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SAFETY CODES AND GUIDES - TRANSLATIONS

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of 20 November 1981

Genehmigung gemäß § 8 Abs. 1 StrlSchV zur Beförderung Radioaktiver Stoffe für Durchstrahlungsprüfungen im Rahmen der Zerstörungsfreien Materialprüfung
Merkblatt für die Beförderung Radioaktiver Stoffe für Durchstrahlungsprüfungen im Rahmen der Zerstörungsfreien Materialprüfung

vom 20. November 1981

**Bundesamt für Strahlenschutz
Salzgitter**

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In case of discrepancies the German text shall prevail.

License under § 8, para. (1) of the Radiological Protection Ordinance for the Carriage of Radioactive Substances for Radiographic Examinations within the Frame of the Nondestructive Testing of Materials

Instruction Sheet for the Carriage of Radioactive Substances for Radiographic Examinations within the Frame of the Nondestructive Testing of Materials

of 20 November 1981

- Circular Issued by the Federal Ministry of the Interior on 20 November 1981 - RS II 3 - 513033/12 -

At its meeting on 23 June 1981, the Federal States Committee for Nuclear Energy - Radiological Protection - discussed the enclosed instruction sheet (see appendix) for the carriage of radioactive substances for radiographic examinations within the frame of the nondestructive testing of materials. The instruction sheet is intended as a supplement to the model license attached to my circular of 29 May 1978, and has to be enclosed to those licenses which are granted for the carriage of radioactive substances for radiographic examinations within the frame of the nondestructive testing of materials pursuant to § 8, para. (1) of the Radiological Protection Ordinance.

To:
The Supreme Federal State Authorities
responsible for Radiological Protection

Instruction Sheet for the Carriage of Radioactive Substances for Radiographic Examinations within the Frame of the Nondestructive Testing of Materials

The Instruction Sheet is intended as a supplement to the Model License issued by the Federal Ministry of the Interior on 29 May 1978 for the carriage of radioactive substances for radiographic examinations within the frame of the nondestructive testing of materials (GMBI, p. 334). The Instruction Sheet explains those provisions of the Radiological Protection Ordinance and of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads which have to be observed when such substances are transported on the road. In addition, it contains statements of the manner of the instructions which have to be accomplished semi-annually in accordance with Section B 1 of the Model License.

1. Radiological Protection Ordinance

For radiographic examinations within the frame of the nondestructive testing of materials radioactive substances (emitters) may only be carried on public roads if a corresponding license was granted pursuant to § 8, para. (1) of the Radiological Protection Ordinance. This license has to accompany each carriage operation.

The individual prerequisites for granting the license are defined in § 10 of the Radiological Protection Ordinance. As they are checked by the responsible authority before the license is granted, there is no need for them to be discussed here.

The protective provisions contained in Part Three of the Radiological Protection Ordinance, with the exception of §§ 38, 77, paras. (4) and (5), and § 79, do not directly apply to the carriage of radioactive materials. With regard to the carriage of emitters which are used for the nondestructive testing of materials, there is an exception from this principle insofar as the provisions of §§ 49 and 55 of the Radiological Protection Ordinance concerning dose limits for persons occupationally exposed to radiation have to be applied in certain cases. This will be discussed in a more detailed way in Sec. 2.5.

With respect to the carriage of radioactive materials for radiographic examinations within the frame of the nondestructive testing of materials, the activity limit specified in § 38 of the Radiological Protection Ordinance is not reached so that this provision can be considered irrelevant in the present case.

The relevant provisions concerning carriage, which are contained in § 77, paras. (4) and (5), are worded as follows:

- (4) Anyone transferring radioactive materials for carriage on public traffic routes or routes accessible to the public shall assure that they are carried by persons who are entitled to carry the materials by virtue of § 4 of the Atomic Energy Act or of §§ 8 or 9 of this Ordinance. Anyone transferring materials for carriage shall furthermore assure that, upon such transfer, they are adequately packed in accordance with the legal requirements pertaining to the type of carriage concerned or, if there are no such legal requirements, in accordance with the requirements generally accepted according to the state of the art for the intended manner of carriage. The materials may only be transferred for further carriage if the packing is intact.
- (5) Anyone carrying radioactive materials shall assure that the materials are transferred direct to the recipient or to a person authorized to receive them.

As a rule, the prerequisites have been fulfilled if the carriage of radioactive materials is required for the intended handling within the frame of the nondestructive

testing of materials and if the holder of the handling license is identical with the holder of the carriage license.

Pursuant to § 79 of the Radiological Protection Ordinance, the loss of radioactive materials shall be reported to the nuclear supervisory authority or to the authority responsible for public safety and order (police). This shall also apply to losses of radioactive materials in transit.

2. Ordinance Relating to the Carriage of Hazardous Goods on Public Roads

2.1 Requirements to the emitters and their packages

Pursuant to the nuclear handling license, all emitters to be installed in nonstationary gamma radiographic devices must have been licensed as radioactive materials of a special kind in accordance with Item 3671 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads. The Federal Institute for Materials Testing in Berlin acts as licensing authority for the Federal Republic of Germany. Pursuant to Item 3683 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, a copy of this license must be kept by the consignor, i.e. as a rule the holder of the handling license.

The emitters must be carried in a Type B (U) package that is in compliance with the provisions of Items 3600 through 3603 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads. In accordance with Item 3672 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, the package - i.e. the packaging and its radioactive contents - requires a model license to be issued by the responsible licensing authority (as far as the

Federal Republic of Germany is concerned, this is the Federal Institute of Physics and Technology at Braunschweig). A copy of the license for the sample of the package has to remain with the consignor (Item 3683), another copy must be included in the accompanying documents (Item 2703, Sheet 9).

2.2 Labels and danger cards

Either the shielded container or a special shipping cask are considered packages as defined in Item 2700 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads. Pursuant to Item 2703, Sheet 9, subpara. 6, the packages must be marked in a clearly visible and permanent way on the outer surface: as follows

- i Type B (U)
- ii Mark of the responsible authority
- iii Weight if the package exceeds 50 kg
- iv Radiation symbol to be stamped or impressed on the outermost fire-resistant and waterproof receptacle.

Pursuant to Item 3656 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, each package must be provided on two opposite sides with a card in compliance with samples 6 A, 6 B or 6 C of Enclosure A.9 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, depending on the category to which the package belongs, i.e. either I-WHITE, II-YELLOW, or III-YELLOW.

The side length must be 10 cm, the symbols and inscriptions must be black on white, with the following exceptions:

- a) the category marks I, II, and III must be red;
- b) the background of the upper halves of Nos. 6 B and 6 C must be yellow.



The admissible dose rate limits for the several categories are laid down in Items 3652 to 3655 of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads.

The information requested on the cards has to be provided as follows in a clearly visible and permanent way:

- besides the word "Contents", the symbols of the radionuclides have to be registered, e.g. Ir-192, Co-60;
- besides the word "Activity", the total activity of the package has to be registered in Curie¹);
- on the cards according to samples 6 B and 6 C, the transport code number (numerical value of the dose rate measured in mrem/h²) at a distance of 1 m from the outer surface of the package) has to be registered.

Pursuant to § 8, para. (10) of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, in conjunction with Item 71 500, para. (2) of Appendix B to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, the following mark has to be affixed in the form of a card or sign to either side and the rear wall of the transport vehicle.



Side length at least 15 cm; symbol and text black on white.

2.3 Shipping documents

The following documents must accompany the package in transit:

- Pursuant to § 4 of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, a shipping document that contains the information required in Item 2703, Sheet 9, subpara. 7 b, and Item 3680 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads;
- Pursuant to § 5 of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, an accident instruction sheet;
- A certificate evidencing the unilateral licensing of the sample of the package (approval certificate) in accordance with Item 2703, Sheet 9, subpara. 7 c;
- Pursuant to § 8 of the Radiological Protection Ordinance, a legalized copy of the license.

For a): Accompanying document (waybill)

Pursuant to § 4 of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads and to Item 2703, Sheet 9, as well as Item 3680 of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads, the accompanying document must contain the following information for each package:

- A statement reading: "Nature of both contents and packaging in compliance with the provisions of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads";
- Names and addresses of consignor and consignee as well as place of shipping and place of destination;
- A statement reading: "Radioactive materials (in Type B

¹ 1 Curie (Ci) = 3,7 x 10¹⁰ Becquerel (Bq)

² 1 mrem/h = 10 µSv/h

- (U) packages) 7, Sheet 9, Ordinance Relating to the Carriage of Hazardous Goods on Public Roads";
- A statement to the effect that the radioactive materials are of a special kind, and the mark issued for this purpose by the responsible authority;
- Nuclide and activity (in Curie) of the radioactive materials;
- The category of the package (II-YELLOW; III-YELLOW);
- The transport code number; and
- The mark of the licensing certificate issued by the responsible authority for the sample of the package.

For b): Accident instruction sheet

§ 5 of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads provides that, in the case of transports of hazardous goods on public roads, the driver of the vehicle concerned has to carry along accident instruction sheets stating in a concise form

- the designation of the hazardous goods carried and the kind of the hazard they involve as well as the necessary safety measures to cope with said hazard;
- the measures to be taken and the assistance to be rendered if persons get into contact with either the goods carried or escaping substances;
- the measures to be taken in the case of fire, and in particular the means or groups of means either to be or not to be used for fire fighting purposes;
- the measures to be taken in the case of a breakage of or other damage to the packaging or the hazardous goods carried, and in particular if the goods concerned have been spread on the road; and
- the possible danger to waterways if the goods carried are released, and the prompt action to be taken in such a case.

As only radioactive materials of a special kind may be used for gamma radiography, it is extremely unlikely, even in the case of a severe accident, that radioactive materials are released in such a way as may lead to a danger to waterways or to the air. Special protective measures in order to prevent incorporation need not be taken either, and there are no particular requirements to be met by the means needed for fire fighting. If the screening effect of the shielded container or the shipping cask is affected or even entirely eliminated, there may be a dangerous situation due to external radiation. Therefore, the place of the accident has to be identified and marked as a hazardous area and closed off, considering the general traffic situation, as soon as all injured persons have been rescued. Spectators have to be kept away. All clearing work that is not required for the prevention of acute danger should not be carried out before experts with measuring equipment have arrived on the scene of the accident. An Accident Instruction Sheet as approved by the Minister of Transportation's Advisory Board for the Carriage of Hazardous Goods is attached.

2.4 Parking of vehicles

The provisions of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads concerning the parking of vehicles (Items 10171, para. (2) and 71171) are fulfilled if the nuclear licensing conditions are met.

Apart from these traffic law provisions, the conditions imposed in Section B of the nuclear license have to be observed. Since, pursuant to this license, emitters may only be carried in vehicles which are especially protected against theft, it may be taken for granted that the traffic law provisions are complied with if the nuclear conditions are observed.

2.5 Protection of personnel

The protection of the persons attending to the carriage of the radioactive materials is provided for in item 3659, para. (8) of Appendix A in conjunction with Item 240 000 of Appendix B of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads. As a basic principle, it

is laid down in these provisions that the persons concerned must not, as a rule, take up an annual dose exceeding 0,5 rem. If certain maximum times of carriage and certain minimum distances which will definitely make sure that these individual dose limits are observed cannot be adhered to (although this is normally the case with respect to the carriage of emitters to be used for the nondestructive testing of materials), an increase in the annual dose to 1,5 rem is admissible in the conditions specified in Item 3659, para. (8) b.

Since, as a rule, the carriage of the emitters is effected by the same persons who use the emitters in the testing of materials and who are thus persons occupationally exposed to radiation as defined by the Radiological Protection Ordinance, the provision of § 55 of the Radiological Protection Ordinance has to be observed. The dose received in transit by these persons shall be measured by the same method as the dose received when handling the radioactive materials and shall be added to the latter.

On drivers who are not persons occupationally exposed to radiation as defined by the Radiological Protection Ordinance, the individual dose must be measured by a method which makes it possible to determine the dose at any time. This condition imposed in Section B 3 of the license corresponds to the provisions of Item 3659, para. (8) b of Appendix A to the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads.

3. Instruction

The purpose of the instruction is to inform the persons to whom the carriage of radioactive materials is entrusted on

- the possible radiation hazards,
- the protective measures to be taken, and
- the legal provisions to be complied with.

If the carriage of the radioactive materials is effected by the same persons who handle the materials, it is appropriate to combine this instruction with the instruction provided for handling pursuant to § 39 of the Radiological Protection Ordinance. The instruction also serves to make sure that the provisions contained in § 5, para. (4) of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads are complied with.

Radiation Hazards

Any danger to persons caused by the radioactive materials is unlikely, even if an accident or fire occurs, if the provisions of the Radiological Protection Ordinance and of the Ordinance Relating to the Carriage of Hazardous Goods on Public Roads as well as the conditions imposed in the license and the advice contained in this instruction sheet are observed.

However, if these provisions are not complied with, or in the case of extreme, very rare accident conditions, there may be a danger to the transportation personnel, other persons and the environment. In this context, the following kinds of radiation hazards to persons have to be considered:

1. external radiation
2. incorporation.

External radiation is caused by emitters outside the human body. The radiation exposure involved decreases if

- the distance from the emitter is increased,
- the quality of the screening between man and emitter is improved, and
- the duration of stay within the radiation area is shortened.

Incorporation is the uptake of radioactive materials by the human body via air or food, open wounds or, in exceptional cases, through the skin. The harmful effect of radiation continues until the activity decays or is completely eliminated from the body.

An incorporation of radioactive materials is only possible if the emitter itself begins to leak and radioactive materials escape as a result of an accident. The result is a contamination (pollution by radioactive materials) which may cause radioactive materials to get onto the whole or parts of the body, clothing, other objects or into the environment. Only then an incorporation is possible.

Since, however, gamma radiography only uses "radioactive materials of a special kind", i.e. in a particularly safe enclosure, a contamination followed by incorporation is extremely unlikely. However, if the undamaged emitter is getting free from the shielded container or shipping cask, there may be a high radiation exposure already after a short time if persons get close to the unshielded emitter.

Protective Measures

The following protective measures have to be taken into consideration with respect to the carriage of radioactive materials:

- The conditions imposed in Sections B 2 and B 3 of the license have to be fulfilled.
- Loading and unloading of radioactive materials should be effected both carefully and as quickly as possible.
- The containers with the radioactive materials have to be arranged in such a way inside the vehicle that they are as far away from the occupants of the vehicle as is possible.
- Persons should not stay unnecessarily long inside, or very close to, the vehicle loaded with radioactive materials.
- If necessary, the dose rates at the locations where persons sit or stand inside the vehicle have to be measured.
- It has to be investigated whether or not additional shielding should be provided for the protection of the occupants of the vehicle.

The protective measures to be taken and the behavior in the event of accidents should be discussed in detail during the instruction.

Legal Provisions

The instruction concerning the legal provisions to be complied with may be effected on the basis of Secs. 1 and 2 of this Instruction Sheet. In addition, the model license and, in particular, the conditions imposed in this license have to be explained.

Appendix

February 1981
Class 7 GGVS
Sheet 9

Accident Instruction Sheet for the Carriage by Road

Nonfissionable radioactive materials of a special kind in Type B (U) packages

Designation of cargo: Gamma radiographic device

Properties of cargo:

Kind of nuclide: Co-60*), Ir-192*),
.....*)
Amount of activity:Ci*)
*) insert or delete what is not applicable

Dangers:

Ionizing radiation

Protective equipment:

1 dose rate meter with operating instructions glued to it
2 signs - Controlled Area - Radioactive - or

- 2 warning triangles with stickers - Caution: Radioactive Material - or - Radioactive: Stay away -
- 1 barring line - Radioactive - or - RADIOACTIVE - (recommended length: 50 m) and
- 4 barring rods (telescoping type)
- 3 substitute stickers - RADIOACTIVE -
- 1 roll of adhesive tape, 50 mm wide - Caution - Radioactivity -
- 1 packet of yellow wax chalk and white chalk

Emergency measures - Fire department and police to be called immediately

- Turn off engine
- Keep sources of ignition away (no open fire), do not smoke
- Secure road and warn other persons using the road. If possible, measure dose rate. Bar road in such a way that 2.5 mrem/h are not exceeded at that particular location. Flowing traffic is not taken into consideration in this context.
- Keep away unauthorized persons.
- Stay as far as possible away from the package marked radioactive.
- No long stays in the radiation area.
- Call an expert.
- Postpone any clearing work which does not serve to prevent immediate danger until after the expert's arrival.

Leak
Radioactive material in Type B (U) packages

Fire
Cool container with water spray jet if affected by fire
Extinguish other fires

First aid
Remove injured persons from the hazardous area

Telephone inquiry
Report accident at once to the following person
.....
(Name and telephone number - including private number after office hours - of the responsible person specified in Section C 1 of the license)

This Accident Instruction Sheet was approved on 11 November 1981 (File No.: A 13/26.20.70-12) by the Ministry of Transportation's Advisory Board for the Carriage of Hazardous Goods in agreement with the "Carriage of Radioactive Materials" Working Group of the "Radiological Protection Technology" Committee of the Radiological Protection Commission advising the Federal Minister of the Interior.