

**PART II RULE FOR THE CONSTRUCTION
AND CLASSIFICATION OF SHIPS
IDENTIFIED BY THEIR MISSION**

TITLE 42 TUG BOAT/PUSHER

SECTION 3 HULL EQUIPMENT

CHAPTERS

- A SCOPE
- B DOCUMENTS, REGULATIONS AND
 STANDARDS
- C MATERIALS AND MANLABOUR
 - See Title 11
- D SPECIFIC SYSTEM REQUIREMENTS
- T TEST AND INSPECTIONS

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CHAPTER A SCOPE

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- A1. APPLICATION
 - A2. DEFINITIONS
-

A1. APPLICATION

100. Nature of the systems

101. This Section applies to hull equipment of tugs and pusher boats covered by the present Title 42, in addition to the requirements of Part II, Title 11, Section 3.

A2. DEFINITIONS

100. Terms

101. In addition of the terms defined in Part II, Title 11, Section 3, the following definition apply:

Towing hook: hook articulated in horizontal and vertical axes, with the working sector of about 90° for each side, with quick release device.

Towing winch: winch for towing fitted with quick release device.

Auxiliary towing winch: winch installed where the task of towline handling is laborious.

Flank rudders: rudders at the forward of the propeller, in pushers, designed to improve the maneuver performance when going aft.

Pushing bumper: beams at the bow, usually vertical, lined with wood in the contact area with the barges.

CHAPTER B DOCUMENTS, REGULATIONS AND STANDARDS

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- B1. DOCUMENTS TO THE RBNA
 - B2. REGULATION
 - B3. STANDARDS
- See Part II, Title 11, Section 3
-

B1. DOCUMENTS TO THE RBNA

100. Towing and pushing gear

101. In addition to the documents required by Part II, Title 11, Section 3, the following will be presented for approval:

102. Towing hook: detailed specifications, dimensional plans and welding (if any);

103. Towing winch: detailed specifications, calculations and detailed plans;

104. Detailed plans of the towing hook towing winch and auxiliary winch foundations and fixing.

105. Detailed plans of deck local reinforcements under towing hooks, towing winches and auxiliary winches.

106. Arrangement showing location and details of the remote quick release device

B2. REGULATION

100. Application

- 101. Refer to NORMAM 01.

CAPÍTULO D REQUIREMENTS OF THE SYSTEMS

CHAPTER CONTENTS

- D1. TOWING AND PUSHING GEAR
- D2. ANCHORING, MOORING AND TOWING
- D3. SYSTEM OF MANEUVER
- D4. EQUIPMENT OF SALVAGE
- See Part II, Title 11, Section 3
- D5. FIREFIGHTING EQUIPMENT
- See Part II, Title 11, Section 3
- D6. HULL OPENINGS: MEANS OF PROTECTION AND CLOSURE
- See Part II, Title 11, Section 3
- D7. HULL EQUIPMENT AND APPENDAGES
- See Part II, Title 11, Section 3

D1. TOWING AND PUSHING EQUIPMENT

100. Application

101. This Subchapter applies to the towing and pushing equipment, and apply to all vessels covered by the present Title 42 irrespective of their GT.

102. Towing hooks and winches shall be certified or have type approval by the RBNA.

200. Calculation hypotheses

201. The design bollard pull T to be considered:

- a. with nozzle: $T = 245 \text{ N/kW}$
- b. without nozzle: $T = 160 \text{ N/kW}$

202. The stresses in the various components, calculated for the test loads, as per Subchapter T1., shall not exceed the values:

$$\sigma_c = \sqrt{\sigma^2 + 3 \times \tau^2} \leq 15,7 \text{ daN/mm}^2$$

(16 kgf/mm²)

where

$$\sigma \leq 0,72 \times \sigma_y$$

$$\tau \leq 0,48 \times \sigma_y$$

σ_y is the yield stress

203. The dimensioning of the towing gear is to be made on the basis of:

- a. the Proof Load “PL” according to subchapter T1;
- b. the power break of the winch.

204. For a load test $PL \leq 500 \text{ kN}$, the towing hook, the base of the towing hook, the foundations in the hull and the quick release device will be dimensioned taking into consideration the towline passed abeam (90°), astern, and an inclination of 60° upwards in relation to the horizontal plane.

205. For a load test $PL > 500 \text{ kN}$, the towing hook, the base of the towing hook, the foundations in the hull and the quick release device will be dimensioned taking into consideration the towline passed abeam (at 90°), at the astern, and at an inclination of 45° upwards in relation to the horizontal plane.

206. For all towing hooks (regardless of load test PL), the quick release device shall be tested with an inclination of the towline of 60° upwards in relation to the horizontal plane, under static pull T.

207. Whenever the towing winch is used, the direction of the towline is to be indicated in the drawings for the purpose of the tests.

208. The same stress values apply to the base of the towing hook and foundations in the hull exposed to the rated load of the static pull.

300. Towing hook

301. A quick release device shall be installed, capable to act in the event of an emergency when the hook is under the designed pull. Its triggering shall be:

- a. from the bridge and
- b. from the deck at each side, in stands where the visibility of the hook is assured, with protection against whiplash.

302. The quick-release devices of the hook may be of three types:

- a. of mechanical transmission
- b. of hydraulic transmission
- c. of pneumatic transmission.

303. For hooks with hydraulic and / or pneumatic release of the towing hook, an electric release may be approved by RBNA provided that the release device is supplied by an emergency source of power and the electric diagram of the release device is approved.

304. A safety device is to be installed to ensure that unintended release does not occur.

305. Mechanical release

- a. Where a mechanical release device is installed the required releasing force shall not exceed 150 N when releasing locally and 250 N if releasing remotely with the hook tested at proof load.

- b. When the test is performed during the bollard pull test (T), these values are to be reduced in the proportion T/PL
- c. The releasing wire of the towing hook mechanical device shall be lead through pulleys and appropriate guides.
- d. The release shall be possible by pulling down with the full weight of the body.

306. Pneumatic release: Where a pneumatic releasing device is installed, an additional mechanical release device shall be provided.

307. In vessels classified by RBNA, the installation of towing hooks with mechanical and pneumatic release devices is to be approved by RBNA. In vessels not classified by RBNA, but whose towing operation is under the supervision of the RBNA, the installation of towing hooks with mechanical and pneumatic release devices is to be inspected for verification of compliance with the present Rules.

308. For tugs subject to risks of sudden loss of stability, an automatic mechanical release device shall be installed in the towing hook in full view from the bridge or the wheelhouse. The angle of inclination of the vessel in which the towing hook is to be released automatically shall be determined based on the stability study.

309. A heavy and appropriate axe is to be installed, accessible by all sides, located near the towing hook, to cut the towing line in the event of an emergency or failure in the quick release device of the hook.

310. The use of springs in towing hooks will only be allowed subject to prior approval of the RBNA

400. Towing winch

401. The pulling capacities for the several layers of the drum are to be specified, as well as the towline storage capability, by diameter.

402. The design speed shall be 9 m/min, except in special cases.

403. The towing winch is to be designed in such a way as to ensure adequate guidance of the towlines in all directions.

404. The winch is to be safely operated from all control stations. In addition to the control station on the bridge an additional control station is to be installed on deck. Each control station is to be equipped with the necessary operational and control elements.

405. The winch drum shall be easily visible from every control station. Where this is not possible, the winch is to be equipped with an automatic spooling device on the drum.

406. The arrangement and working direction of the operational elements are to be aligned with the direction of the towline movement.

407. Operating levers shall automatically return to their initial position when released, and shall be possible to lock them in the stop position.

408. The power of the towing winch brake (with the towline in its first layer) shall be equal to or greater than 80 per cent of the rated breaking strength of the towline.

409. The connection of the tow cable in the drum of the winch shall allow the release of the end of the cable in case of an emergency.

410. The diameter of the drum of the winch is to be greater than 12 times the rated diameter of the towline;

411. There shall be a release device uncoupling the drum of the winch from the driver.

412. Where the drum brake is activated by a non-manual device, a manual brake device is to be installed.

413. The dimensioning of the winch drum components subject to static pull when the drum is uncoupled, that is, the drum, the drum shaft, brake devices, the bedplate structure and its attachment to the deck, shall be done by assuming a tensile strength equal to the power of the winch brake. In the dimensioning of the drum shaft, the braking forces are to be considered. The brake drum shall not slip when subjected to this load.

414. It shall be possible the release quickly the drum brake from the control station on the bridge, as well as from any other control stations, in accordance with the requirements below:

- a. quick brake release is to be feasible in any working conditions, including in the event of a failure in the transmission device, if any;
- b. brake control handles are to be protected against unintentional operation;
- c. after a quick release operation the winch brake is to be set back in normal function without delay.
- d. after the brake drum quick release, the drive motor of the winch shall not start automatically.

500. Auxiliary winch

501. The control stations for auxiliary winches shall be located in an area free of towline hazards.

502. In addition to the control station on deck, there shall be another control station on the bridge. In order to operate the auxiliary winch there shall be a system of transmission of orders between the bridge and the auxiliary winch control station.

503. The auxiliary winch is to be dimensioned adequately according to the tug dimensions.

504. The auxiliary winch wire shall have a working safety coefficient $K = 2,5$, in regard to the braking force of the auxiliary winch.

600. Bow pushing device

601. Tension in the several components shall be calculated based on the design bollard pull and are not to exceed the following stress levels:

$$\sigma_c = \sqrt{\sigma^2 + 3 \times \tau^2} \leq 12,8 \text{ daN/mm}^2$$

$$(13 \text{ kgf/mm}^2)$$

where:

$$\sigma \leq 0,60 \times \sigma_y$$

$$\tau \leq 0,40 \times \sigma_y$$

σ_y is the yield stress

700. Special provisions for harbor tugs for operation with three crew members

701. The harbor tugs for operation with three crew members are subject to the regulations of the National Authority regulations (for Brazilian Flag, NORMAMs 01 and 08) in force and, additionally, the requirements of D1.700.

702. The end attachment of the towline shall be located aft.

703. Control stations are to be installed on the bridge and in the operating control room (if any) for towing winches, and on deck and in the operating control room (if any) for winches of cable storage.

704. Electric and hydraulic winches shall be suitable for towing operations.

705. Where a towing hook is fitted, two independent devices are to be installed for the release of towing hook in case of emergency. Where a towing winch is fitted, two independent devices for unlocking the brake in an emergency shall also be installed. One of these devices shall remain operational in the event of a failure in the other.

706. The quick release device of the towing hook and the towing winch are to be controlled from the bridge, from the control center of operations and from the deck.

707. Where the tug is fitted with a hydraulic towing hook system, one releasing device will suffice.

D2. ANCHORING, MOORING AND TOWING

100. Application

101. The requirements of this subchapter apply to tugs and pushers, complementing or replacing the prescribed at Part II, Title 11, Section 3.

102. to 104. See Part II, Title 11, Section 3

200. Arrangements

201. For harbor tugs which sporadically sail out of inland waters, the use of a bow anchor in position and a spare, so located as to be ready for use, may be approved, upon justification of the Ship owner.

D3. MANOEUVERING SYSTEM

100. Application

101. The requirements of this Subchapter apply to tugs and pushers, in addition or in replacement to those prescribed in Part II, Title 11, Section 3.

102. The requirements in D3.101. above are also applicable to flank rudders of pusher tugs, taking into account the direction of the water flow.

CHAPTER T INSPECTIONS AND TESTS

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- T1. TOWING AND PUSHING GEAR
- T2. ANCHORING, MOORING AND TOWING
-See Part II, Title 11, Section 3
- T3. MANOEUVERING SYSTEM
- T4. SALVAGE EQUIPMENT
-See Part II, Title 11, Section 3
- T5. FIREFIGHTING EQUIPMENT
-See Part II, Title 11, Section 3
- T6. HULL OPENINGS-
PROTECTION AND CLOSING
-See Part II, Title 11, Section 3
- T8. HULL EQUIPMENT AND APPENDAGES
-See Part II, Title 11, Section 3

T1. TOWING AND PUSHING GEAR

100. Towing hook and winch

101. Towing hooks and towing winches are to be tested under the following Proof Loads:

Design Bollard Pull T (kN) Proof Load (PL)

≤ 500	$2 \times T$
from 500 to 1500	$T + 500$
> 1500	$1,33 \times T$

102. The quick release system is to be tested at the design load specified in Paragraph D1.305. of this Title 42.

103. For towing hooks with mechanical device release the moving parts and other devices are to be subjected to a proof load PL by means of approved facilities and equipment. During the test, the hook quick release shall be tested as well. The force required to trigger the quick release is to be measured and shall not exceed 150 N.

104. Towing hooks with hydraulic release device are to be subjected to a proof load PL. The hydraulic release device need not be subjected to the proof load PL. Where a cylinder tested and approved by RBNA is employed as a component of the device during the load test this cylinder may be replaced by a loading element not belonging to the mechanism. The operating capacity of the towing hook shall be immediately restored after the release. The functionality of the release of the towing hook shall be tested with the towline slack on the hook.

105. The towing hooks fitted with pneumatic device release are to be subjected to a test as in Paragraph 104. above.

106. Towing winches are to be inspected and tested as follows:

a. **bench test of drive units:** the Certificates of these tests are to be submitted at the time of the final inspection of the towing winch;

b. **tightness and pressure test of components under pressure:**

Components under pressure are to be subjected to test pressure of:

$$P = 1.5 \times p,$$

where

$$p \text{ [bar]} = \begin{array}{l} \text{allowed working pressure} \\ \text{= pressure of opening the safety valves,} \end{array}$$

whichever is greater

Where the working pressure is greater than 200 bar, the test pressure is not to be greater than

$$p + 100 \text{ bar.}$$

Tightness tests will be performed where applicable;

c. **final inspection and operational examination;** after manufacture and final inspection, operational tests are carried out at the rated strength; the lifting speed is to be determined during the nominal load

test; the brake and safety equipment shall be tested and adjusted during the load test.

107. Where the manufacturers do not have the equipment required, the tests above, including adjusting the overload protection device, will be performed on board, being the equipment tested without load on the manufacturer.

200. Bollard pull test

201. During the test, the towline shall stay as far as possible in a horizontal position.

202. On both sides of the tugboat, there shall be a free lateral area and draft of 4 times the average draft but not less than 10 m.

203. The bollard pull test shall, wherever practicable, be carried out in favorable environmental conditions with maximum wind speed of 5 m/s and maximum current speed of 1 knot.

204. In order to delete any dynamic effects, the bollard pull is to be recorded / read only when the tug is pulling longitudinally, i.e.: without any drift.

205. All auxiliary equipment required for the propulsion of the tug and driven by the main engine or by the shaft line are to be coupled and operating throughout the tests.

206. The bollard pull at full power of the main engine is to be maintained for at least 30 minutes.

207. For all types of towing hook, operational tests of the quick release devices shall be carried out.

208. For mechanical release devices, the strength required to release the cable are to be measured. The results are to comply with the requirements of Paragraph D1.305.

210. For all ships, after each bollard pull test, reports and certificates shall be issued in the form prescribed i:

a. NORMAM 01 for vessels under the Brazilian Flag;

b. National regulations for vessels under foreign flags.

300. Periodicity of testing the towing equipment

301. The bollard pull test will have a validity of five years (as prescribed by NORMAM 01 or by the National Flag Administration). The operational safety of the tow hook and quick release device shall be checked by the ship's captain at least once a month and the records filed on board to be inspected at the time of the annual surveys.

302. The mechanical and/or pneumatic release devices are to be removed every two years, completely examined and subjected to a proof load test PL in recognized facilities. After the reinstallation of the hook on the tug, the hook release device is to be subjected to an operational test on board every other year with the towline slacked on the hook. In addition, all components shall be carefully inspected.

303. The correct working of all components of the towing equipment is to be verified.

304. For any type of towing hook, the bollard pull test shall be repeated every 5 years and a new certificate issued.

305. The towing winches are to be subjected to a test during the bollard pull test with a proof load corresponding to the power of the winch brake. The winch operation shall be checked from all control stations, to assure that when the brake drum is activated the release device operates unhindered.

400. Bow pushing device

401. It will be tested in operational condition at the maximum operational speed of the propulsion engine.

T3. MANEUVRING SYSTEM

100. Tightness testing of rudder

See Part II, Title 11, Section 3

200. Hydraulic system testing

See Part II, Title 11, Section 3

300. Rudder movement testing

301. The steering gear must be able to take the rudder from 35° of a board to the 30° of the other board in 18 (eighteen) seconds at maximum forward speed.

302. The time needed for this manoeuvre in reverse shall be registered, at the maximum speed of the engine (s).

303. On pushers equipped with flank rudders the requirements of the Paragraph 302. above are to apply to aft rudders and flank rudders.

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