RESOLUTION MEPC.64(36)

adopted on 4 November 1994

GUIDELINES FOR APPROVAL OF ALTERNATIVE STRUCTURAL OR OPERATIONAL ARRANGEMENTS AS CALLED FOR IN REGULATION 13G(7) OF ANNEX I OF MARPOL 73/78

ANNEX 8

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THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention of the International Maritime Organization concerning the function of the Committee,

NOTING resolution MEPC.52(32) by which the Committee adopted new regulations 13F and 13G and related amendments to Annex I of MARPOL 73/78,

NOTING FURTHER resolution MEPC.52(32) by which the Committee agreed to develop, as a matter of urgency, guidelines for approval of alternative structural or operational arrangements as called for in regulation 13G(7),

HAVING CONSIDERED, at its thirty-sixth session, the guidelines developed under regulations 13G(7) of Annex I of MARPOL 73/78,

1. ADOPTS:

   the Guidelines for Approval of Alternative Structural or Operational Arrangements as called for in regulation 13G(7), the text of which is set out at Annex to this resolution;

2. INVITES:

   Governments to give due consideration to the Guidelines, set out in the Annex, when accepting structural or operational arrangements for a tanker as an alternative to the requirements prescribed in paragraph (4) of regulation 13G of Annex I of MARPOL 73/78.

ANNEX

GUIDELINES FOR APPROVAL OF ALTERNATIVE STRUCTURAL OR OPERATIONAL ARRANGEMENTS AS CALLED FOR IN MARPOL 73/78, ANNEX I, REGULATION 13G(7)

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Background

1 Regulation 13G(4) of Annex I of MARPOL 73/78 specifies the requirements applicable to existing crude oil tankers of 20,000 tons deadweight and above and product carriers of 30,000 tons deadweight and above to reduce the accidental outflow of oil in the event of a collision or stranding. Regulation 13G(7) permits other structural or operational arrangements to be accepted as alternatives, provided that such alternatives provide at least the same level of protection against oil pollution in the event of collision or stranding, and are approved by the Administration based on guidelines developed by the Organization.

The guidelines contained herein specify the criteria by which the acceptability of alternative arrangements should be determined. Methods approved by the MEPC at the time of development of the guidelines are detailed in the Appendix.

Other alternative arrangements may be approved by the MEPC after considering their pollution prevention and safety characteristics. A proposal for approval of a new or revised arrangement should be submitted by an Administration and contain technical and operational specifications and evaluation of any safety aspects.

Applicability

2 These guidelines apply to crude oil tankers of 20,000 tons deadweight and above and product carriers of 30,000 tons deadweight and above which are not required to comply with regulation 13F and do not satisfy the requirements of regulation 13G(1)(c).

Performance Requirements

3 The required minimum protection against accidental oil outflow is governed by regulation 13G(4), which stipulates that tankers to which regulation 13G applies shall have wing tanks or double bottom spaces, not used for the carriage of oil and meeting the width and height requirements of regulation 13E(4), covering at least 30% of L_t for the full depth of the ship on each side or at least 30% of the projected bottom shell area within the length L_t, where L_t is as defined in regulation 13E(2). Equivalent structural or operational arrangements, as permitted by regulation 13G(7), should ensure at least the same degree of protection against oil pollution in the event of collision or stranding. The equivalency should be determined by calculations in accordance with paragraphs 4 and 5 below.

Damage and outflow criteria

4 The oil outflow should be calculated for the damage cases identified in subparagraph 5.1 of these guidelines. The hypothetical outflow should be calculated for the conditions specified in subparagraphs 4.1, 4.2 and 4.3 below and in accordance with the procedures defined in subparagraphs 5.2, 5.3 and 5.4. The hypothetical outflows so calculated, divided by the volume of the cargo being carried by the ship in its original configuration, and expressed as a percentage, constitute the Equivalent Oil Spill number (the EOS number) for the ship under each of the conditions detailed in subparagraphs 4.1, 4.2 and 4.3.

4.1 The EOS number should be calculated for the existing ship, with the ship loaded to the maximum assigned loadline with zero trim and with cargo having a uniform density allowing all cargo tanks to be loaded to 98% full. This calculation establishes the base EOS number and also the nominal cargo oil density, which should be applied in the calculations required by subparagraphs 4.2 and 4.3.

4.2 A second EOS number should be calculated for the ship arranged with non-cargo side tanks as referred to in regulation 13G(4).

4.3 A third EOS number should be calculated for the selected alternative method and should not exceed the EOS number as calculated according to subparagraph 4.2, and should furthermore not be greater than 85% of the EOS number calculated according to subparagraph 4.1.

4.4 Fuel oil tanks located within the cargo tank length should be considered as cargo oil tanks for the purpose of calculating the EOS numbers.

Methodology for calculation of the hypothetical oil outflow

5 The methodology detailed in this paragraph should be used for calculating the Equivalent Oil Spill number as required by paragraph 4.

5.1 **Damage assumptions**

The damage assumptions identified below should be applied to all oil tanks when calculating the Equivalent Oil Spill number.

5.1.1 **Side damage**

Longitudinal extent	l_c	=	$1/3L^{2/3}$ or 14.5m whichever is less
Transverse extent	t_c	=	B/5 or 11.5m whichever is less
Vertical extent	v_c	=	from the baseline upwards without limit

5.1.2 **Bottom damage**

Longitudinal extent	l_s	=	0.2 L
Transverse extent	b_s	=	B/6 or 10m whichever is less but not less than 5m
Vertical extent from the base line	v_s	=	B/15

5.2 **Calculation of outflow in case of side damage**

Calculation of the outflow from a side damage should be done as follows:

Length in meters between the forward and after extremities of the cargo tanks	=	L_t	(m)
Length of tank number "i"	=	l_i	(m)
Distance from hull plating to the tank boundary	=	s_i	(m)
Cargo volume in tank number "i"	=	V_i	(m^3)
Length of side damage according to subpara 5.1.1	=	l_c	(m)
Transverse extent of damage according to subpara 5.1.1	=	t_c	(m)

Even longitudinal distribution of damage location is assumed

Probability factor for breaching tank number "i" due to side damage

$$q_{ci} = (1 - s_i/t_c)\,\frac{(l_i + l_c)}{(L_t + l_c)}$$

$(1 - s_i/t_c)$ to be ≥ 0

Total hypothetical outflow in case of a side damage

$$O_c = \Sigma\, q_{ci} \cdot V_i$$

This calculation method gives appropriate credit for any number and size of side ballast tanks. It also takes into account the effect of the cargo tank size. The risk of breaching a longitudinal bulkhead and outflow from centre tanks is also taken into account.

5.3 Calculation of outflow in case of bottom damage

Calculation of the outflow from bottom damages should be done as follows:

Length in meters between the forward and after extremities of the cargo tanks	=	L_t	(m)
Width of the cargo tank area	=	B_t	(m)

Length of tank number "i"	=	l_i	(m)
Width of tank number "i"	=	b_i	(m)
Height of a double bottom	=	h_i	(m)
Cargo volume in tank number "i"	=	V_i	(m^3)
Length of a bottom damage according to subparagraph 5.1.2	=	l_s	(m)
Width of a bottom damage according to subparagraph 5.1.2	=	b_s	(m)
Vertical extent of a bottom damage according to subparagraph 5.1.2	=	v_s	(m)

Probability factor for breaching tank number "i" due to bottom damage

$$q_{si} = (1-h_i/v_s) \cdot \frac{(l_i + l_s)(b_i + b_s)}{(L_t + l_s)(B_t + B_s)}$$

$(1- h_i/v_s)$ to be ≥ 0

Nominal density of the cargo according to para 4	=	ρ_c	(t/m^3)
Density of the sea water (normally 1.025)	=	ρ_s	(t/m^3)
Loaded condition draft	=	d	(m)
Height of cargo column above the cargo tank bottom	=	h_c	(m)
Highest normal overpressure in the inert gas system (normally 0.05 bar)	=	Δp	(bar)
Margin for average transient loss, swell and tide effects	=	1.1	
Standard acceleration of gravity g	=	$9.81 m/s^2$	

Outflow factor due to hydrostatic overpressure in tank number "i"

$$q_{hi} = 1 - \frac{(\rho_s . (d - h_i) . g - 100\Delta p)}{1.1 \; . \; \rho_c \; . \; h_c \; . \; g}$$

q_{hi} to be ≥ 0

Outflow from tank number "i"

$$O_{si} = q_{si} . q_{hi} \; . \; V_i$$

Total hypothetical outflow in case of a bottom damage

$$O_s = \Sigma \; q_{si} \; . q_{hi} \; . \; V_i$$

In case the ship is equipped with a double bottom the calculated outflow from tanks located above such double bottom may be assumed to be reduced by 50% of the total capacity of the affected double bottom tanks but in no case by more than 50% of the calculated outflow from each tank.

Calculation of total outflow in case of a side or bottom damage

5.4 The outflow calculated under subparagraphs 5.2 and 5.3 above should be combined to the total hypothetical outflow as follows:

$$O_{tot} = 0.4 \; . \; O_c + 0.6 \; . \; O_s$$

Outflow reducing arrangements

6 Alternative outflow reducing methods as permitted under regulation 13G(7) may include a single method or a combination of methods giving protection in case of collision or stranding or both. Methods that have been approved by the MEPC are identified in the Appendix.

Other methods may be accepted by the Organization. Such methods should, in addition to meeting the outflow criteria given in paragraphs 4 and 5, be evaluated in each individual case for acceptability from general operational and safety points of view. In particular any such method:

should not expose the tanker to an unacceptable stress level in intact condition and should not cause the accidental hull damage to be exacerbated;

should not create an unacceptable additional fire or explosion hazard.

Operations Manual

7 The Master should be supplied with operational instructions, approved by the Administration, in which the operational conditions required for compliance with these guidelines should be clearly described. These instructions may be contained in a separate manual or be incorporated into existing shipboard manuals. These instructions should identify approved loading conditions, including part load conditions and including any ballasting used for obtaining these conditions. It should also contain information on the use of inert gas system and relevant trim, stress and stability information.

Endorsement of the IOPP Certificate/Supplement

8 The IOPP Certificate/Supplement should be endorsed to identify the structural or operational measures approved in accordance with regulation 13(G)(7) as well as the approved operations instructions.

APPENDIX

Arrangements acceptable as alternatives under regulation 13G(7) of Annex I of MARPOL 73/78

This appendix contains detailed requirements on arrangements accepted by the MEPC as alternatives under the provisions of regulation 13G(7) of Annex I of MARPOL 73/78. At the time of development this appendix contains only one approved alternative method.

Requirements for application of hydrostatic balanced loading in cargo tanks

Hydrostatic balance loading is based on the principle that the hydrostatic pressure at the cargo tank bottom of the cargo oil column plus the ullage space inert gas overpressure remains equal to or less than the hydrostatic pressure of the outside water column, thereby mitigating the outflow of oil in case of bottom damage.

The maximum cargo level in each tank being loaded under this criterion should therefore satisfy the following equation:

$$h_c \cdot \rho_c \cdot g + 100\Delta P \leq (d - h_i) \cdot \rho_s \cdot g$$

where:

h_c	is the maximum acceptable cargo level in each tank, measured from the cargo tank bottom,	(m)
ρ_c	is the density of the current cargo,	(t/m^3)
d	is the corresponding draught of the vessel,	(m)
h_i	is the height of the tank bottom above the keel,	(m)
ΔP	is the highest normal overpressure in the inert gas system, expressed in bar (normally 0.05 bar),	(bar)
ρ_s	is the density of the sea water,	(t/m^3)
g	is the standard acceleration of gravity ($g = 9.81\ m/s^2$).	

Ballast may be carried in segregated ballast tanks to increase draught to a larger value. This may be used to allow more cargo to be taken into cargo tanks within the hydrostatic equilibrium criterion and within the limits of the assigned load line.

The arrangements and procedures for operation with the hydrostatic balance method should be approved by the Administration. The approval should be based on a system specification and documentation, incorporating also:

.1 calculations made to confirm whether or not resonance can occur between the natural period of longitudinal cargo liquid motion and the natural period of pitching of the ship, and also between the natural period of transverse cargo liquid motion and the natural period of rolling of the ship under approved cargo loading conditions and in any cargo tanks. In this context 'resonance can occur' means that the natural period of longitudinal motion of cargo oil is within the range from 60% to 130% of the natural period of pitching of the ship and/or the natural period of transverse motion of cargo is within the range from 80% to 120% of the natural period of rolling of the ship. When resonance can occur between ship's motion and cargo liquid motion, the sloshing pressure caused by such resonance should be estimated, and it should be confirmed that the existing structure has sufficient strength to withstand the estimated sloshing pressure; and

.2 calculations of intact and damage stability, including the effects of free surface. Damage stability calculations are however only required for ships defined in regulation 1(6).

When the accidental outflow reduction requirement can be met by applying hydrostatic loading to a limited number of tanks, wing tanks should have priority, thereby ensuring some reduction also in outflow from a side damage and minimizing sloshing in part loaded centre tanks.

When operating in a multiport loading or unloading mode using the hydrostatic balance loading method, tanks covering at least 30% of the side of the length of the cargo section should be kept empty until the last loading location or should be unloaded at the first unloading location.

Copies of certified ullage measurement reports should be kept on board, clearly identified, for at least three years.

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