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GUIDELINES FOR SAFE OCEAN TOWING

1 The Maritime Safety Committee, at its seventieth session (7 to 11 December 1998), considered Guidelines for safe ocean towing, as prepared by the Sub-Committee on Ship Design and Equipment (DE) at its forty-first session (9 to 13 March 1998) and, in order to enhance safety of navigation and environmental protection, agreed to the need for such Guidelines for commercial towing operations which, by their nature, are not salvage or rescue towing services.

2 Recalling the adoption by the eighteenth session of the Assembly of resolution A.765(18) on Guidelines on the safety of towed ships and other floating objects, including installations, structures and platforms at sea and the availability of guidance to minimize the danger to navigation from towed objects, which have broken adrift from the towing vessel, have grounded or are out of control, the Committee approved the Guidelines for safe ocean towing, as set out in the annex.

3 Member Governments are invited to implement the annexed Guidelines and bring them to the attention of all parties concerned with ocean towing operations.

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1 PURPOSE

The objectives of these Guidelines are to ensure safety at sea, prevention of human injury or loss of life, avoidance of damage to the environment, in particular to the marine environment, and to property through providing minimum recommendations for the organization, planning and execution of ocean towages and the design of associated equipment.

2 APPLICATION

2.1 These Guidelines are applicable to international ocean towing operations from one State to another State. However, these guidelines may also be used for any other ocean towing operation.

2.2 These Guidelines do only apply to commercial towage operations, which are not in the nature of salvage. However, amongst towing vessels available to undertake such towing, priority should be given to those which are fitted to the nearest extent in line with section 12.

2.3 The status of these Guidelines is advisory.

3 DEFINITIONS

Bollard Pull (BP)	-	Documented continuous bollard pull
Breaking Load (BL)	-	Documented minimum breaking load
Ocean towing	-	Towing operations where the distance between designated ports of refuge or safe anchoring along the route is more than 24 hours, taken into account weather conditions.
Tow	-	The towing vessel, including towing vessel equipment and the towed object including its towing equipment, cargo and cargo securing
Towage	-	The complete towing operation
Towing equipment	-	All towing equipment on the towing vessel and the towed object used to effect the towage
Towing master	-	The manager responsible for the towage. A Tug master may be designated as Towing master
Tug master	-	The master of a towing vessel
1 and 10-year return periods	-	The most unfavourable combination of extreme environmental conditions, comprising wind, wave and current, that can be expected statistically every 1 and 10 years respectively.

4 RESPONSIBILITIES

4.1 Organizational command lines should be established and responsibilities and duties clearly defined before a towage commences.

4.2 The towing operation should be in charge of a competent towing master, normally being either the master of the towing vessel or the master of the leading towing vessel, in case the towed object is towed by more than one towing vessel.

4.3 The towing master is responsible for the towing operation. In preparation for the towing operation, the towing master should consider these guidelines, as appropriate. The towing master should also consider what regulations are applicable during the towage, as well as ensuring that all relevant safety measures as he finds necessary are implemented.

4.4 Nothing in this section shall set aside or limit the towing master's/tug master's authority in accordance with maritime laws.

5 MANNING OF TOWING VESSELS AND TOWED OBJECTS

5.1 Towing vessels should be manned to operate the towing vessel on a 24-hour basis in accordance with the STCW Code.

5.2 The manning should also, in addition to operating the vessel, be sufficient to ensure that it will be possible to:

- establish a new towing connection; and
- board the unmanned towed object, if planned, in an emergency situation.

5.3 If the towed object is manned, the number of personnel on board the towed object should, as far as possible, be limited to the necessary crew only.

5.4 Considerations should be given to the need to safely transfer personnel and equipment between the towing vessel and the towed object when such operation is planned to take place in an emergency situation. Personnel under transfer should have life jackets or immersion suits, carry suitable radiocommunication equipment and portable lights. In selecting immersion suits, due regard should be given to the degree of body heat-loss protection necessary in the area of operation.

6 PLANNING

6.1 All aspects of the towage should be planned in advance, taking into account such factors as maximum anticipated environmental conditions as reflected in section 9.1, including tidal streams, current and water depths, as well as the size, windage, displacement and draft of the tow. Possible cargo and cargo securing arrangements on board the towed object should also be taken into consideration. Strength calculation of non-routine cargo securing arrangements should be carried out. Weather routing advice should be obtained and used where available and appropriate, and careful consideration given to the bollard pull of the towing vessel(s) to be employed, cf. section 9.4. The towing arrangements and procedures should be such as to reduce to a minimum any danger to personnel during the towing operations.

6.2 There should be a contingency plan on board the towing vessel to cover the onset of adverse weather, particularly in respect of arrangements for heaving to or taking shelter. Personnel should be familiarized with their responsibilities and duties in an emergency situation in accordance with this contingency plan. If the towed object is manned, the contingency plan should also be carried on such object.

6.3 There should be operation or towing manuals on board the towing vessel which describe routine towing operations and additional manuals to describe any special towage requirements, of which due account should be taken.

7 PREPARATION

7.1 The tow should not proceed to sea until a satisfactory inspection of the tow has been carried out by the towing master and, if requested or for any reason considered necessary, by any other competent person.

7.2 The towing operation should not commence unless the environmental conditions prevailing, and forecast, will allow the tow to achieve safe sea room where the tow is not endangered by a lee shore or other navigational hazards.

7.3 Where operational limitations have been identified for the tow, procedures should be put in place to prevent the tow encountering conditions in excess of the limitations. Such procedures may include weather routing or safe shelter locations, or both.

8 SURVEY

In cases, where particular circumstances or factors signify an increased risk to the tow, or where the risk cannot be evaluated on the basis of seafaring and nautical knowledge and experience alone, the owner of the towing vessel, owner(s) of the towed object or the towing master/tug master should apply for survey in accordance with these guidelines by a competent organization or authority, as appropriate.

9 DESIGN ENVIRONMENTAL CONDITIONS

9.1 The towed object, including cargo and securing arrangements, should be capable to withstand the loads caused by the most adverse environmental conditions expected for the season and areas in question.*

9.2 The duration of a towing operation is measured from the time the operation is started until the tow is in a safe condition at its arrival location. If there are locations along the route where the towed object can safely be located, the duration of the towing operation can be measured between such locations.

9.3 For long duration towing operations passing through areas having different sea state characteristics, the worst sea state for the route should be considered when selecting the cargo securing arrangements and the equipment to ensure watertight integrity of the towed object.

9.4 The continuous bollard pull of the towing vessel(s) involved should be sufficient to maintain station keeping of the tow in the following environmental conditions, acting in the same direction:

- Wind: 20 m/s
- Significant wave height: 5 m
- Current: 0.5 m/s

*If found appropriate, the following guidance for design environmental conditions should apply:

<u>Duration of towing operation</u>	<u>Return period</u>
< 5 days	1 year
> 5 days	10 year

Other criteria may be acceptable if high confidence on the weather forecasts and experience data for the actual waters can be obtained.

10 WEATHER FORECAST

10.1 Where possible a weather forecasting source should be available on a 24-hour basis for the whole towing operation.

10.2 Weather forecasts should, as a minimum, contain the following information:

- Synopsis of the area
- Wind speed and direction
- Wave height and period
- Swell height and period
- Outlook for the next 48 hours.

10.3 In certain high risk situations, or when such forecast may be seasonally unpredictable, consideration should be given to obtaining a second weather forecast.

10.4 Weather forecasts should be received on the towing vessel (and received or relayed on the towed object if manned) at least every 24 hours during the towage. Where there are specific weather limitations imposed, then more frequent forecasts may be appropriate, and possible direct communication with the forecaster if significant changes are expected.

11 TOWING VESSEL REQUIREMENTS

11.1 Towing vessels should carry on board appropriate valid cargo ships certificates according to their size.

The following documents should also be provided:

- Documentation of bollard pull
- Documentation of all towing vessel equipment, ref. section 12

11.2 The continuous bollard pull (BP) at maximum continuous rated power of the main propulsion machinery should be documented. The testing procedure in Appendix A or a similar procedure should be adhered to.

11.3 When selecting towing vessels for long distance towing operations, special considerations should be given to the following:

- the vessels propulsion and steering gear are appropriate for the proposed towage operation;
- the towline should not hamper the vessel's manoeuvrability under extreme environmental conditions; and
- the towing gear can be handled safely and effectively.

11.4 Towing vessels should have an adequate reserve of fuel depending on the duration of the towing operation. If refuelling on route is necessary, suitable arrangements should be provided before towing commences.

11.5 Towing vessels should keep a towing log with information according to Appendix B. Further, it should keep an engine log for main propulsion machinery and auxiliaries required for the towage, which as a minimum should contain information related to running hours and unscheduled events.

11.6 Towing vessels should have a documented maintenance system for all important systems including communication and navigation equipment, main and auxiliary machinery, and steering and towing gear.

11.7 Notwithstanding the above requirements, all towing vessels, irrespective of their size, should have as a minimum:

- .1 marine radar in compliance with relevant recognized performance standards appropriate for the size and operation of the vessel;
- .2 adequate self-sufficient fire suppression capability;
- .3 installation of the following equipment:
 - .3.1 a searchlight that can be directed from the vessel's main steering station;
 - .3.2 two VHF-FM radios with Digital Selective Calling capability if not already equipped with Global Maritime Distress Safety System (GMDSS);
 - .3.3 an illuminated card type magnetic steering compass or an illuminated flux gate magnetic compass (with a reserve power supply) that can be read at the vessel's main steering station;
 - .3.4 an echo depth-sounding device that can be read at the vessel's main steering station; and
 - .3.5 an electronic positioning device; and
- .4 the following on board:
 - .4.1 currently corrected marine charts of the area to be transited, published by an appropriate authority, of a scale large enough to make navigation of the area possible; and
 - .4.2 any other useful currently corrected navigational publications and notices.

12 TOWING EQUIPMENT

12.1 The towing equipment should be designed according to the below mentioned recommendations and recognized standards. The towing arrangements should be suitable for the particular tow and of adequate strength.

12.2 The towing vessel should be equipped with a towing winch.

12.3 It is recommended that the towing winch brakes should have an appropriate static holding capacity to that of the documented minimum breaking load (MBL) of the largest towline to be used. The holding capability should be calculated for the outermost towline layer on the winch drum at which towing will be performed.

12.4 The design and scantling of the towing winch, including supports, should be capable of withstanding the breaking load of the main towing wire rope without permanent deformation.

12.5 It should be possible to release the tension on the winch drum(s) in an emergency and in all operational modes. The end attachment of the towing wire rope to the winch drum should be of limited strength, thus forming a weak link in case the towline has to be run out. After an emergency release the winch brakes should revert to normal function without delay. It should also be possible to carry out the emergency release sequence (emergency release/application of brakes) even during a black-out.

12.6 It is recommended that on board towing vessels, whenever practicable, the winch should be fitted with equipment for measuring the tension in the towline. This equipment should, as a minimum, record the mean tension and the tension peaks, and the information should be displayed in the wheel house.

12.7 Means should be provided to spool the towline effectively on the drum(s).

12.8 Towline protection sleeves, or other means should be provided to prevent the towlines being damaged by chafing or abrasion. There should be no sharp edges or obstructions at the stern of the vessel that may damage the towlines during operation. A sufficient number of spare towline sleeves should be carried on board.

12.9 An appropriate length for the towline should be determined using established criteria. Where no such criteria has been established, the minimum required length (L) of the main towline should be determined from the formula;

$$L = (BP/BL) \times 1800 \text{ m}$$

where: BL = Documented breaking load of the towline,
BP = Continuous bollard pull

12.10 All wire ropes in use should have the same lay (i.e. right hand, left hand, etc.).

12.11 The minimum documented breaking load (MBL) of the main towline should generally be in accordance with the following table.

Bollard pull (BP) (tonnes)	<40	40-90	>90
MBL (tonnes)	3.0xBP	(3.8-BP/50) BP	2.0xBP

12.12 A spare towline satisfying all requirements for the main towline should be kept on board the towing vessel.

If the towing winch is equipped with two drums the spare towline should preferably be stored on the winch drum, readily available for use.

The alternative is to have a spare towline which should be in position and so arranged to ensure that transfer to the main towing drum is easily, quickly and safely effected.

In case of two towed objects whereby two independent towlines (main and spare) are to be connected, an extra spare towline should be on board, arranged as specified above.

12.13 All wire rope terminations should be hard eyes, i.e. reinforced thimbles or spelter sockets except for the end connection to the drum on the towing winch.

12.14 All connecting items like shackles, rings, etc., should have an ultimate load bearing capacity of minimum 50% in excess of the documented minimum breaking load (MBL) of the towing arrangement to be used.

12.15 If fibre rope pennants are used, the pennants should be in a sound condition and the minimum breaking load of any fibre rope pennants should not be less than:

- 2.0 times the tow line MBL, for tugs with bollard pull less than 50 tonnes;
- 1.5 times the tow line MBL, for tugs with bollard pull greater than 100 tonnes; and
- linearly interpolated between 1.5 and 2.0 times the tow line MBL for tugs with bollard pull between 50 and 100 tonnes.

Fibre rope pennants should be of grommet construction and be terminated with hard eyes, and should not normally be connected directly to the apex of the towing bridle.

12.16 The towing vessel should be equipped with sufficient spare equipment to completely replicate the towing arrangements, unless found impractical.

12.17 Inspection of the towline should be carried out on completion of each towing operation. The results of the inspection should always be recorded as a basis for decision on future inspection programs. The inspection should also be noted on the towing log (Appendix B).

12.18 No part of any towline arrangement should be used for the towing operation if:

- the reduction in cross sectional area due to wear, abrasion, corrosion and broken wires exceeds 10% or there is severe kinking, crushing or other damage resulting in distortion of the rope structure;
- end sockets or other towline terminations such as thimbles, etc., are damaged, deformed or significantly corroded.

12.19 If relevant, gog ropes or alternative arrangement should be provided to prevent athwartship pull, and to facilitate retrieving of the towline. The arrangement should be remotely operated from a safe position. A spare gog rope should be carried on board.

13 TOWED OBJECT

13.1 Every towed object, whether manned or not, should be assessed and provided with a confirmation of its fitness to be towed, covering all below mentioned requirements.

13.2 The towed object should have adequate intact stability in all the loaded and ballast conditions expected during the voyage. Compliance with any applicable damage stability criteria should be verified, if not unreasonable due to special conditions. Such damage stability should be demonstrated to the extent the towed object may have been previously documented to.

13.3 Prior to sailing, the watertight and weathertight integrity should be confirmed by an inspection of the closing arrangements for all hatches, valves, airpipes, and other openings through which water might

enter the towed object and affect its stability. It should also be confirmed that any watertight doors or other closing arrangements within the hull are securely closed and that any portable closing plates are in place.

13.4 Towed objects should be at a suitable draught and suitably trimmed for the intended voyage, commensurate with the stability condition demonstrated in accordance with section 13.2.

13.5 It should be documented that the towed object has adequate structural integrity in relation to the cargo loads, the design environmental conditions and other foreseen loads during the voyage. Where applicable, reference should be made to the towed object's loading manual.

13.6 The cargo securing arrangements (ref. section 6.1) and weather protection for the cargo, equipment and stores carried on the towed object should be carefully examined to ensure that they are adequate for the voyage. Where applicable, reference should be made to the towed object's cargo securing manual.

13.7 Where applicable, a bridle should normally be used for connection of the main towing wire rope to the towed object. Chains should be used in way of chafing areas such as fairleads.

13.8 All connection parts (e.g. each leg of a bridle) should have a documented minimum breaking load (MBL) exceeding the breaking load of the towing arrangement.

13.9 Towline attachments should be designed to resist the towline pull from any likely direction, with use of fairleads if necessary. The design and arrangement of the towing fittings should take into account both normal and emergency conditions.

13.10 The ultimate strength of any towline attachment (bracket or bollard and their foundation) should not be less than 1.3 times the minimum breaking load of the towing arrangement which is to be attached.

13.11 Fairleads should be designed to accommodate the chafing chain and should be shaped so as to prevent excessive bending stress in the chain links.

13.12 A bridle recovery system should be fitted on the towed object, strong enough to be utilised after towline breakage, in case the bridle is planned to be used again during the towage.

13.13 Emergency towing equipment should be provided in case of bridle failure or inability to recover the bridle. This equipment should preferably be fitted at the bow of the towed object and should consist of a spare bridle or towing pennant fitted with a floating rope and buoy allowing it to be picked up without any significant hazard.

13.14 Towed objects should exhibit the navigation lights, shapes and, if manned, make the sound signals required by the International Regulations for Preventing Collisions at Sea, 1972, as amended. Due consideration should be given to the reliability of the lights and sound signals and their ability to function for the duration of the voyage. When practicable, a duplicate system of lights should be provided.

13.15 Boarding facilities should be rigged on each side of the towed object.

13.16 When appropriate, the rudder should be secured in the amidships position and measures taken to prevent the propeller shaft from turning.

13.17 Life-saving appliances in the form of lifejackets and life buoys shall be provided whenever personnel are likely to be on board the towed object even if only for short periods. When personnel are expected to remain on board for longer periods of time, liferafts should also be provided. If the freeboard is more than 4.5 m, liferaft davits should be provided, unless rendered impractical due to the design or conditions of the towed object.

Whenever the towed object is continually manned, the riding-crew should be provided with adequate supplies of food and water, cooking and sanitary facilities, radio equipment, including means of communication with the towing vessel, distress signals, life-saving and fire-fighting appliances.

13.18 Towed objects should be equipped with an anchor, suitable for holding the towed object in severe weather conditions, that is securely attached to a chain cable or wire and is arranged for release in an emergency by persons on, or boarding the towed object, unless rendered impractical due to the design or conditions of the towed object.

13.19 To reduce the risk of pollution, the amount of oil carried on the towed object should be limited to what is required for the safety of the towed object and/or towing vessel and for their normal operations, provided no risk to the environment will result from the removal of oil from the towed object.

14 IN AN EMERGENCY

14.1 Should the tow present a direct danger to navigation, offshore structures or coastlines through breaking adrift or for some other cause, the master of the towing vessel is bound by SOLAS regulation V/2 to communicate the information by all the means at his disposal to ships in the vicinity, and also to the competent authorities at the first point on the coast with which he can communicate.

14.2 In all cases, the arrangements for recovering the tow, should it break adrift, should be made in accordance with good seamanship, bearing in mind the seasonal weather conditions and area of operation.

APPENDIX A

BOLLARD PULL TESTING PROCEDURE

1. A proposed test programme should be submitted prior to the testing.
2. During testing of continuous bollard pull (BP) the main engine(s) should be run at the manufacturer's recommended maximum torque according to maximum continuous rating. Verification of the actual output should be requested during the test.
3. During testing of overload pull, the main engine(s) should be run at the manufacturer's recommended maximum rating that can be maintained for minimum 30 minutes.

The overload test may be omitted.
4. The propeller(s) fitted when performing the test should be the propeller(s) used when the vessel is in normal operation.
5. All auxiliary equipment such as pumps, generators and other equipment which are driven from the main engine(s) or propeller shaft(s) in normal operation of the vessel should be connected during the test.
6. The length of the towline should not be less than 300 metres, measured between the stern of the vessel and the test bollard. A minimum length of twice the vessel length might be accepted.
7. The water depth at the test location should not be less than 20 metres within a radius of 100 metres of the vessel. If the water depth of 20 metres cannot be obtained at the test location, then a minimum water depth which is equal to twice the maximum draft of the vessel may be accepted. It should be noted that reduced water depth may adversely affect the test results.
8. The test should be carried out with the vessel's displacement corresponding to full ballast and half fuel capacity.
9. The vessel should be trimmed at even keel or at a trim by stern not exceeding 2% of the vessel's length.
10. The vessel should be able to maintain a fixed course for not less than 10 minutes while pulling as specified in items 2. or 3. above. Certified continuous bollard pull is the average reading of the 10 minutes period.
11. The test should be performed with a wind speed not exceeding 5 m/sec.
12. The current at the test location should not exceed 0.5 m/sec. in any direction.

13. The load cell used for the test should be approved by a competent body and be accurate within $\pm 2\%$ within the range of loads to be measured and for the environmental conditions experienced during the test.
14. An instrument giving a continuous read-out and also a recording instrument recording the bollard pull graphically as a function of time should both be connected to the load cell. The instruments should if possible be placed and monitored ashore.
15. The load cell should be fitted between the eye of the towline and the bollard.
16. The figure certified as the vessel's continuous bollard pull shall be the towing force recorded as being maintained without any tendency to decline for a duration of not less than 10 minutes.
17. Certification of bollard pull figures recorded when running the engine(s) at overload, reduced RPM or with a reduced number of main engines or propellers operating can be given and noted on the certificate.
18. A communication system shall be established between the vessel and the person(s) monitoring the load cell and the recording instrument ashore, by means of VHF or telephone connection, for the duration of the test.

APPENDIX B

TOWING LOG

Vessel: Date/Master sign.
 Main Towline: (Installed) Breaking Load: (M/T) Length/Dia: Insp.Date/Year:
 Spare Towline: Breaking Strain: (M/T) Length/Dia: Insp.Date/Year:
 Main Towline: Lubrication (L) Maintenance (M) Date: Ref.Insp.Reports etc.:
 Spare Towline: Lubrication (L) Maintenance (M) Date: Ref.Insp.Reports etc.:
 Towed Object: Towline Connected: Date/Hours Position:
 Length of Bridle (M): Towline Released: Date/Hours Position:

TOWING INFORMATION (NOON + MIDNIGHT OR TWICE A DAY)							
FROM	TO	Duration of wire rope used (total days/hours)	Wire tension (M/T)	Wire length (m)	ENVIRONMENTAL CONDITIONS	Wire length Adjusted + - (m)	Remarks
Date/year	Hours	Date/year	Hours	Max.	Aver.	Wave (height/direct./p period)	Wind (force/direct.)
Total to be transferred to page				Remarks:			