

INF. 5

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RID/ADR/ADN

Joint Meeting of the RID Committee of Experts and the
Working Party on the Transport of Dangerous Goods
(Geneva, 17 – 21 September 2018)

Agenda item 2: Tanks

Accident involving molten aluminium

Information from Germany

Introduction

1. On 26 February 2018, a semi-trailer travelling on the A38 motorway between Großwechsungen and Bleicherode skidded and overturned. On the trailer, there were three vats filled with molten aluminium.
2. According to information from the police, one vat was damaged in contact with the concrete surface of the motorway (the ventilation valve was broken off) and around 4/5 of the contents (approx. 5,400 kg) of the 800°C molten aluminium leaked and spread over the road.



3. The driver received minor injuries in the accident. The police estimated material damage of at least 270,000 Euro. 100 square meters of the road surface was damaged.
4. The relevant accident report in accordance with ADR 1.8.5 is attached as Annex 1 (an English translation of the report originally made in Polish).

Information and discussion on the requirements for such containers

5. Germany wishes to use this document to provide information on this accident to all those states in which such containers are approved and suggests holding a discussion on whether mandatory requirements for such transport operations are required in RID/ADR and whether retrofitting might be necessary.
6. The regulations applicable in Germany, which were developed after similar accidents, are attached for information in Annex 2.

Conditions for specially equipped vehicles/wagons and containers/large containers in accordance with ADR/RID 7.3.3, special provision VC 3 for the carriage of elevated temperature liquids and solids of UN numbers 3257 and 3258.

1. Scope

Elevated temperature substances of UN numbers 3257 and 3258 may be carried in bulk in specially equipped vehicles/wagons or containers/large containers, provided the following conditions are met.

- 1.1 Elevated temperature liquids, UN Number 3257, are in particular
 - molten aluminium,
 - bitumen,
 - molten iron,
 - hot paraffin (wax).
- 1.2 Elevated temperature solids, UN Number 3258, are in particular
 - hot slabs (heavy metals as semi-finished products),
 - steel coils (hot-rolled),
 - aluminium skimmings, provided these goods do not exceed the threshold value for the evolution of gas of 1 litre per kilogram of mass per hour in accordance with ADR/RID 2.2.43.1.5 (b)if the temperature is 240°C or more when carriage commences.

2. General requirements for the means of containment and their load securing

- 2.1 The means of containment for the dangerous goods (e.g. sand bed with hydraulically operated protective cover for the carriage of heavy metals, coil trays for the carriage of coils, vats with fireproof cladding for the carriage of molten metals, tubs placed in fixed supports enclosed in a protective cover under a protective gas atmosphere for the carriage of hot aluminium skimmings; see also Appendix 1) must either be insulated so as not to exceed a surface temperature of 130°C during carriage or must be so positioned that the means of containment cannot be touched. The rule in number 5.13 is exempt from the above. The surface temperature must in no case have a detrimental effect on the functioning of the vehicle/wagon, particularly the brake pipes and electric cables.
- 2.2 The means of containment must be secured on the vehicle/wagon in accordance with the load security principles of ADR/RID 7.5.7.1. The elevated temperature goods are to be placed in their means of containment and carried in such a way that the position of the goods relative to their means of containment does not change under normal conditions of carriage (example: sand bed with bracing struts for slabs, coil trays, carriage in bulk in containers).
- 2.3 It is not necessary to affix marks in accordance with ADR/RID Chapter 5.3 if such marks have already been affixed to the vehicle/wagon.

3. Fire and explosion protection

The risk of fire as a result of thermal influence of the substance on the means of containment, vehicle/wagon or load security aids, and the risk of an explosion resulting from e.g. escaping vapours or chemical reaction of gases that have evolved, must be avoided (e.g. by using inert gases).

4. Additional requirements for the carriage of molten metals in vats.

4.1 Construction and testing of vats

The construction of vats built from 1 September 2016 onwards must be calculated and they must be manufactured according to the state of the art in accordance with a suitable technical code (EN 14025:2013 or equivalent level of safety). A body in accordance with § 12 of the GGVSEB (German transport of dangerous goods regulations) must verify the construction design using a design type test procedure to ensure that it complies with the construction requirements of the technical code used. With regard to the requirements for the documents to be checked, the stipulations of EN 12972:2007 should be referred to. The body mandated to carry out the tests in accordance with § 12 of the GGVSEB must prepare a qualified test report of the result of the design type. A copy of the design type test report must be attached to the vat file of each vat manufactured in accordance with number 4.7 of this Annex.

The hydrostatic pressure and surge effect of the molten metal must be taken into account when deciding the dimensions of the vats and their attachment to the vehicle/wagon. In so doing, the stresses described in ADR 6.8.2.1.2 and the forces described in RID 6.8.2.1.2 must be taken as the basis. This requirement also applies to vats manufactured before the date referred to above.

The vat closures must also be designed in accordance with a suitable technical code and must be designed so as to remain leakproof if a full vat overturns.

The filling and emptying openings must be protected by their construction, e.g. by collars, deflectors, cages or equivalent constructions (see examples in Appendix 2). The protective device on the top of the vat must be designed so as to withstand in its entirety a static load equal to twice the mass of the filled vat.

Provided the protection on the filling and emptying openings remains intact, plastic deformations of the protective device resulting from the above-mentioned load are permissible. Retrofitting of the protective device on existing vats must be completed by 30 June 2018.

It is the responsibility of the bodies according to § 12 of the GGVSEB to inspect the protective device fitted on each vat in terms of its construction design, dimensions and workmanship. A qualified test report must be prepared and, if necessary, after any other components are added, an exceptional test in accordance with number 4.5 of this Annex must be carried out. The test report on the protective device and, if necessary, the report on the exceptional test, must be enclosed with the vat file in accordance with number 4.7 of this Annex.

4.2 Initial test and inspection of vats before placing in service

A body in accordance with § 12 of the GGVSEB must test the vats according to EN 12972:2007 before they are placed in service.

The test must at least include:

- a check to ensure that the vat is in line with the construction documents or certificates, taking into account the qualified test report on the design type test,
- a design inspection,
- an examination of the internal and external condition,
- a hydraulic pressure test at a test pressure of 4 bar; at this stage, the vats need not have a fireproof cladding or coating,
- a leakproofness test and a check of satisfactory operation of the equipment.

The hydraulic pressure test and leakproofness test may also be carried out with a replacement seal.

4.3 Intermediate test and inspection of vats

After the initial test and inspection and after each periodic inspection in accordance with number 4.4 of this Annex, the vats must undergo intermediate inspections by a body according to § 12 of the GGVSEB, except for the hydraulic pressure test and the internal inspection of the metal surface. The intermediate inspection includes:

- an examination of the external condition, including the integrity of the flange and cover connections,
- measurement of the wall thickness,
- non-destructive testing of all accessible weld seams.

The maximum period between intermediate inspections is six years.

The internal conditions must also be checked by an expert under the responsibility of the operator.

4.4 Periodic test and inspection of vats

Each time the fireproof cladding (lining) is renewed, or after twelve years at the latest, a body according to § 12 of the GGVSEB must carry out a periodic inspection. The inspection must include the elements of number 4.3 of this Annex, plus a hydraulic pressure test at a test pressure of 4 bar and a visual inspection of the internal metal surface of the vat. The hydraulic pressure test may also be carried out with a replacement seal.

4.5 Exceptional test and inspection of vats

If the safety of the vats might have been compromised as the result of a repair, an alteration or an accident, a body according to § 12 of the GGVSEB must carry out an exceptional inspection in accordance with ADR/RID 6.8.2.4.4.

4.6 Marking of vats

Vats must be marked with a vat plate by analogy with ADR/RID 6.8.2.5.1 (“P” marking for the inspection according to ADR/RID 6.8.2.4.1 and 6.8.2.4.2 and “L” marking for the inspection according to ADR/RID 6.8.2.4.3).

4.7 Keeping files on the vats (service and inspection book)

The operator must keep the results of all tests and inspections and the documents relating to the initial test and inspection in the vat file.

4.8 Carriage of vats

The following additional requirements apply to vehicles for carriage by road:

From 1 July 2017, the vehicle (tractor or motor vehicle) and from 1 January 2021, the semi-trailer or trailer must be fitted with Electronic Stability Control – ESC.

Vats must be loaded onto vehicles/wagons so as to avoid detrimental effects on the functioning of e.g. the brake pipes, electric cables.

Vats must be positioned on the vehicles/wagons in such a way that the discharge openings face or are opposite to the direction of travel.

4.9 Vehicle driver requirements

In addition to the basic course in accordance with 8.2.1.2, for the carriage of molten metals in vats, drivers must either be in possession of a training certificate for the special tank course according to ADR 8.2.1.3 or must receive supplementary instruction from a competent person. These must include the following main points:

- the particular handling behaviour of vehicles carrying vats,
- general driving physics (driving stability/overturning behaviour, particularly centre of gravity height, surge effects),
- limits of electronic stability control and
- special measures to be taken in the event of an accident.

The carrier must document this instruction in writing or electronically, giving the date, duration and main topics covered. By 30 June 2018 at the latest, all drivers must have taken part in the special tank course or be able to demonstrate that they have received instruction.

5. Special provisions for the carriage by rail of molten iron in torpedo or tubular ladle wagons

- 5.1 The ladles must consist of sheet material and a suitable fireproof cladding. The steel jacket of the ladle must be fitted onto two supports as a self-supporting system.
- 5.2 The ladles, their filling openings and their items of equipment must be so designed that they withstand the static and dynamic stresses specified in RID 6.8.2.1.2 without loss of contents under normal conditions of carriage.
- 5.3 At the highest operating load, the maximum force in the steel jacket of the ladle must not exceed 6/10 of the highest yield strength (0.6 Re at 20°C and 0.75 Re at 250°C, whichever value is the lowest).
- 5.4 A sufficient number of evaporation holes must be provided in the steel jacket of the ladles. Evaporation holes may have a maximum diameter of 10 mm.
- 5.5 The fireproof component must be state of the art. All fireproof component repairs and renewals must be recorded by the operator or manufacturer.
- 5.6 The properties of the fireproof materials for the cladding of ladles must be monitored by means of appropriate inspections in the framework of the quality controls to be carried out by the operator or supplier. Only tested materials may be used for the parts supporting the ladles. The test must be proved by the approval report and certificate. TRT 042 (VkBl.¹ 2003, volume 7, page 178) applies by analogy.
- 5.7 Welding on the steel jacket, particularly on the supporting parts, may only be carried out by recognised welding companies and only by qualified welders under the supervision of an approved welding supervisor. The requirements of RID 6.8.2.1.23 apply by analogy.
- 5.8 The ladles must be tested and inspected before they are placed in service.
- 5.9 The ladles shall undergo periodic inspections. These shall include
 - measurement of the wall thickness,
 - crack testing in the area of the supports,
 - microstructural examination.

¹ Transport Journal (Official Journal of the German Ministry of Transport).

- 5.10 The periodic tests and inspections must be carried out after eight years at the latest. Each time the fireproof cladding (wear lining and permanent lining) is renewed, an internal visual inspection of the metal surface must be performed.
- 5.11 When the safety of the ladle may have been impaired as a result of repairs, alterations or accident, an exceptional check shall be carried out.
- 5.12 All the tests and inspections due must be performed by a body according to § 12 of the GGVSEB. The test and inspection bodies must issue certificates for the tests and inspections, which the operator must keep.
- 5.13 During carriage, the surface temperature in the freely accessible area of the external metal container may not exceed 250°C.
- 5.14 The fireproof cladding of the ladles must be checked by the operator before it is used for the first time.

Heating up must be carried out and monitored in accordance with a heating plan suitable for the grade of stone chosen and type of cladding.

- 5.15 Before each use, the operator or filler must check that the ladles are in a proper condition. Where appropriate, rectifications must be made. These must be recorded.
- 5.16 During carriage, the filling opening of the ladles must be hermetically closed with a cover.

Illustration 1

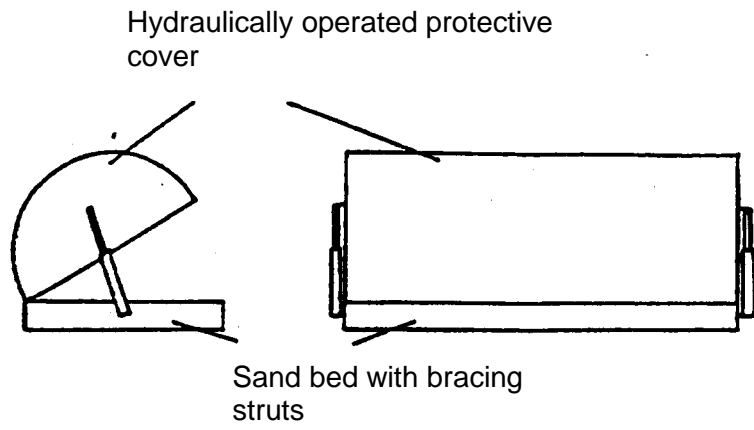
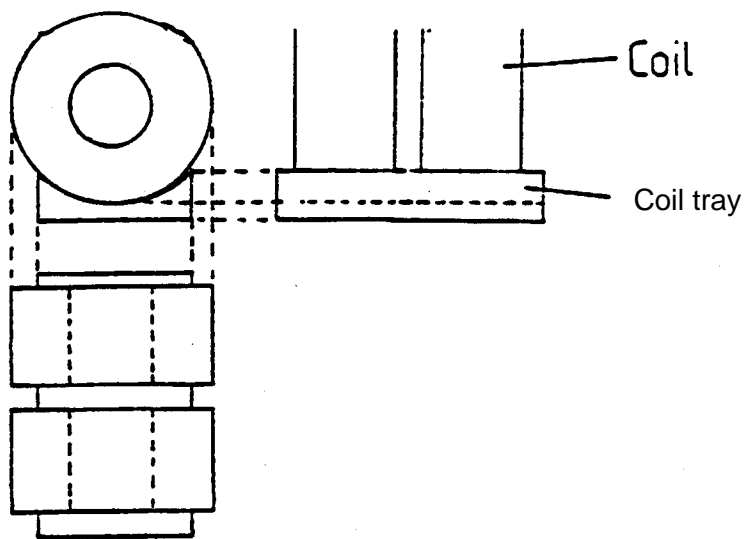
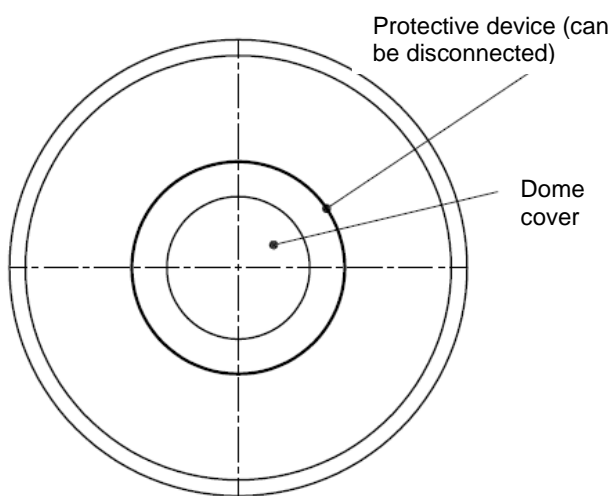
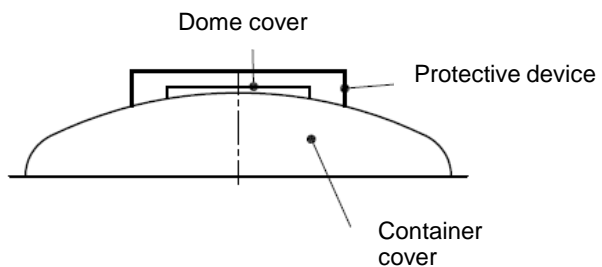


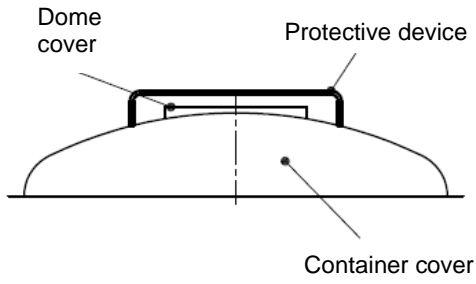
Illustration 2



“Collar type” protective device



“Deflector type” protective device



“Cage type” protective device

