

RESOLUTION A.446(XI) adopted on 15 November 1979
REVISED SPECIFICATIONS FOR THE DESIGN, OPERATION
AND CONTROL OF CRUDE OIL WASHING SYSTEMS



Distr.
GENERAL

A XI/Res.446
6 March 1980

Original: ENGLISH

ASSEMBLY - 11th session
Agenda item 11

IMCO

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REVISED SPECIFICATIONS FOR THE DESIGN, OPERATION
AND CONTROL OF CRUDE OIL WASHING SYSTEMS

THE ASSEMBLY,

RECALLING resolution A.297(VIII) by which it established the Marine Environment Protection Committee and specified the functions and responsibilities of that Committee,

RECALLING ALSO Regulation 13B(2) of Annex I of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973, concerning requirements for crude oil washing and resolution 15 of the International Conference on Tanker Safety and Pollution Prevention, 1978, which contains the Specifications for the Design, Operation and Control of Crude Oil Washing Systems,

RECALLING FURTHER that by the same resolution the Conference requested the Organization to review and revise, as necessary, the Specifications to reflect the latest technology and practices as may be developed by the time of entry into force of the Protocol,

HAVING CONSIDERED the recommendation made by the Marine Environment Protection Committee at its eleventh session,

1. ADOPTS:

(a) The revised Specifications for the Design, Operation and Control of Crude Oil Washing Systems, the text of which is set out in the Annex to the present resolution, to supersede the Specifications for the Design, Operation and Control of Crude Oil Washing Systems contained in resolution 15 of the International Conference on Tanker Safety and Pollution Prevention, 1978;

(b) Agreed interpretations of certain of the provisions of the revised Specifications as shown in Appendix III of the revised Specifications.

2. URGES Governments to establish, in time for the entry into force of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973, requirements for the crude oil washing installation and associated equipment and arrangements based on the revised Specifications;

3. URGES FURTHER that the requirements to be established by Administrations should not impose requirements over and above those as laid down in the revised Specifications.

ANNEX

REVISED SPECIFICATIONS FOR THE DESIGN, OPERATION AND CONTROL OF CRUDE OIL WASHING SYSTEMS

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1. PURPOSE

The purpose of these Specifications is to provide specific design criteria, operational requirements and control and enforcement procedures for the crude oil washing of cargo tanks of crude oil carriers as specified in section 2.

2. APPLICATION

2.1 These Specifications apply to:

- (a) Existing crude oil tankers of 40,000 tons deadweight and above in accordance with Regulation 13(8) of Annex I of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL Protocol); and
- (b) New crude oil tankers of 20,000 tons deadweight and above in accordance with Regulation 13(6) of Annex I of the MARPOL Protocol, with the changes listed in Appendix I.

Compliance of these ships with these Specifications shall be shown on the International Oil Pollution Prevention Certificate as modified by the MARPOL Protocol.

2.2 If a crude oil that is not suitable for crude oil washing is intended to be carried as cargo in a ship that is provided with only a crude oil washing system, then that ship must comply with segregated ballast tank requirements in accordance with Regulation 13(7) or dedicated clean ballast tank requirements in accordance with Regulation 13(9) of Annex I of the MARPOL Protocol.

3. GENERAL PROVISIONS

3.1 *Definition*

For the purpose of these Specifications:

3.1.1 "Arrival ballast" means clean ballast as defined in Regulation 1(16) of Annex I of the MARPOL Protocol.

3.1.2 "Departure ballast" means ballast other than arrival ballast.

3.2 *Initial survey*

The initial survey referred to in Regulation 4 of Annex I of the MARPOL Protocol shall include a complete inspection of the crude oil washing equipment and arrangements and shall include, except for the cases specified in 4.2.11, an examination of the tanks after they have been crude oil washed and the additional controls as specified in 4.2.10 to ensure that the washing system efficiency is in accordance with these Specifications.

4. DESIGN CRITERIA

4.1 *Piping*

4.1.1 The crude oil washing pipes and all valves incorporated in the supply piping system shall be of steel or other equivalent material and shall be of adequate strength having regard to the pressure to which they may be subjected, and shall be properly jointed and supported.

4.1.2 The crude oil washing system shall consist of permanent pipework and shall be independent of the fire mains and of any system other than for tank washing except that sections of the ship's cargo system may be incorporated into the crude oil washing system provided that they

meet the requirements applicable to crude oil pipework. Notwithstanding the above requirements, in combination carriers the arrangement may allow:

- (a) The removal of the equipment, if necessary, when carrying cargoes other than crude oil, provided that, when reinstated, the system is as originally fitted and tested for oil tightness;
- (b) The use of flexible hose pipes to connect the crude oil washing system to tank washing machines if it is necessary to locate these machines in a cargo tank hatch cover. Such flexible hose pipes must be provided with flanged connexions and be manufactured and tested in accordance with standards acceptable to the Administration and be consistent with the duties the hoses are required to perform. The length of these hoses shall be no greater than necessary to connect the tank washing machines to an adjacent point just outside the hatch coaming. These hoses shall be removed to suitably prepared and protected stowage when not in use and be pressure tested by an authority acceptable to the Administration at intervals of not more than two and a half years.

4.1.3 Provision shall be made to prevent overpressure in the tank washing supply piping. Any relief device fitted to prevent overpressure shall discharge into the suction side of the supply pump. Alternative methods to the satisfaction of the Administration may be accepted provided an equivalent degree of safety and environmental protection is provided.

4.1.4 Where hydrant valves are fitted for water washing purposes on tank washing lines, all such valves shall be of adequate strength and provision shall be made for such connexions to be blanked off by blank flanges when washing lines may contain crude oil. Alternatively, hydrant valves shall be isolated from the crude oil washing system by spade blanks.

4.1.5 All connexions for pressure gauges or other instrumentation shall be provided with isolating valves adjacent to the lines unless the fitting is of the sealed type.

4.1.6 No part of the crude oil washing system shall enter the machinery spaces. Where the tank washing system is fitted with a steam heater for use when water washing, the heater must be effectively isolated during crude oil washing by double shut-off valves or by clearly identifiable blanks.

4.1.7 Where a combined crude oil-water washing supply piping is provided the piping shall be so designed that it can be drained so far as is practicable of crude oil, before water washing is commenced, into spaces designated in the Operations and Equipment Manual. These spaces may be the slop tank or other cargo spaces.

4.1.8 The piping system shall be of such diameter that the greatest number of tank cleaning machines required, as specified in the Operations and Equipment Manual, can be operated simultaneously at the designed pressure and throughput. The arrangement of the piping shall be such that the required number of tank cleaning machines to each cargo compartment as specified in the Operations and Equipment Manual referred to in these Specifications can be operated simultaneously.

4.1.9 The piping system shall be tested to one and one half times the working pressure after it has been installed on the ship.

4.1.10 The crude oil washing supply piping shall be anchored (firmly attached) to the ship's structure at appropriate locations, and means shall be provided to permit freedom of movement elsewhere to accommodate thermal expansion and flexing of the ship. The anchoring shall be such that any hydraulic shock can be absorbed without undue movement of the supply piping. The anchors should normally be situated at the ends furthest from the entry of the crude oil supply to the supply piping. If tank washing machines are used to anchor the ends of branch pipes then special arrangements are necessary to anchor these sections when the machines are removed for any reason.

4.2 *Tank washing machines*

4.2.1 The tank washing machines for crude oil washing shall be permanently mounted and shall be of a design acceptable to the Administration.

4.2.2 The performance characteristic of a tank washing machine is governed by nozzle diameter, working pressure and the movement pattern and timing. Each tank cleaning machine fitted shall have a characteristic such that the sections of the cargo tank covered by that machine will be effectively cleaned within the time specified in the Operations and Equipment Manual.

4.2.3 Tank washing machines shall be mounted in each cargo tank and the method of support shall be to the satisfaction of the Administration. Where the tank washing machines are positioned well below the deck level to cater for protuberances in the tank, consideration may need to be given to additional support for the machine and its supply piping.

4.2.4 Each machine shall be capable of being isolated by means of stop valves in the supply line. If a deck mounted tank washing machine is removed for any reason, provision shall be made to blank off the oil supply line to the machine for the period the machine is removed. Similarly, provision shall be made to close the tank opening with a plate or equivalent means.

4.2.5 Where the drive units for the tank cleaning machines are not integral with the tank cleaning machine, sufficient drive units shall be provided to ensure that no drive unit need be moved more than twice from its original position during cargo discharge to accomplish the washing programme as specified in the Operations and Equipment Manual.

4.2.6 The number and location of the tank washing machines shall be to the satisfaction of the Administration.

4.2.7 The location of the machines is dependent upon the characteristics detailed in 4.2.2 and upon the configuration of the internal structure of the tank.

4.2.8 The number and location of the machines in each cargo tank shall be such that all horizontal and vertical areas are washed by direct impingement or effectively by deflection or splashing of the impinging jet. In assessing an acceptable degree of jet deflection and splashing, particular attention shall be paid to the washing of upward facing horizontal areas and the following parameters shall be used:

- (a) For horizontal areas of a tank bottom and the upper surfaces of a tank's stringers and other large primary structural members, the total area shielded from direct impingement by deck or bottom transverses, main girders, stringers or similar large primary structural members shall not exceed 10 per cent of the total horizontal area of tank bottom, the upper surface of stringers, and other large primary structural members.
- (b) For vertical areas of the sides of a tank, the total area of the tank's sides shielded from direct impingement by deck or bottom transverses, main girders, stringers or similar large primary structural members shall not exceed 15 per cent of the total area of the tank's sides.
- (c) For existing crude oil tankers, the Administration may permit the percentages required in (a) and (b) above to be exceeded for tanks having complicated internal structural members provided that the percentages calculated over all the cargo tanks do not exceed 10 per cent for horizontal areas and 15 per cent for vertical areas.

In some installations it may be necessary to consider the fitting of more than one type of tank washing machine in order to effect adequate coverage.

4.2.9 At the design stage the following minimum procedures shall be used to determine the area of the tank surface covered by direct impingement:

- (a) Using suitable structural plans, lines are set out from the tips of each machine to those parts of the tank within the range of the jets.
- (b) Where the configuration of the tanks is considered by the Administration to be complicated, a pinpoint of light simulating the tip of the tank washing machine in a scale model of the tank shall be used.

4.2.10 (a) To confirm the cleanliness of the tank and to verify the design in respect of the number and location of the tank washing machines, a visual inspection shall be made by entry to the tanks after a crude oil wash but prior to any water rinse which may be specified in the Operations and Equipment Manual. The bottom of the tank to be inspected may, however, be flushed with water and stripped in order to remove any heel of crude oil before gas freeing for entry. This inspection shall ensure that the tank is essentially free of oil clingage and deposits. If the flushing procedure is adopted, a similar but unflushed tank must be used for the test specified in (b) below.

(b) To verify the effectiveness of the stripping and drainage arrangements, a measurement shall be made of the amount of oil floating on top of the departure ballast. The ratio of the volume of oil on top of the total departure ballast water to the volume of tanks that contain this water shall not exceed 0.00085. This test shall be carried out after crude oil washing and stripping in a tank similar in all relevant respects to the tank examined in accordance with (a) above, which has not been subjected to a water rinse or to the intervening water flushing permissible in (a) above.

(c) To verify the design, installation and operation of the system, the arrival ballast, after a typical ballast voyage before which the arrival ballast tanks have been crude oil washed and during which the tanks have been water rinsed in accordance with the programme set out in the Operations and Equipment Manual, shall be totally discharged to the loading port harbour through an oil monitoring system approved by the Administration, and the oil content of the effluent in this test shall not exceed 15 ppm.

4.2.11 Where an Administration is satisfied that ships are similar in all relevant respects, the requirements of 4.2.10 need only be applied to one such ship. Furthermore, where a ship has a series of tanks that are similar in all relevant respects then, for that series of tanks, the requirements of 4.2.10(a) need only be applied to one tank of that series.

4.2.12 The design of the deck mounted tank washing machines shall be such that means are provided external to the cargo tanks which, when crude oil washing is in progress, would indicate the rotation and arc of the movement of the machine. Where the deck mounted machine is of the non-programmable, dual nozzle type, alternative methods to the satisfaction of the Administration may be accepted provided an equivalent degree of verification is attained.

4.2.13 Where submerged machines are required, they should be non-programmable and, in order to comply with the requirements of 4.2.8, it must be possible to verify their rotation by one of the following methods:

- (a) By indicators external to the tank;
- (b) By checking the characteristic sound pattern of the machine, in which case the operation of the machine shall be verified towards the end of each wash cycle. Where two or more submerged machines are installed on the same supply line, valves shall be provided and arranged so that operation of each machine can be verified independently of the other machines on the same supply line;

- (c) By gas freeing the tank and checking the operation of the machine with water during ballast voyages. In this case the check shall take place after a maximum of six usages of the machine but the interval between checks shall not exceed 12 months. Each verification shall be recorded in Supplement 2 to the Oil Record Book.

The method of verification shall be stated in the Operations and Equipment Manual.

4.3 *Pumps*

4.3.1 The pumps supplying crude oil to the tank cleaning machines shall be either the cargo pumps or pumps specifically provided for the purpose.

4.3.2 The capacity of the pumps shall be sufficient to provide the necessary throughput at the required pressure for the maximum number of tank cleaning machines required to be operated simultaneously as specified in the Operations and Equipment Manual. In addition to the above requirement, the pumps shall, if an eductor system is fitted for tank stripping, be capable of supplying the eductor driving fluid to meet the requirements of 4.4.2.

4.3.3 The capacity of the pumps shall be such that the requirements of 4.3.2 can be met with any one pump inoperative. The pumping and piping arrangements shall be such that the crude oil washing system can be effectively operated with any one pump out of use.

4.3.4 The carriage of more than one grade of cargo shall not prevent crude oil washing of tanks.

4.3.5 To permit crude oil washing to be effectively carried out where the back pressure presented by the shore terminal is below the pressure required for crude oil washing, provision shall be made such that an adequate pressure to the washing machines can be maintained in accordance with 4.3.2. This requirement shall be met with any one cargo pump out of action. The minimum supply pressure required for crude oil washing shall be specified in the Operations and Equipment Manual. Should this minimum supply pressure not be obtainable, crude oil washing operations shall not be carried out.

4.4 *Stripping system*

4.4.1 The design of the system for stripping crude oil from the bottom of every cargo tank shall be to the satisfaction of the Administration.

4.4.2 The design and capacity of the tank stripping system shall be such that the bottom of the tank being cleaned is kept free of accumulations of oil and sediment towards completion of the tank washing process.

4.4.3 The stripping system shall be capable of removing oil at a rate of 1.25 times the total throughput of all the tank cleaning machines to be operated simultaneously when washing the bottom of the cargo tanks as described in the ship's Operations and Equipment Manual.

4.4.4 Means such as level gauges, hand dipping and stripping system performance gauges as referred to in 4.4.8 shall be provided for checking that the bottom of every cargo tank is dry after crude oil washing. Suitable arrangements for hand dipping must be provided at the aftermost portion of a cargo tank and in three other suitable locations unless other approved means are fitted for efficiently ascertaining that the bottom of every cargo tank is dry. For the purpose of this paragraph, the cargo tank bottom shall be considered "dry" if there is no more than a small quantity of oil near the stripping suction with no accumulation of oil elsewhere in the tank.

4.4.5 Means shall be provided to drain all cargo pumps and lines at the completion of cargo discharge, where necessary, by connexion to a stripping device. The line and pump draining shall be capable of being discharged both to a cargo tank and ashore. For discharge ashore a special small diameter line shall be provided for that purpose and connected outboard of the ship's manifold valve. For new oil tankers or existing oil tankers not already fitted with such a line

the cross-sectional area of this line shall not exceed 10 per cent of that of a main cargo discharge line. Where such a line is already fitted on an existing tanker, a cross-sectional area of not more than 25 per cent of that of a main cargo discharge line may be accepted.

4.4.6 The means for stripping oil from the cargo tanks shall be by positive displacement pump, self-priming centrifugal pump or eductor or other methods to the satisfaction of the Administration. Where a stripping line is connected to a number of tanks, means shall be provided for isolating each tank not being stripped at that particular time.

4.4.7 The carriage of more than one grade of cargo shall not prevent crude oil washing of tanks.

4.4.8 Equipment shall be provided for monitoring the efficiency of the stripping system. All such equipment shall have remote read out facilities in the cargo control room or in some other safe and convenient place easily accessible to the officer in charge of cargo and operations. Where a stripping pump is provided, the monitoring equipment shall include either a flow indicator, or a stroke counter or revolution counter as appropriate, and pressure gauges at the inlet and discharge connexions of the pump or equivalent. Where eductors are provided the monitoring equipment shall include pressure gauges at the driving fluid intake and at the discharge and a pressure/vacuum gauge at the suction intake.

4.4.9 The internal structure of the tank shall be such that drainage of oil to the tank suction of the stripping system is adequate to meet the requirements of 4.4.2 and 4.4.4. Care shall be taken that both longitudinal and transverse drainage are satisfactory and shall be verified during the inspection required by 3.2 and 4.2.10.

4.4.10 The trim conditions for crude oil washing given in the Operations and Equipment Manual shall be adhered to. In general, trim by the stern is only important during the final stages of tank discharge and shall be the maximum possible compatible with operational constraints but in no case less than that recorded during the crude oil washing prior to the inspection required by 3.2 and 4.2.10.

4.5 *Ballast lines*

4.5.1 Where a separate ballast water system for ballasting cargo tanks is not provided, the arrangement shall be such that the cargo pump, manifolds and pipes used for ballasting can be safely and effectively drained of oil before ballasting.

5. QUALIFICATION OF PERSONNEL

5.1 The training requirements of ships' personnel engaged in the crude oil washing of tankers shall be to the satisfaction of the Administration.

5.2 Where a person such as the master, the chief officer or the cargo control officer assumes overall charge of a crude oil wash he shall:

- (a) Have at least one year's experience on oil tankers where his duties have included the discharge of cargo and associated crude washing. Where his duties have not included crude oil washing operations, he shall have completed a training programme in crude oil washing in accordance with Appendix II to these Specifications and satisfactory to the Administration;
- (b) Have participated at least twice in crude oil wash programmes one of which shall be in the particular ship for which he is required to undertake the responsibility of cargo discharge. Alternatively, this latter participation may be acceptable if undertaken on a ship that is similar in all relevant respects; and
- (c) Be fully knowledgeable of the contents of the Operations and Equipment Manual.

5.3 Where other nominated persons are intended to have particular responsibilities as defined in the Operations and Equipment Manual they shall have at least 6 months' experience on oil tankers where, in the course of their duties, they should have been involved in the cargo discharge operation. In addition, they should have been instructed in the crude oil washing operation in the particular ship for which they are required to undertake this responsibility and be fully knowledgeable of the contents of the Operations and Equipment Manual. Appendix II to these Specifications should be used as guidance in establishing the content of such instruction.

6. OPERATION

6.1 *Tankage to be crude oil washed*

Before departure on a ballast voyage, after the complete discharge of cargo, sufficient tanks shall have been crude oil washed in accordance with the procedures specified in the Operations and Equipment Manual to ensure that:

- (a) As a minimum, sufficient tanks have been washed to permit compliance with the draught and trim requirements of Regulation 13(2)(a), (b) and (c) of Annex I of the MARPOL Protocol during all phases of the ballast voyage; and
- (b) Account is taken of the ship's trading pattern and the expected weather conditions so that additional ballast water is not put into tanks which have not been crude oil washed.

In addition to the tanks referred to in (a) above, approximately one quarter of all remaining tanks shall be crude oil washed for sludge control on a rotational basis, but these additional tanks may include the tanks referred to in (b) above. However, for sludge control purposes, no tank need be crude oil washed more than once in every four months. Crude oil washing shall not be conducted between the final discharge and loading ports; that is to say, no crude oil washing shall be undertaken during the ballast voyage. Ballast water shall not be put into tanks that have not been crude oil washed. Water that is put into a tank which has been crude oil washed but not water rinsed shall be regarded as dirty ballast.

6.2 *Drainage and discharge ashore of cargo lines*

At the end of cargo discharge all cargo mains and stripping lines shall be drained and stripped and the drainings and strippings discharged ashore via the special diameter line required by 4.4.5. In addition all cargo tanks are to be stripped before the ship leaves its final port of discharge.

6.3 *Filling of departure ballast tanks*

Care shall be taken at the completion of crude oil washing of any departure ballast tank to strip the tank as completely as possible. Where departure ballast is filled through cargo lines and pumps, these must be drained and stripped of oil using the means required by 4.4.5 before ballast is loaded.

6.4 *Crude oil washing at sea*

All crude oil washing must be completed before the ship leaves its final port of discharge. Where any tank is crude oil washed while the ship is at sea between multiple discharge ports, the tank shall be left empty and available for inspection at the next discharge port before commencing the next ballast voyage. This inspection may consist of multiple sounding/dipping of the bottom of the tank when the tank is empty. Departure ballast tanks shall be ballasted prior to departure from port so that examination of the surface of the ballast water can be made. In the latter case the guidance given in 4.2.10(b) is relevant to the inspection.

6.5 *Discharge of oily water effluents on ballast voyage*

The discharge of departure ballast and any other water effluent discharged during the ballast voyage shall comply with the requirements of Regulation 9 of Annex I of the MARPOL Protocol.

6.6 *Use and control of inert gas*

On ships to which these Specifications apply, no tank shall be crude oil washed unless the inert gas system required by Regulation 13B(3) of Annex I of the MARPOL Protocol is in proper operation. Before each tank is crude oil washed, the oxygen level shall be determined at a point 1 metre from the deck and at the middle region of the ullage space and neither of these determinations shall exceed 8 per cent by volume. Where tanks have complete or partial wash bulkheads, the determinations should be taken from similar levels in each section of the tank. The oxygen level of the inert gas being delivered during the washing process shall be continuously monitored. If during crude oil washing:

- (a) The oxygen level of the inert gas being delivered exceeds 8 per cent by volume; or
- (b) The pressure of the atmosphere at the tanks is no longer positive;

then the washing must be stopped until satisfactory conditions are restored.

6.7 *Precautions against electrostatic generation*

To avoid excessive electrostatic generation in the washing process due to the presence of water in the crude oil washing fluid, the contents of any tank to be used as a source of crude oil washing fluid must first be discharged by at least 1 metre before being so used. Any tank used as a slop tank on the previous ballast voyage shall be completely discharged and refilled with dry crude oil if that tank is to be used as a source of washing fluid.

6.8 *Vapour emission*

On ships to which these Specifications apply there shall be means to avoid vapour emission during the filling of departure ballast wherever local conditions require it. The method of preventing the emission of hydrocarbon vapour into the atmosphere shall be:

- (a) By the use of permanent ballast tanks wherever these are sufficient to provide the minimum departure draught; or
- (b) By containment of vapour in empty cargo tanks by simultaneous ballasting and cargo discharge.

Alternative methods to the satisfaction of the Administrations may be accepted provided an equivalent degree of environmental protection is provided.

7. OPERATIONS AND EQUIPMENT MANUAL

The Operations and Equipment Manual must be to the satisfaction of the Administration and shall contain the following information and operational instructions:

- (a) The complete text of the revised Specifications for the Design, Operation and Control of Crude Oil Washing Systems.
- (b) A line drawing of the crude oil washing system showing the respective position of pumps, lines and washing machines which relate to the crude oil washing system.
- (c) A description of the system and a listing of procedures for checking that equipment is working properly during crude oil washing operations. This shall include a listing of the system and equipment parameters to be monitored, such as line pressure, oxygen

level, machine revolutions, duration of cycles, etc. The established values for these parameters shall be included. The results of the tests carried out in accordance with 4.2.10 and the values of all parameters monitored during such tests shall also be included.

- (d) Details of the requirements of section 6 of these Specifications together with advice and instructions, where appropriate, in meeting these requirements such as:
 - (i) Recommended methods and programmes of crude oil washing in order to accord with all foreseeable circumstances of cargo discharge restraints and to obtain maximum trim during the completion of washing and draining of each tank.
 - (ii) The procedure on ships to avoid vapour emission in accordance with 6.8.
 - (iii) The method of draining tanks which shall include information on optimum trim conditions as required by 4.4.10.
 - (iv) The method of draining cargo pumps, cargo lines, crude oil washing lines and stripping lines, and spaces into which they may be drained, together with the final discharge ashore via the small discharge line on completion of discharge.
 - (v) Typical washing programmes under various conditions of loading specifying:
 - (1) The tanks to be washed in accordance with 6.1;
 - (2) The method for washing each tank, that is single or multi-stage;
 - (3) The number of tank washing machines to be used simultaneously;
 - (4) The duration of the crude oil wash and water rinse where the latter is appropriate;
 - (5) The volume of water used for water rinse, which shall be at least equal to that used in the water rinse prior to the inspection required by 3.2 and 4.2.10; and
 - (6) The preferred order in which the tanks are to be washed.
 - (vi) The procedure for draining and stripping, where appropriate, cargo lines and pumps before being used for the loading of departure ballast.
 - (vii) The procedure for water washing lines before discharge of departure ballast and the loading and final discharge of arrival ballast.
 - (viii) The procedure for verifying by sound patterns that bottom mounted machines are operating shall be carried out towards the end of the wash cycle for each tank. When carrying out such verification all other machines shall be shut down if necessary.
 - (ix) Precise details of procedure to ensure compliance with Regulation 9 of Annex I of the MARPOL Protocol in the discharge of departure ballast, the water flushing of lines and the decanting of the slop tanks at sea.
- (e) The dangers of leakage from the crude oil washing system and the precautions necessary to prevent leakage and the action to be taken in the event of a leakage. Guidance shall be given on how the crude oil washing system is to be operationally tested for leakage before each discharge.
- (f) The method of preventing the entry of oil to the engine room through steam heaters as required by 4.1.6.

- (g) The personnel required at all times to conduct the dual operation of discharging cargo and crude oil washing. The numbers of such personnel shall include:
 - (i) The person meeting the requirements of 5.2 who will have overall control of the crude oil washing process;
 - (ii) Those persons meeting the requirements of 5.3 who will be expected to undertake the actual operation; and
 - (iii) At least one person on deck at all times during washing to keep watch for leaks and malfunctioning of equipment, to test the oxygen content of tanks before washing, to check tank atmosphere pressure, to sound tank bottoms if required, to lift ullage floats if necessary and to change drive units when this is necessary.

The duties of such persons are not necessarily mutually exclusive.

- (h) An effective means of communication between the watchkeeper on deck and the cargo control position so that in the event of a leak in or malfunctioning of the crude oil washing system the washing may be stopped as soon as possible.
- (i) The typical procedures for ballasting.
- (j) A pre-crude oil wash operational check list for the use of the crew at each discharge which shall include the checking and calibration of all instruments.
- (k) The recommended intervals for on board inspection and maintenance of crude oil washing equipment in addition to statutory surveys. Reference should be made to technical manuals supplied by the manufacturers of the equipment.
- (l) A list of crude oils unsuitable for the crude oil washing process and their origin.

Appendix I

LIST OF CHANGES WHEN APPLYING THE SPECIFICATIONS TO NEW CRUDE OIL TANKERS OF 20,000 TONS DEADWEIGHT AND ABOVE

Paragraph number	List of changes
4.2.5	This paragraph is not applicable.
4.2.10	Subparagraph (c) is not applicable.
6.1	Replace by the following:
6.1	<i>Tankage to be crude oil washed</i>
6.1.1	Before departure on a ballast voyage:
	(a) Approximately one quarter of the cargo tanks shall be crude oil washed for sludge control purposes on a rotational basis and in accordance with the procedures specified in the Operations and Equipment Manual. However, for these purposes, no tank need be crude oil washed more than once in every four months; and

- (b) If it is considered that additional ballast in a cargo tank or tanks may be required during the ballast voyage under the conditions and provisions specified in Regulation 13(3) of Annex I of the MARPOL Protocol, the tank or tanks which may be used for this ballast shall be crude oil washed in accordance with the procedures specified in the Operations and Equipment Manual.

6.1.2 Ballast water shall not be put into cargo tanks that have not been crude oil washed. Water that is put into a tank which has been crude oil washed but not water rinsed shall be regarded as dirty ballast.

6.1.3 Crude oil washing shall not be conducted between the final discharge and loading ports; that is to say, no crude oil washing shall be undertaken during the ballast voyage.

6.3 Replace by the following:

6.3 *Filling of additional ballasting cargo tanks*

Care shall be taken at the completion of crude oil washing of any cargo tank that might contain ballast to strip the tank as completely as possible. Where this ballast is filled through cargo lines and pumps, these must be drained and stripped of oil using the means required by 4.4.5.

6.4 The last two sentences are not applicable.

6.5 Replace by the following:

6.5 *Discharge of oily water effluents on ballast voyage*

The discharge of additional ballast from cargo tanks and any other water effluent discharged during the ballast voyage shall comply with the requirements of Regulation 9 of Annex I of the MARPOL Protocol.

6.8 This paragraph is not applicable.

7.4 This paragraph is not applicable.

Appendix II

TRAINING FOR PERSONS INTENDED TO ASSUME OVERALL CHARGE OF CRUDE OIL WASHING

INTRODUCTION

Any required training shall be supervised instruction, conducted in a shore-based facility or aboard a suitably equipped ship having training facilities and instructors for this purpose, dealing with the principles involved and the application of these principles to ship operation.

In drawing up an Administration-approved syllabus of training, the revised Specifications for the Design, Operation and Control of Crude Oil Washing Systems of tankers shall be taken into account.

Such training shall include but not necessarily be limited to:

- (a) An introduction to the principles of crude oil washing which shall include:
 - the characteristics of crude oil as a washing fluid and its contrast with water washing;
 - top washing;
 - bottom washing;
 - trim requirements;
 - methods of bleeding off from the cargo discharge;
 - maintenance of required washing fluid pressure;
 - washing at sea between discharge ports;
 - recirculatory washing;
 - relative priorities and requirements for the departure ballast tanks, arrival ballast tanks and cargo only tanks.
- (b) Equipment and design
 - (i) location of washing machines;
 - (ii) washing machines, deck mounted and submerged:
 - types;
 - characteristics;
 - features of construction;
 - operating parameters;
 - (iii) drive units;
 - (iv) washing fluid supply and distribution systems;
 - (v) stripping systems;
 - (vi) means of sounding tanks;
 - (vii) inert gas requirements.
- (c) Generalized crude oil washing procedures
 - (i) traditional pipeline ship/free flow ship/partial free flow ship;
 - (ii) single/multi parcel cargoes;
 - (iii) optimization of washing procedure in order to minimize extra berth time;
 - (iv) ballasting for departure with various ship and pipeline configurations;
 - (v) procedure for washing at sea between discharge ports.
- (d) Associated procedure
 - (i) means for minimizing residues on board
 - stripping of cargo tanks;
 - draining and stripping of cargo lines;
 - final discharge of cargo ashore;
 - (ii) water rinsing of arrival ballast tanks;
 - (iii) filling and ultimate discharge of arrival ballast;

- (iv) discharge of departure ballast;
 - (v) build-up and decanting of residues in slop tank;
 - (vi) requirements of Regulation 9 of Annex I of the MARPOL Protocol;
 - (vii) avoidance of venting in port during ballasting operations.
- (e) Safety
- (i) inert gas procedure;
 - (ii) maintenance and monitoring of inert gas quality and pressure;
 - (iii) stopping of washing/discharge under abnormal inert gas conditions;
 - (iv) electrostatic generation and the precautions required to avoid it;
 - (v) pipework integrity;
 - (vi) avoidance of surge pressures;
 - (vii) spillage.
- (f) Check lists
- (i) before entering port;
 - (ii) before commencing crude oil washing;
 - (iii) after crude oil washing;
 - (iv) after sailing.
- (g) Regulatory enforcement procedures
- (i) Operations and Equipment Manual;
 - (ii) Oil Record Book;
 - (iii) sounding of tanks;
 - (iv) measurement of oil on surface of departure ballast.
- (h) Maintenance of plant and equipment
- (i) maintenance of equipment in accordance with manufacturers' instructions;
 - (ii) additional maintenance items.

Administrations shall ensure that the training facility issues an appropriate document to those qualified in accordance with this Appendix to serve as officers primarily responsible for crude oil washing.

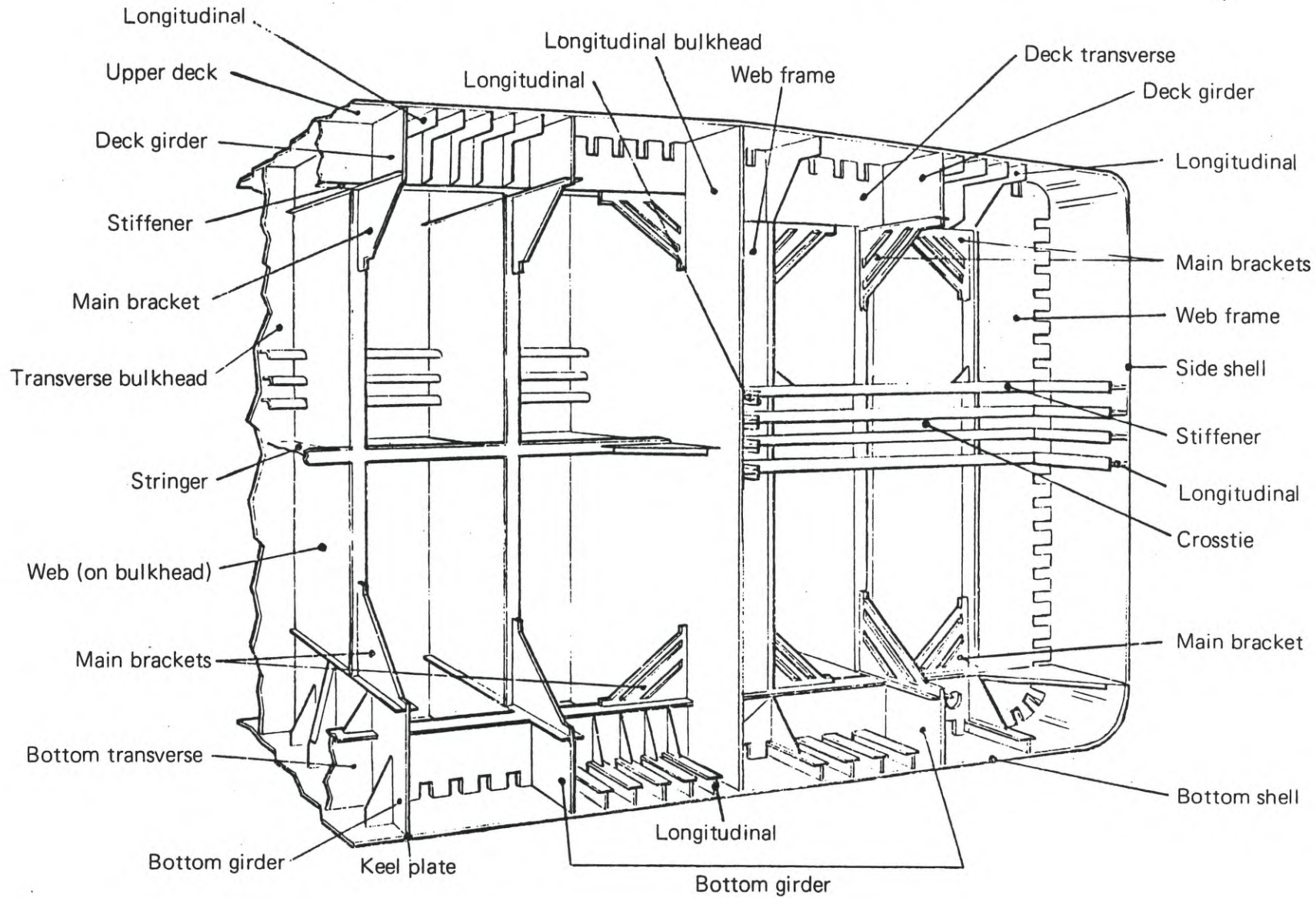
Appendix III

AGREED INTERPRETATIONS OF CERTAIN OF THE PROVISIONS OF THE REVISED SPECIFICATIONS

- 4.1.1 This paragraph requires pipes and valves to be of steel or other equivalent material. As classification societies permit grey cast iron for cargo piping with a maximum permissible working oil pressure of 16 kp/cm², grey cast iron may be permitted in the supply system for crude oil washing systems when complying with nationally approved standards.
- 4.1.3 The requirements of this paragraph allow alternative arrangements. One such alternative is that where the system is served only by centrifugal pumps so designed that the pressure derived cannot exceed that for which the piping is designed, a temperature sensing device located in the pump casing is required to stop the pump in the case of overheating.

- 4.1.6 On new oil tankers the steam heater referred to shall be located outside the machinery spaces. However, on an existing oil tanker with an existing steam heater located in the machinery spaces, no more additional isolation will be required other than that which isolates the crude oil washing system from the machinery spaces.
- 4.2.8 With regard to the application of this paragraph a slop tank is considered as a cargo tank.
- 4.2.9 *Guidelines for the assessment of shadow diagrams*
- (a) Shadow diagrams (to be prepared in accordance with 4.2.9) must be on drawings the scale of which must be at least:
- (i) 1:100 for tankers of less than 100,000 tons deadweight
 - (ii) 1:200 for tankers of 100,000 tons deadweight and above.
- (b) The drawings must provide at least a plan view, a profile view and an end elevation for each tank, or for tanks considered to be similar.
- (c) Sufficient detailed drawings of the vessel must be provided to check that all large primary structural members have been included.
- (d) The term "large primary structural members" is to be construed as those components of a tank structure which contribute significant strength to the ship such as web frames and girders. It is intended that smaller components such as those that contribute to plate stiffening be excluded. In general the following lists, in conjunction with the diagram showing structural components of cargo tanks, may be used to amplify this interpretation.
- | <i>Include</i> | <i>Disregard</i> |
|---|-------------------|
| (i) web frames | (i) longitudinals |
| (ii) girders | (ii) brackets |
| (iii) stringers | (iii) stiffeners |
| (iv) webs | (iv) ladders |
| (v) main bracket | (v) pipe work |
| (vi) transverses | |
| (vii) crossties in transverse web frames unless it can be verified by tank inspection that their presence does not affect the cleanliness of the tank. However, for the purpose of making an initial assessment where there are no more than two crossties and each is less than 1/15 of the total depth of the tank they may be ignored. | |
- (e) Shadows cast upon the underside of decks, web frames, centre and side girders can be ignored.
- (f) Calculations must be provided either on the drawing or separately to show how the percentages required by 4.2.8 have been arrived at. The calculations should be itemized so that it is possible to relate each item with a particular shadow area.
- (g) Where a curved surface is presented to jets it is not necessary to provide exact geometric projections to determine the resultant shadow. A reasonable estimate is acceptable.
- (h) For the purpose of determining the bottom area of wing tanks the breadth of the tank is to be taken as the horizontal distance measured across the top of the bottom longitudinal frames to the inside of the shell plating, midway between the tank bulkheads.
- (i) A swash bulkhead may be taken as a tank boundary. However, in this event the bulkhead must be assumed to have no openings in it.

DIAGRAM SHOWING STRUCTURAL COMPONENTS OF CARGO TANKS



- 4.2.10 "Water rinse" means the water washing process carried out in connexion with tank cleaning after crude oil washing and is not intended to be construed as limiting the amount of water needed in the process.
- 4.2.10(c) The "oil monitoring system" referred to in this paragraph means any approved system, including laboratory tests, which verifies that the oil content of the effluent does not exceed the stated level. If laboratory tests are to be conducted, standards contained in resolution A.393(X) should be used as guidance. Oil tankers engaging in a trade where discharge of cargo takes place in one port State and cargo loading in another port State create a special problem with respect to verification. Two alternatives available to confirm the tanker's capability are:
- (i) The tanker could be required to conduct the entire COW operations at the discharge port, taking inspectors to sea if necessary to observe water washing, handling of discharge ballast and departure of arrival ballast;
 - (ii) Co-ordination between the flag State Administrations and port States to obtain the required documentation.

However the test is performed, it should be decided on a case-by-case basis taking into account the service of the tanker and the availability of surveyors.

RESOLUTION A.446(XI) adopted on 15 November 1979
REVISED SPECIFICATIONS FOR THE DESIGN, OPERATION
AND CONTROL OF CRUDE OIL WASHING SYSTEMS