the IMDG Code. Contrary to the IMDG Code, certain stowage of dangerous goods is permitted within LWHA areas. However, for class 1 dangerous goods (explosive substances), the IMDG Code is mandatory with regard to stowage and segregation.
- The carriage of tanks with open vents is not permitted on ro-ro vessels.
- Refrigerated liquefied gases of the ADR or stowage category D of the IMDG Code are prohibited!

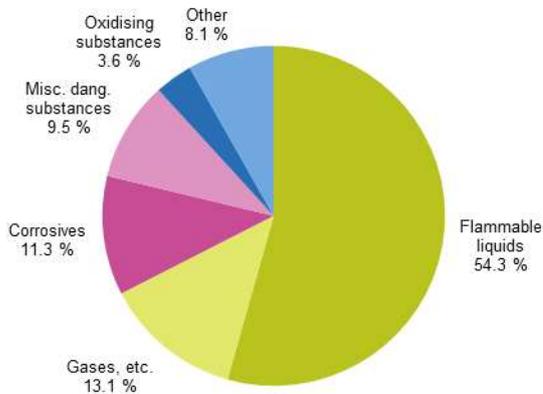
The following table shows the basic regulations applicable to the transport of dangerous goods according to the MoU. The right column shows the frequencies (not quantities!!!) of dangerous goods transports for ALL ferry lines of the shipping companies Scandlines and TT-Line within the 2nd half of 2011, which were determined from real data in the VESPER plus Project (2011 - 2014). After inquiries with the shipping companies, these ratios have hardly changed. The shading shows which dangerous goods classes are negligible for the ALBERO Project (gray shading), because the transported quantities are too small or because the transport of these DG classes is only permitted on cargo ferries, but not on ferries with more than 25 passengers. The blue shading indicates that this DG class is not relevant for the ALBERO Project because it does not pose a corresponding hazard.

substance	DG class	on deck	below deck	Transport frequency % (incl. freight ferries*)
explosive substances	1	Strict regulations on stowage and packaging, in principle prohibited		0,0001
flammable gases	2.1	prohibited	prohibited	6,7
non-flammable, non-toxic gases	2.2	permitted	permitted	3,4
toxic gases	2.3	prohibited	prohibited	0,2
flammable liquids, PG I , II	3	permitted	prohibited	35,9
flammable liquids, PG III	3	permitted	permitted	
flammable solids UN No. 1944, 1945, 2254, 2623 (different types of matches)	4.1	permitted	prohibited	2,1
flammable solids other UN numbers	4.1	permitted	permitted	
substances liable to spontaneous combustion	4.2	permitted	prohibited	0,3
substances that form flammable gases in contact with water	4.3	permitted	prohibited	0,2
inflammatory substances	5.1	permitted	prohibited	6,5
organic peroxides	5.2	prohibited	prohibited	1,2
toxic substances, PG I , II	6.1	permitted	prohibited	
toxic substances, PG III	6.1	permitted	permitted	2,5
infectious substances	6.2	prohibited	prohibited	0,005
radioactive substances	7	permitted	permitted	0,05
corrosive substances, PG I oder II	8	prohibited	prohibited	
liquid corrosive substances, PG III	8	permitted	prohibited	23,9
solid corrosive substances, PG III	8	permitted	permitted	
various dangerous substances and objects	9	permitted	permitted	16,5

table: Transport of dangerous goods on passenger ships with more than 25 passengers on board, PG = packing group, packing group I: high hazard substances; packing group II: medium hazard substances, packing group III: low hazard substances.* On cargo ferries (no more than 25 passengers on board), the transport of all classes of dangerous goods from class 2 is permitted at least on deck.

The following statistics are given for road traffic in general in Europe [3]:

Road freight transport of dangerous goods by type of goods, EU-28, 2017
(% share in tonne-kilometres)



Note: Malta excluded (see chapter 'data sources')
Source: Eurostat (online data code: road_go_ta_dg)



Figure: Frequency of transport of dangerous goods on road in Europe 2016 [3]

Again, the vast majority of shipments are in the flammable liquids category, but there are also significant quantities of corrosive substances and other hazardous materials (class 9).

Overall, the following relevance results are shown for the ALBERO Project, in order of probability of occurrence:

On Deck:

class of dangerous goods	probability to be expected	What can it be? (SELECTION!!!)
class 3	ca. 50 %	especially fuels such as gasoline, diesel, alcohols and solvents such as acetone
class 8 with PG III	ca. 20%	phosphoric acid solution or liquid fertilizer
class 9	ca. 17%	<ul style="list-style-type: none"> • vehicle powered by flammable gas or vehicle powered by flammable liquid or fuel cell vehicle • battery-powered vehicle / device • Li-metal batteries, Ni batteries • inflatable rescue equipment • fumigated goods transport equipment

		<ul style="list-style-type: none"> • asbestos • magnets • marine pollutants (largest group in 9)
class 5.1	<u>ca. 5%</u>	chlorates, peroxides, nitrates (fertilizers)
class 6.1	<u>ca. 5%</u>	pesticides
class 4	<u>ca. 3%</u>	aluminum powder, phosphorus, sulfur, coal, cotton, fish meal, carbide, metal hydrides, lithium metal

Below Deck:

class of dangerous goods	probability to be expected	What can it be? (SELECTION!!!)
class 3 with PG III	<u>ca. 55 %</u>	Below deck, flammable liquids are expected to be less hazardous. Diesel fuel and kerosene may also be transported below deck, but gasoline may not. Other typical cargoes in this category are special alcohols and oils, and paints.
class 9	<u>ca. 30%</u>	<ul style="list-style-type: none"> • vehicle powered by flammable gas or vehicle powered by flammable liquid or fuel cell vehicle • battery-powered vehicle / device • Li-metal batteries, Ni batteries • inflatable rescue equipment • fumigated goods transport equipment • asbestos • magnets • marine pollutants (largest group in 9)
<u>solid goods</u> class 8 with PG III	<u>ca. 10 %</u>	There are not so many <u>solid</u> corrosive substances with low hazard, which are processed in larger quantities. (e.g. soda lime, anhydrides of various acids, ferric chloride). Therefore, lower frequencies of this class of hazardous materials are to be expected below deck.
class 6.1 with PG III	<u>ca. 5%</u>	selected pesticides
class 4.1	<u>ca. 3%</u>	aluminum powder, phosphorus, sulfur

The transport of flammable gases (DG class 2.1), i.e. also LNG, LPG is prohibited on ROPAX vessels if these gases constitute the transported cargo. Thus, a gas tanker carrying liquid LNG may not be carried. A vehicle using gas for its own propulsion counts as DG class 9, and transportation is allowed both above and below deck. A battery-powered vehicle also belongs to DG Class 9.

Literature:

- [1] https://www.bmvi.de/SharedDocs/DE/Anlage/VerkehrUndMobilitaet/Gefahrgut/mou-2018.pdf?__blob=publicationFile
- [2] <https://media1.autohaus.de/fm/5293/main.8905284.pdf>
- [3] https://ec.europa.eu/eurostat/statistics-explained/images/2/2b/Road_freight_transport_of_dangerous_goods_by_type_of_goods%2C_EU-28%2C_2017_%28%25_share_in_tonne-kilometres%29.png