

**United States
Coast Guard**

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NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 3-94

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SubJ: INTERNATIONAL MARITIME ORGANIZATION CODE FOR THE SAFE CARRIAGE OF IRRADIATED NUCLEAR FUEL, PLUTONIUM AND HIGH-LEVEL RADIOACTIVE WASTES IN FLASKS ON BOARD SHIPS (IMO RESOLUTION A.748(18))


1. **PURPOSE.** This Circular calls the attention of Coast Guard field units, marine surveyors, shippers and carriers of nuclear materials to the International Maritime Organization (IMO) Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (IMO Resolution A.748(18)).
2. **DIRECTIVES AFFECTED** None. (Note that Navigation and Vessel Inspection Circular 2-87, entitled Domestic Barge Transportation of Radioactive Materials/Nuclear Waste, remains applicable to domestic barge movements.)
3. **BACKGROUND.**
 - a. The International Maritime Organization (IMO) establishes codes and standards for the maritime transportation of packaged hazardous materials. The principal code issued by IMO in this regard is the International Maritime Dangerous Goods (IMDG) Code. The IMDG Code includes provisions for transportation of all classes of hazardous materials including class 7 (radioactive) materials. The IMDG Code standards for transport of class 7 materials primarily address documentation, marking, labeling, placarding, stowage, segregation and other handling requirements. For packaging requirements for class 7 materials, the IMDG code relies on the International Atomic Energy Agency (IAEA) requirements as set forth in Safety Series No. 6, Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As amended 1990).
 - b. The IMDG Code and IAEA Safety Series No. 6 do not contain special design and equipment requirements for the vessels which transport class 7 materials. Also, the International Convention for the Safety of Life at Sea (SOLAS) does not contain special requirements for vessels transporting class 7 materials as it does for vessels carrying other classes of dangerous goods (SOLAS Regulation 11-2/54).
 - c. The IMO Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (IMO Resolution A.748(18)) was developed to complement the provisions of the IMDG Code by providing specific requirements for ship design and construction. IMO Resolution A.748(18) was developed as a Joint effort of IMO and the IAEA.
4. **DISCUSSION.**
 - a. IMO Resolution A.748(18) applies to new and existing ships, regardless of size, that transport irradiated nuclear fuel (INF), plutonium and high level radioactive wastes in flasks (packagings which are also known as casks). The casks are extremely robust packagings which meet stringent design and testing requirements. The casks may or may not be contained within an intermodal freight container for shipment.

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- b. The specific scope of radioactive materials to which Resolution A.748(18) applies is defined in the resolution. Irradiated nuclear fuel is also known as spent nuclear fuel and in general terms is nuclear fuel which has been removed from a reactor following irradiation.
- c. Resolution A.748(18) assigns ships covered by its requirements to three separate classes depending on total radioactive quantity of materials which may be carried on board. These are INF 1, INF 2 and INF 3 in increasing order of maximum quantity of material which may be carried, and level of ship requirements which apply.
- d. Resolution A.748(18) sets forth requirements which address the following main areas of ship design or equipment: damage stability, fire protection, temperature control of cargo spaces, structural considerations, cargo securing arrangements, and electrical arrangements. In each case, the Code relies on established international standards particularly those of the SOLAS Convention rather than defining a new set of requirements. The Code also contains more general provisions for ships to have appropriate radiological protection equipment and a management, training and shipboard emergency plan.
- e. Resolution A.748(18) also calls for the flag Administration to provide a ship which meets the provisions of that Code with an appropriate document as evidence of compliance with the construction and equipment requirements of the Code.

5. IMPLEMENTATION.

- a. A shipper intending to offer for transport by vessel materials covered by IMO Resolution A.748(18) should include compliance with the provisions of IMO Resolution A.748(18) as a criterion in selection of the ship to transport the material.
- b. An owner or operator of a U.S. flag vessel intending to transport materials covered by IMO Resolution A.748(18) should request the cognizant Coast Guard Officer in Charge, Marine Inspection (OCMI) to issue an endorsement to the Certificate of Inspection to document compliance with the provisions of IMO Resolution A.748(18). To facilitate handling a request, it should be submitted to Comandant (G-MTH) for initial review prior to forwarding to the cognizant OCMI or Commanding Officer, Marine Safety Center for technical review.


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End: (1) International Maritime Organization Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (IMO Resolution A.748(18))

INTERNATIONAL MARITIME
ORGANIZATION

A 18/Res.748
17 November 1993
Original: ENGLISH

ASSEMBLY - 18th session
Agenda item 11

RESOLUTION A.748(18)
adopted on 4 November 1993

CODE FOR THE SAFE CARRIAGE OF IRRADIATED NUCLEAR FUEL,
PLUTONIUM AND HIGH-LEVEL RADIOACTIVE WASTES IN
FLASKS ON BOARD SHIPS

A

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization (IMO) concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING FURTHER the provisions of chapter VII of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, and the provisions of the International Maritime Dangerous Goods Code (IMDG Code), which regulate, inter alia, the carriage of radioactive material by sea,

RECOGNIZING that the IMDG Code, which generally implements the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, contains no specific requirements for the design and equipment of ships engaged in the carriage of irradiated nuclear fuel, plutonium and high level radioactive wastes,

NOTING the increase in maritime transport of irradiated nuclear fuel, plutonium and high-level radioactive wastes,

BELIEVING that adequate regulations for the construction, equipment and operation of ships engaged in the carriage of irradiated nuclear fuel, plutonium and high-level radioactive wastes would enhance maritime safety and protection of the marine environment,

NOTING ALSO paragraph 17.30(a)(ix) of Agenda 21 of the United Nations Conference on Environment and Development (UNCED), encouraging IMO and IAEA to work together to complete consideration of a code on the carriage of irradiated nuclear fuel in flasks on board ships,

HAVING NOTED with appreciation the work carried out by the joint IAEA/IMO/UNEP Working Group on the Safe Carriage of Irradiated Nuclear Fuel and other Nuclear Material by Sea,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its sixty-second session and by the Marine Environment Protection Committee at its thirty-fourth session,

1. ADOPTS the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships, set out in the Annex to the present resolution;
2. URGES Governments to implement this Code at the earliest possible opportunity.

B

THE ASSEMBLY,

HAVING ADOPTED the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (INF Code),

BEARING IN MIND the results of the United Nations Conference on Environment and Development, in particular chapter 17 of Agenda 21,

NOTING the reports of the Joint IAEA/IMO~UNEP Working Group on the Safe Carriage of Irradiated Nuclear Fuel and other Nuclear Material by Sea, in particular matters identified by the Working Group which require further consideration and which are complementary to the INF Code,

NOTING ALSO the importance of technical co-operation for the enhancement of international standards for maritime safety and marine environmental protection, as envisaged by the INF Code,

RECOGNIZING the need for further work to be carried out, with a view to augmenting or improving the INF Code,

REQUESTS the Maritime Safety Committee and the Marine Environment Protection Committee, in consultation with IAEA:

- (a) to keep the INF Code under regular review and to amend it, as necessary;
- (b) to consider, as a matter of high priority, relevant aspects of the transport of irradiated nuclear fuel and other nuclear material which are complementary to the INF Code, taking into account the recommendations of the Joint IAEA/IMO/UNEP working Group and the objectives of paragraph 17.22 of Agenda 21 of UNCED;
- (c) to keep under review the need for international co-operation for the implementation of the INF Code and related matters; and
- (d) to report to the nineteenth session of the Assembly on the progress of work made in this field.

ANNEX

CODE FOR THE SAFE CARRIAGE OF IRRADIATED NUCLEAR FUEL,
PLUTONIUM AND HIGH-LEVEL RADIOACTIVE WASTES
IN FLASKS ON BOARD SHIPS

GENERAL

1 This Code applies to new and existing ships regardless of size, including cargo ships of less than 500 tons gross tonnage, engaged in the carriage of irradiated nuclear fuel, plutonium and high level radioactive wastes in flasks approved in accordance with the applicable Regulations for the Safe Transport of Radioactive Material adopted by the International Atomic Energy Agency and carried in accordance with class 7 of the International Maritime Dangerous Goods (IMDG) Code, schedules 10, 11, 12 or 13.

2 For the purposes of this Code:

- .1 Irradiated nuclear fuel means material containing uranium, thorium and/or plutonium isotopes which has been used to maintain a self-sustaining nuclear chain reaction.
- .2 Plutonium means the resultant mixture of isotopes of that material extracted from irradiated nuclear fuel from reprocessing.
- .3 High-level radioactive wastes means liquid wastes resulting from the operation of the first stage extraction system or the concentrated wastes from subsequent extraction stages, in a facility for reprocessing irradiated nuclear fuel, or solids into which such liquid wastes have been converted.

3 For the purposes of this Code, ships carrying materials covered by this Code in flasks have been assigned to three classes, depending on the total radioactive quantity which may be carried on board:

Class INF 1 - Ships carrying such materials with an aggregate radioactivity less than 4,000 TBq.

Class INF 2 - Ships carrying irradiated nuclear fuel or high-level radioactive wastes with an aggregate radioactivity less than 2×10^6 TBq and ships carrying Plutonium with an aggregate radioactivity less than 2×10^5 TBq.

Class INF 3 - Ships carrying irradiated nuclear fuel or high-level radioactive wastes and ships carrying Plutonium with no restriction on the aggregate radioactivity of the materials.

4 All ships, regardless of size, carrying materials covered by this Code should comply with the requirements of SOLAS 1974, as amended, and in addition with the requirements as prescribed in table 1 and paragraphs 7 to 25, concerning damage stability, fire protection, temperature control of cargo spaces, structural considerations, cargo securing arrangements, electrical supplies, radiological protection equipment and management, training and shipboard emergency plan.

5 In addition to the requirements of this Code, the provisions of the IMDG Code also apply.

6 The Administration should provide the ship with an appropriate document as evidence of compliance of construction and equipment with the requirements of this Code.

DAMAGE STABILITY

7 To the satisfaction of the Administration concerned.

8 Part B, chapter II-i, of the 1974 SOLAS Convention¹ as amended by MSC resolution 12(56), or resolution A.265(VIII).

9 Part B-1, chapter 11-1 of the 1974 SOLAS Convention (resolution MSC.19(58))¹ regardless of ship length.

10 Type 1 ships survival capability and location of cargo spaces in chapter 2 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IEC Code) or, regardless of ship length, requirements in part B-1, chapter 11-1 of the 1974 SOLAS Convention (resolution MSC.19(58)) with subdivision index RINF as given below:

$$R_{INF} = R + 0.2(1 - R)$$

FIRE PROTECTION

11 To the satisfaction of the Administration concerned.

12 Accommodation spaces, service spaces, control stations and machinery spaces of category A, as defined in regulation 11-2/3.19 of SOLAS 74, as amended, should be fitted either forward or aft of the cargo spaces, due regard being paid to the overall safety of the ship.

13 The ship should be fitted with the following systems and equipment, irrespective of its gross tonnage, i.e. also for cargo ships of less than 500 tons gross tonnage:

- .1 a water fire-extinguishing system complying with the requirements of regulation 11-2/4 of SOLAS 74, as amended;
- .2 a fixed fire-extinguishing system in machinery spaces (defined as above) complying with the requirements of regulation 11-2/7 of SOLAS 74, as amended;
- .3 fixed cargo space cooling arrangements, complying with the requirements of regulation 11-2/54.2.1.3 of SOLAS 74, as amended; and
- .4 a fixed fire-detection and fire-alarm system, protecting the machinery spaces, accommodation and service spaces, complying with the requirements of regulation 11-2/13 of SOLAS 74, as amended.

TEMPERATURE CONTROL OF CARGO SPACES

- 14 Adequate ventilation or refrigeration of enclosed cargo spaces should be provided so that the average ambient temperature within such spaces does not exceed 55°C at any time.
- 15 Ventilation or refrigeration systems serving cargo spaces intended for the transport of materials covered by this Code should be independent of those serving other spaces.
- 16 Those items essential to operation, e.g., fans, compressors, heat exchangers, cooling water supply, etc., should be provided in duplicate for each cargo space and spare parts should be available, to the satisfaction of the Administration concerned.

STRUCTURAL CONSIDERATIONS

- 17 The structural strength of deck areas and support arrangements should be designed, taking into account the high loading which is to be sustained. In existing ships the structural strength should be evaluated with a view to limit the locations where flasks may be stowed.

CARGO SECURING ARRANGEMENTS

- 18 Adequate permanent securing devices should be provided to prevent movement of the flasks within the cargo spaces. In designing permanent devices, due consideration should be given to the orientation of the flasks and the following ship acceleration levels should be taken into account:
- 1.5 g longitudinally;
 - 1.5 g transversely;
 - 1.0 g vertically up;
 - 2.0 g vertically down;

or alternatively,

where flasks are carried on the open deck or a vehicle deck they should be secured in accordance with the principles of safe stowage and securing of heavy, unitized and wheel-based (rolling) cargoes contained in Assembly resolution A.714(17) of 6 November 1991, on the Code of Safe Practice for Cargo stowage and Securing, taking into account Assembly resolution A.581(14) of 20 November 1985, on Guidelines for Securing Arrangements for the Transport of Road Vehicles on Ro-Ro Ships and MSC/Circ.385 of 8 January 1985, on Provisions to be included in the Cargo Securing Manual to be carried on board ships

- 19 Where collision chocks are used, these should be so arranged that they will not interfere or prevent cooling air flow which may be necessary (see 14, 15 and 16).

ELECTRICAL SUPPLIES

- 20 To the satisfaction of the Administration concerned.
- 21 An alternative source of electrical power, complying with the requirements of the International Electrotechnical Commission (IEC) should be provided so that damage involving the main supply would not also affect the alternative source.

22 The power available from the alternative source should be sufficient to supply the following services for at least 36 hours:

- .1 the equipment provided for the flooding and cooling arrangements referred to in 13.3, 14, 15 and 16: and
- .2 all emergency services required by SOLAS 74, as amended.

23 The alternative source referred to in 21 should be located outside the extent of any damage envisaged in 7, 8, 9 and 10.

RADIOLOGICAL PROTECTION EQUIPMENT

24 Depending upon the degree of activity of the materials covered by this Code which are being carried, the ship's design may need to provide for additional arrangements or equipment for radiological protection to the satisfaction of the Administration concerned.

MANAGEMENT, TRAINING AND SHIPBOARD EMERGENCY PLAN

25 The management, training and shipboard emergency plan for a ship should take account of developments within the Organization to the satisfaction of the Administration concerned.