

**PARTE II RULES FOR THE CONSTRUCTION
AND CLASSIFICATION OF SHIPS
IDENTIFIED BY THEIR MISSIONS**

TITLE 15 ROLL ON - ROLL OFF CARGO SHIPS

SECTION 2 STRUCTURE

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CHAPTER A SCOPE

CHAPTER CONTENTS

A1. SCOPE

A1. SCOPE

100. Application

101. The present Title 15 applies to roll on – roll off cargo ships as defined in Part I, Title 01, Section 1, Table T.B3.101.1.

CHAPTER B DOCUMENTS, REGULATIONS AND STANDARDS

B1. DOCUMENTS

B2. STANDARDS

B1. DOCUMENTS

100. Additional documents

101. In addition to the requirements of Part II, Title 11, Section 2, Chapter B, the following documents are required for the vessels under the present Title 15:

- a. The design deck loadings including details of wheeled vehicles and trains, where applicable. See Chapter E of the present Title.
- b. Locations of fixed securing points for wheeled vehicles, with indication of the magnitude and direction of the imposed lashing force.

B2. STANDARDS

100. Standards adopted by the present Rules

101. The wheel load adopted by the present Rules is based on the National Brazilian Regulations. Other accredited regulations and standards will be accepted, subject to RBNA approval

CHAPTER E DESIGN PRINCIPLES OF LOCAL STRUCTURAL SYSTEMS

CHAPTER CONTENTS

E1. DIRECT CALCULATION
- See Part II. Title 11, Section 2

E2. CONFIGURATION OF THE LOCAL STRUCTURE
- See Part II. Title 11, Section 2

E3. LOCAL LOADINGS

E4. SELECTION OF THE SCANTLINGS
- See Part II. Title 11, Section 2

E3. LOCAL LOADINGS

100. Scope

101. This Subchapter applies to local loading introduced by the carriage of vehicles on deck.

200. Wheeled load

201. The maximum load per axle is to be in accordance with B.101 above.

**CHAPTER F
DIMENSIONINGS PER SYSTEMS OF THE
STRUCTURE**

CHAPTER CONTENTS

- F1. BOTTOM AND DOUBLE BOTTOM
- See Part II. Title 11, Section 2
- F2. BULKHEADS
- See Part II. Title 11, Section 2
- F3. SIDE SHELL
- See Part II. Title 11, Section 2
- F4. DECK
- F5. STERN STRUCTURE
- See Part II. Title 11, Section 2
- F6. BOW STRUCTURE
- See Part II. Title 11, Section 2
- F7. SUPERSTRUCTURES AND DECK HOUSES - See -
Part II. Title 11, Section 2
- F8. SUMMARY OF FORMULAS FOR
DIMENSIONING OF LOCAL STRUCTURE
- See Part II. Title 11, Section 2

F4. DECK

100. Deck thickness at the ends

- See Part II. Title 11, Section 2

200. Strength deck thickness amidships

- See Part II. Title 11, Section 2

300. Wheeled loads

301. The plate thickness for the wheeled load is given by the equation

$$e = (4,3 + 0,04 \times \sqrt{E}) \times \sqrt{P}$$

where:

P = 0,50 QE for single wheel in t

P = 0,35 QE for double wheel in t

where:

QE: axle load in tons

P : single or double wheel load

E : spacing of the stiffeners of the panel, in mm

302. The dynamic loads introduced by the ship's motions given in Part II, Title 11, Section 2, Chapter C, Subchapter C2 are to be taken into account. Cargo load due to static

and dynamic forces shall be based on a roll angle of 30 degrees and a period of 10 seconds.

303. Special attention shall be given to the lashing points welded to the structure and the local loads introduced by them. Vehicle decks are to have a sufficient number of lashing points that are to be supported by the deck structure or specially arranged headers. The loads on the lashing points are to be not less than the rated breaking strength of the lashing point fitting but not less than 200 kN.

400. Deck transverses and beams

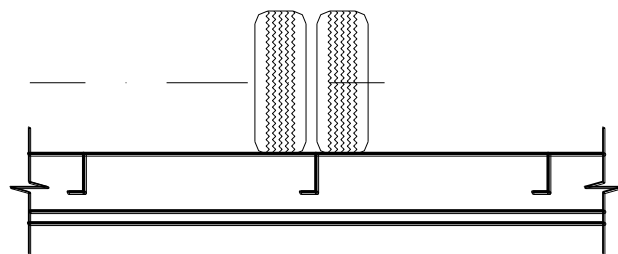
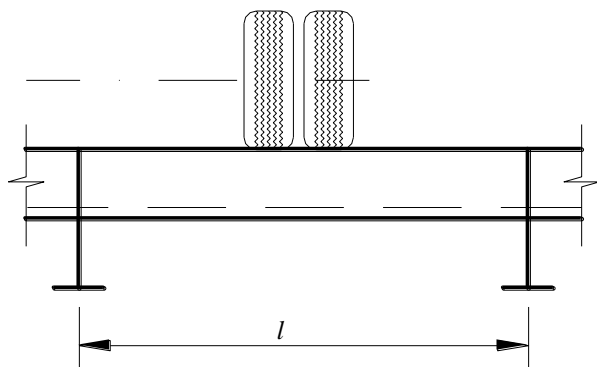
401. The strength module for a wheeled load is to be checked so that the stresses are smaller than:

In bending: $\sigma \leq 14 \text{ kgf/mm}^2 (13,7 \text{ daN/mm}^2);$

In shearing: $\tau \leq 8 \text{ kgf/mm}^2 (7,8 \text{ daN/mm}^2);$

Combined: $\sigma = \sqrt{\sigma^2 + 3 \times \tau^2} \leq 18 \text{ kgf/mm}^2 (17,7 \text{ daN/mm}^2).$

402. Where only a single or a double wheel will rest on the deck transverse, and the wheel axle is parallel or perpendicular to the deck transverse, as in the examples of the figures below, the following equations shall be used:



- for double wheels:

$$\sigma = 59 \times \frac{QE \times l}{W} \text{ da N/mm}^2$$

$$\tau = 296 \times \frac{QE}{S} \quad \text{daN/mm}^2$$

- for single wheel:

$$\sigma = 67 \times \frac{QE \times l}{W} \quad \text{da N/mm}^2$$

$$\tau = 333 \times \frac{QE}{S} \quad \text{da N/mm}^2$$

where:

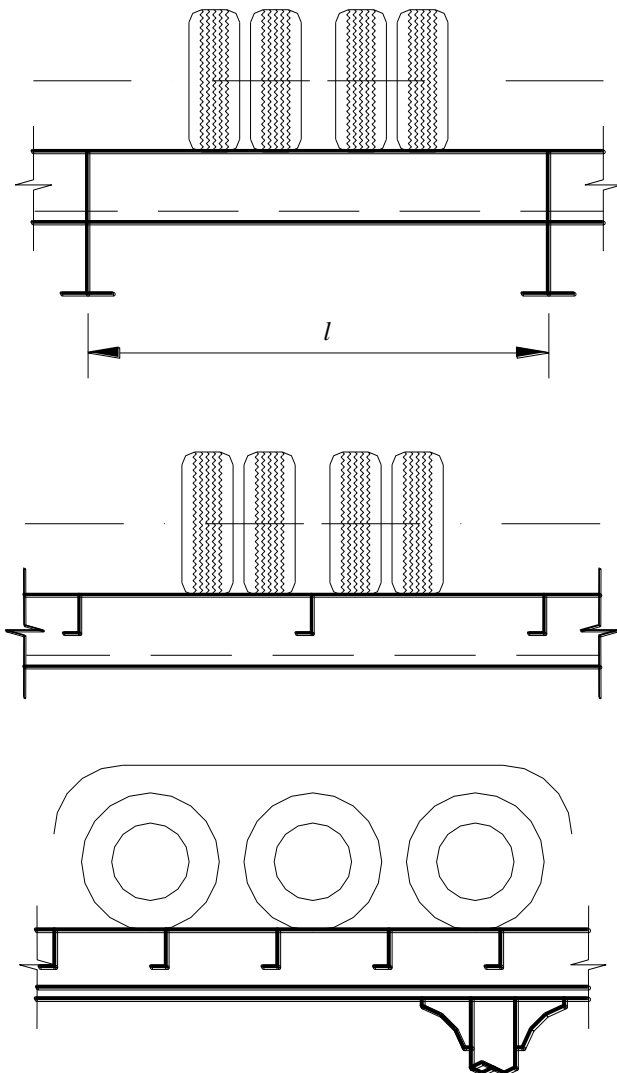
QE: axle load, in tons

l : beam span, in m;

W : beam section modulus, in cm³;

S : beam web section area, in mm

405 In all other cases, i.e., when the two wheels of two adjacent vehicles may be side by side or when two or three axle wheels rest on the same deck transverse, as in the examples of the following figures, a schematic drawing of the loads shall be presented including calculation of the stresses.



500. Longitudinal beams and reinforced girders

See Part II, Title 11, Section 2 and 400 and topic 400 above.

600. Hatch Coaming

See Part II, Title 11, Section 2

700. Pillars

-See Part II, Title 11, Section 2

CHAPTER G PRINCIPLES OF HULL GIRDER DESIGN

CHAPTER CONTENTS

G1. SCOPE

G2. CONFIGURATION OF THE GLOBAL STRUCTURE

- See Part II, Title 11, Section 2.

G3. LOADINGS OF THE GLOBAL STRUCTURE

- See Part II, Title 11, Section 2, Chapter H.

G1. SCOPE

100. Application

101. The longitudinal strength is calculated for vessels that fit in the following cases:

- a. In which the loading cannot be considered evenly distributed;
- b. Of type B, that load the cargo along of the hold in only one pass or in a particular way;
- c. Of type B with length $L \geq 30,00$ meters;
- d. With length $L \geq 40,00$ meters; and
- e. With $GT \geq 500$.

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