



## **GUIDE FOR THE CLASS NOTATION**

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# **MOVEABLE PLATFORMS (DECKS) FOR VEHICLE LOADING (MOVDK)**

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**American Bureau of Shipping  
Incorporated by Act of Legislature of  
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## **Updates**

### **February 2014 consolidation includes:**

- November 2010 version plus Corrigenda/Editorials

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- October 2008 version plus Notice No. 1

### **October 2008 consolidation includes:**

- April 2007 version plus Corrigenda/Editorials

## Foreword

There is a desire in the industry for an optional class notation for moveable/retractable decks. ABS currently has requirements for design of retractable decks in the *Rules for Building and Classing Steel Vessels* (Section 3-2-3 for all vessels and Section 5C-10-2 for Vehicle Carriers) and in the *Rules for Building and Classing Steel Barges* (Section 3-2-3). The *Rules for Building and Classing High-Speed Craft* (Section 3-2-3) and the *Rules for Building and Classing High Speed Naval Craft* (Section 3-2-3) also contain requirements for decks intended for vehicle loading. In addition, the *Guide for Certification of Lifting Appliances* (Chapter 6) contains requirements for lifting appliances of moveable platforms (decks).

This Guide consolidates the above requirements for easy application of the Rule requirements for the optional notation **MOVDK**. For convenience, an easy-to-follow road map for classification of moveable platforms (decks) is also provided.

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LOADING (MOVDK)**

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## SECTION 1 Introduction

### 1 Scope

This Guide covers design criteria for moveable platforms (decks) on vessels classed with ABS.

The Guide consolidates the requirements for moveable platforms (decks) currently found in the following Rules and Guides:

- *Rules for Building and Classing Steel Vessels (Steel Vessel Rules)* (3-2-3/5.15, 3-2-3/7.3, et al.)
- *Rules for Building and Classing Steel Vessels – Vehicle Carriers* (5C-10-2/11.11, [5C-10-2/11.13](#))
- *Rules for Building and Classing Steel Barges (Steel Barge Rules)* (3-2-3/15, 3-2-3/19, et al.)
- *Rules for Building and Classing High-Speed Craft (High-Speed Craft Rules)* ([3-2-3/1.9](#), [3-2-3/5.7.6](#), [3-2-4/1.15](#), et al.)
- *Rules for Building and Classing High-Speed Naval Craft (HSNC Rules)* (3-2-3/1.9, 3-2-3/5.7.6, 3-2-4/1.15, et al.)
- *Guide for Certification of Lifting Appliances (Lifting Appliances Guide)* (Chapter 6) – cross-reference for certification of lifting appliances

See also the flowcharts in Appendix 1 for a detailed map of the above requirements.

### 3 Application

This Guide is applicable to moveable platforms (decks) on steel vessels of all lengths, vehicle carriers, steel barges, high speed craft and high speed naval craft. Vessels in compliance with this Guide will be assigned the notation **MOVDK**.

### 5 Definitions

*Moveable Platform (Deck)* – a deck intended for the stowage of vehicles that can be either a retractable tween deck or a hatch cover.

*Retractable Tween Deck* – a deck that allows an extra level of vehicle stowage within a hold and can be raised or lowered to stow out of the way when not in use.

*Hatch Cover* – a deck that allows an extra level of vehicle stowage within a hold and can be removed and stowed when not in use. These decks are often of pontoon-type construction.

### 7 Submission of Design Plans and Data (2011)

Plans **should** generally **be submitted electronically to ABS**. However, **hard copies will also be accepted**.

- Detailed structural drawings.
- Specification of vehicles to be loaded on moveable platform (deck) (i.e., total weight, axle width/loads, wheelbase, wheel imprint sizes).
- Stowage arrangement of vehicles.
- Details of moveable platform (deck) loading conditions, including moveable platforms (decks) self weight and center of gravity.

## **Section 1 Introduction**

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- Arrangements and details of supporting/securing means.
- Calculations.
- Moveable platform (deck) general arrangement.
- Operations and Maintenance manual.

If moveable platforms (decks) are arranged in ro-ro spaces, similar drawings of ramps for vehicle loading are to be submitted.



## SECTION 2 Design Criteria

### 1 General

The scantlings of moveable platforms (decks) are to comply with the requirements in this Section.

### 3 Plating

#### 3.1 General

The edges of the deck panels are to be stiffened to provide the necessary rigidity.

#### 3.3 Uniform Loading

##### 3.3.1 Steel Vessels and Steel Barges

The thickness of the moveable platform (deck) plating is to be not less than required by the following equation for platform decks in enclosed cargo spaces.

$$t = 0.00395s_b\sqrt{h} + 1.5 \text{ mm} \quad \text{but not less than 5.0 mm}$$

$$t = 0.00218s_b\sqrt{h} + 0.06 \text{ in.} \quad \text{but not less than 0.20 in.}$$

where

$h$  = tween deck height, in meters (feet). When a design load is specified,  $h$  is to be taken as  $p/7.07$  m ( $p/720$  m,  $p/45$  ft)

$p$  = uniformly distributed deck loading, in  $\text{kN/m}^2$  ( $\text{kgf/m}^2$ ,  $\text{lbf/ft}^2$ )

$s_b$  = spacing of deck beams, in mm (in.)

#### 3.5 Loading of Vehicles with Rubber Tires

##### 3.5.1 Steel Vessels and Steel Barges

When moveable platforms (decks) are intended for the operation or stowage of vehicles having rubber tires, the thickness of the deck plating is to be not less than obtained from the following equation, except that for hatch covers, the thickness of plate panels adjacent to the edges of the moveable platforms (decks) is to be at least 15% greater. The moveable platforms (decks) are to be secured against movement and effectively supported by the hull structure.

$$t = 0.9kKn\sqrt{CW} \text{ mm (in.)}$$

where

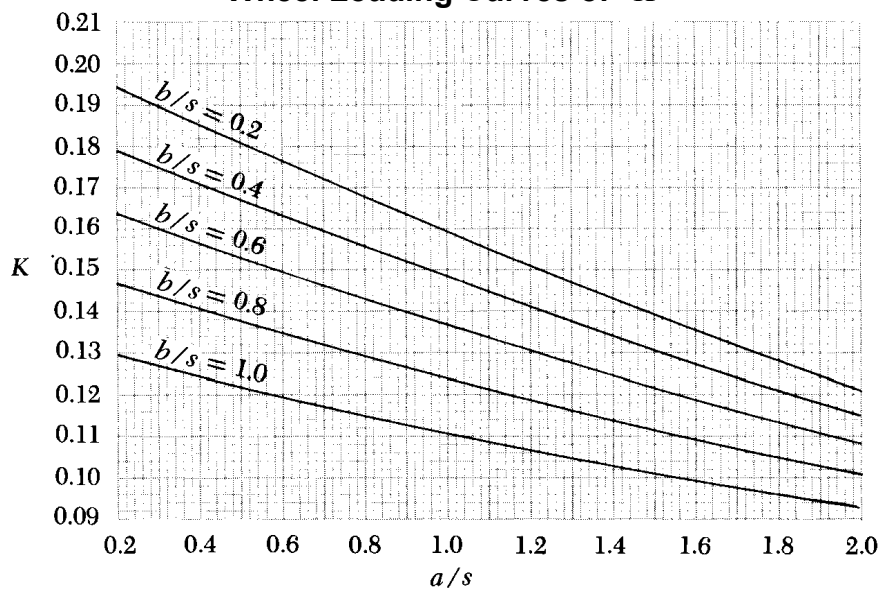
$k$  = 8.05 (25.2, 1.0)

$K$  = as obtained from Section 2, Figure 1

- $n$  = 1.0 where  $\ell/s \geq 2.0$  and 0.85 where  $\ell/s = 1.0$ , for intermediate values of  $\ell/s$ ,  $n$  is to be obtained by interpolation
- $C$  = 1.5 for wheel loads of vehicles stowed at sea and 1.1 for vehicles operating in port
- $W$  = static wheel load, in kN (tf, Ltf)
- $a$  = the wheel imprint dimension, in mm (in.), parallel to the longer edge,  $\ell$ , of the plate panel
- $b$  = the wheel imprint dimension, in mm (in.), perpendicular to the longer edge,  $\ell$ , of the plate panel
- $s$  = the spacing of deck beams or deck longitudinals, in mm (in.)
- $\ell$  = the length of the plate panel, in mm (in.)

Where the wheels are close together, special consideration will be given to the use of a combined imprint and load. Where the intended operation is such that only the larger dimension of the wheel imprint is perpendicular to the longer edge of the plate panel, then  $b$  above may be taken as the larger wheel imprint dimension, in which case  $a$  is to be the lesser dimension.

**FIGURE 1**  
**Wheel Loading Curves of “K”**



3.5.2 High Speed Craft

Where provision is to be made for the operation or stowage of vehicles having rubber tires, and after all other requirements are met, the thickness of steel moveable platform (deck) plating is to be not less than obtained from the following equation. Required deck thickness for aluminum moveable platforms (decks) will be subject to special consideration.

$$t = 0.9kKn \sqrt{1.1W \left( + \frac{n_{xx}}{2} \right)} \text{ mm (in.)}$$

where

- $k$  = 8.05 (25.2, 1)
- $K$  = as given in Section 2, Figure 1



- $n$  = 1.0 where  $\ell/s > 2.0$  and 0.85 where  $\ell/s = 1.0$ .  
For intermediate values of  $\ell/s$ ,  $n$  is to be obtained by interpolation.
- $W$  = static wheel load, in kN (tf, Ltf)
- $n_{xx}$  = average vertical acceleration at the location under consideration as defined in 3-2-2/1.1 of the ABS *High-Speed Craft Rules*
- $a$  = wheel imprint dimension, in mm (in.), parallel to the longer edge,  $\ell$ , of the plate panel
- $b$  = wheel imprint dimension, in mm (in.), perpendicular to the longer edge,  $\ell$ , of the plate panel
- $s$  = spacing of deck beams or deck longitudinals, in mm (in.)
- $\ell$  = length of the plate panel, in mm (in.)

Where the wheels are close together, special consideration will be given to the use of the combined imprint and load. Where the intended operation is such that only the larger dimension of the wheel imprint is perpendicular to the longer edge of the plate panel,  $b$  above may be taken as the larger wheel imprint dimension, in which case  $a$  is to be the lesser one.

### 3.5.3 High Speed Naval Craft

Where provision is to be made for the operation or stowage of vehicles having rubber tires, and after all other requirements are met, the thickness of steel or aluminum moveable platform (deck) plating is to be not less than obtained from the following equation:

$$t = 0.9 \sqrt{\frac{\beta W (1 + 0.5n_{xx})}{\sigma_a}} \text{ mm (in.)}$$

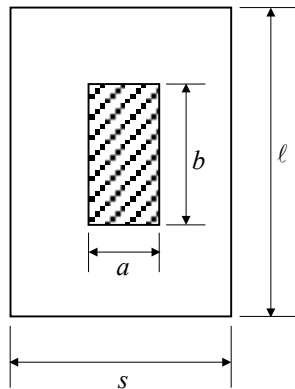
where

- $W$  = static wheel load, in N (lbf)
- $n_{xx}$  = average vertical acceleration at the location under consideration as defined in 3-2-2/1.1 of the ABS *HSNC Rules*
- $\beta$  = as given in Section 2, Figure 2
- $\sigma_a$  = design stress for decks, in N/mm<sup>2</sup> (kgf/mm<sup>2</sup>, psi)  
=  $0.60\sigma_y$
- $\sigma_y$  = yield strength of steel or of welded aluminum in N/mm<sup>2</sup> (kgf/mm<sup>2</sup>, psi), but not to be taken greater than 70% of the ultimate strength of steel or welded aluminum

Where the wheels are close together, special consideration will be given to the use of combined imprint and load. Where the intended operation is such that only the larger dimension of the wheel imprint is perpendicular to the longer edge of the plate panel, then  $b$  below may be taken as the smaller wheel imprint dimension, in which case,  $a$  is to be the greater one.

The use of aluminum sandwich panels for wheel loading will be specially considered.

**FIGURE 2**  
Values for  $\beta$



a/s	b/s	$\ell/s = 1$						$\ell/s = 1.4$						$\ell/s \geq 2$					
		0	0.2	0.4	0.6	0.8	1	0	0.2	0.4	0.8	1.2	1.4	0	0.4	0.8	1.2	1.6	2
0			1.82	1.38	1.12	0.93	0.76		2.00	1.55	1.12	0.84	0.75		1.64	1.20	0.97	0.78	0.64
0.2		1.82	1.28	1.08	0.90	0.76	0.63	1.78	1.43	1.23	0.95	0.74	0.64	1.73	1.31	1.03	0.84	0.68	0.57
0.4		1.39	1.07	0.84	0.72	0.62	0.52	1.39	1.13	1.00	0.80	0.62	0.55	1.32	1.08	0.88	0.74	0.60	0.50
0.6		1.12	0.90	0.74	0.60	0.52	0.43	1.10	0.91	0.82	0.68	0.53	0.47	1.04	0.90	0.76	0.64	0.54	0.44
0.8		0.92	0.76	0.62	0.51	0.42	0.36	0.90	0.76	0.68	0.57	0.45	0.40	0.87	0.76	0.63	0.54	0.44	0.38
1		0.76	0.63	0.52	0.42	0.35	0.30	0.75	0.62	0.57	0.47	0.38	0.33	0.71	0.61	0.53	0.45	0.38	0.30

Notes:

- s = spacing of deck beams or deck longitudinals, in mm (in.)
- ℓ = length of plate panel, in mm (in.)
- a = wheel imprint dimension, in mm (in.), parallel to the shorter edge, s, of the plate panel
- b = wheel imprint dimension, in mm (in.), parallel to the longer edge, ℓ, of the plate panel

### 3.7 Higher-strength Steels

Where moveable platforms (decks) are constructed of higher-strength steel and provision is made for the operation or stowage of vehicles having rubber tires, the thickness of plating is to be not less than obtained from the following equation:

$$t_{hts} = t_{ms} \sqrt{M / Y} \quad \text{mm (in.)}$$

where

- $t_{ms}$  = thickness of ordinary-strength steel, as obtained from 2/3.3 or 2/3.5, as applicable
- Y = specified minimum yield point or yield strength, in N/mm<sup>2</sup> (kgf/mm<sup>2</sup>, psi), as defined in 2-1-1/13 of the *ABS Rules for Materials and Welding (Part 2)*, for the higher-strength material or 72% of the specified minimum tensile strength, whichever is the lesser
- M = 235 (24, 34000)

### 3.9 Fiber Reinforced Plastic

For moveable platforms (decks) constructed of fiber reinforced plastic, special consideration will be given to the required thickness where provision is made for the operation or stowage of vehicles having rubber tires after all other requirements are met.

## 5 Local and Primary Support Members

### 5.1 General

Local and primary support members are to be efficiently arranged to support the loads on moveable platforms (decks). These supporting members are to have adequate structural stability.

On moveable platforms (decks), both the web and flange are to be welded to the supporting member. At beam knees or at other bracketed end connections, continuity of strength of the beam or longitudinal is to be maintained at the connection to the bracket and at the connection of the bracket to the supporting member. Welding is to be in accordance with 3-2-19/Table 1 of the ABS *Steel Vessel Rules*.

Girders and transverses of the sizes required by 3-2-8/5.3 through 3-2-8/5.15 of the ABS *Steel Vessel Rules* are to be fitted, as required to support the beams. In way of deck girders or special deep beams, the deck plating is to be of sufficient thickness and suitably stiffened to provide an effective part of the girder.

### 5.3 Steel Vessels and Steel Barges

The local or primary support members, in association with the plating to which they are attached, are to have section modulus,  $SM$ , not less than obtained from the following equation.

$$SM = kchs\ell^2 \quad \text{cm}^3 \text{ (in}^3\text{)}$$

where

$k$	=	7.8 (0.0041)
$c$	=	0.81 for the section modulus to the flange or face bar
	=	1.00 for the section modulus to the deck plating
$h$	=	$p/7.07$ m ( $p/720$ m, $p/45$ ft)
$p$	=	uniform loading, in kN/m <sup>2</sup> (kgf/m <sup>2</sup> , lbf/ft <sup>2</sup> )
$s$	=	spacing of the local or primary support members, in m (ft)
$\ell$	=	unsupported length of the local or primary support member, in m (ft)

In general, the depth of beams and girders is not to be less than 4% of the unsupported length.

### 5.5 High Speed Naval Craft

All local and primary support members of steel or aluminum moveable platforms (decks) that are subject to vehicle loads are to be checked under all possible combinations of the loads given in Section 3-2-4 of the ABS *HSNC Rules*. The maximum allowable design stresses for these members are given in 3-2-4/Table 1 of the ABS *HSNC Rules*.

### 5.7 Higher-strength Steels

#### 5.7.1 Beams (Local Support Members)

Each beam of higher-strength steel, in association with the higher-strength plating to which it is attached, is to have a section modulus  $SM_{hts}$  not less than obtained from the following equation.

$$SM_{hts} = 7.8chs\ell^2 Q \quad \text{cm}^3$$

$$SM_{hts} = 0.0041chs\ell^2 Q \quad \text{in}^3$$

where

$c$	=	0.540 for half beams, for beams with centerline support only, for beams between longitudinal bulkheads, and for beams over tunnels or tunnel recesses
	=	0.585 for beams between longitudinal deck girders. For longitudinal beams of platform decks and between hatches at all decks

- $s$  = spacing of beams, in m (ft)
- $\ell$  = distance, in m (ft), from the inner edge of the beam knee to the nearest line of girder support or between girder supports, whichever is greater. Normally  $\ell$  is not to be less than  $0.2B$ .
- $h$  = height, in m (ft), as follows
  - = is normally to be the height measured at the side of the vessel, of the cargo space wherever stores or cargo may be carried. Where the cargo load differs from  $7.04 \text{ kN/m}^3$  ( $718 \text{ kgf/m}^3$ ,  $44.8 \text{ lbf/ft}^3$ ) multiplied by the tween-deck height, in m (ft), the height is to be proportionately adjusted.
  - = elsewhere, the value of  $h$  may be taken as follows.

$L$ <i>meters</i>	$h$ <i>meters</i>	$L$ <i>feet</i>	$h$ <i>feet</i>
90	1.51	300	5.00
100	1.69	325	5.50
110	1.90	350	6.00
120	1.98	375	6.50
122 and above	1.98	400 and above	6.50

- $Q$  = 0.78 for H32 strength steel
- = 0.72 for H36 strength steel

**5.7.2 Girders and Transverses (Primary Support Members)**

Each girder and deck transverse of higher-strength steel, in association with the higher-strength plating to which they are attached, are generally to comply with the requirements of the appropriate preceding paragraphs of this Section and is to have a section modulus  $SM_{hts}$  not less than obtained from the following equation:

$$SM_{hts} = SM(Q)$$

where

- $SM$  = required section modulus in ordinary-strength material
- $Q$  = 0.78 for H32 strength steel
- = 0.72 for H36 strength steel

Calculations are to be submitted to show adequate provision to resist buckling.

**7 Loading of Vehicles with Rubber Tires**

**7.1 General**

When moveable platforms (decks) are intended for the operation or stowage of vehicles having rubber tires, the local and primary support members are to be satisfactorily assessed by direct calculation in accordance with the following criteria.

**7.3 Loads and Fixities**

The following loading criteria are to be taken into account:

- i)* Assume a simply-supported beam for local and primary support members, unless ends are effectively fixed.
- ii)* Check each member for the worst possible loading condition.

- iii) Disregard dynamic load increases due to rolling, pitching and heaving accelerations of vessel (except for high speed craft).
- iv) Special attention is to be paid to supporting details and attachments to ship structure.

**7.5 Allowable Stresses**

Moveable platforms (decks) are to comply with the following maximum allowable stresses:

- i) Maximum allowable bending stress for beams and girders 14.0 kN/cm<sup>2</sup> (1415 kg/cm<sup>2</sup>, 20,160 psi).
- ii) Maximum allowable shear stress for beams and girders 10.5 kN/cm<sup>2</sup> (1055 kg/cm<sup>2</sup>, 15,000 psi).
- iii) Maximum allowable bearing stress for beams and girders 21.0 kN/cm<sup>2</sup> (2150 kg/cm<sup>2</sup>, 30,600 psi).
- iv) Maximum allowable resisting tearing failure for beams and girders 12.0 kN/cm<sup>2</sup> (1225 kg/cm<sup>2</sup>, 17,400 psi).

**9 Lashing Points**

Moveable platforms (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 200 kN (20,400 kg, 20 tons) or the rated breaking strength of the lashing point fitting, whichever is greater. These loads are for one securing device. Where more than one securing device is to be attached to a lashing point, the load is to be increased proportionately. The deck strength member is to have a section modulus, *SM*, not less than that obtained from the following equation:

$$SM = M/f \quad \text{cm}^2 \text{ (in}^2\text{)}$$

where

- M* = maximum bending moment due to lashing load, in kN-cm (kgf-cm, tonf-in)
- f* = design stress given below

The sectional area of the web of the deck structural member, *A*, is to be not less than that obtained from the following equation:

$$A = \frac{F}{\tau} \quad \text{cm}^2 \text{ (in}^2\text{)}$$

where

- F* = maximum shear force due to lashing load, in kN (kgf, tons)
- $\tau$  = design stress given below
  - normal or bending stress (*f*): 1.0*Y*
  - shear stress ( $\tau$ ): 0.56*Y*
- Y* = minimum yield strength of material, as defined in 2-1-1/13 of the *ABS Rules for Materials and Welding (Part 2)*, or 72% of the specified minimum tensile strength, whichever is lesser, kN/cm<sup>2</sup> (kgf/cm<sup>2</sup>, tons/in<sup>2</sup>)

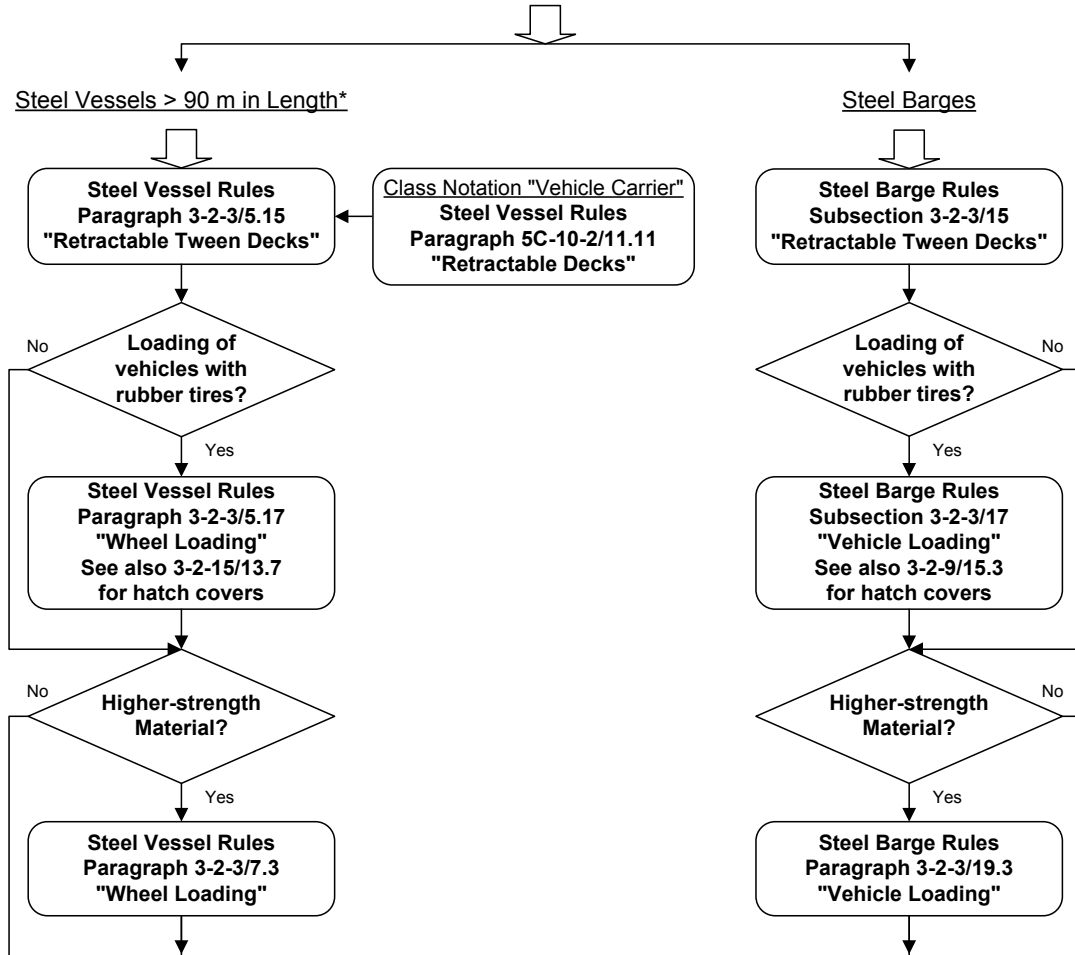


## SECTION **3** **Lifting Appliances for Moveable Platforms (Decks)**

Lifting appliances for moveable platforms (decks), if fitted, are to comply with Chapter 6, “Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)” of the ABS *Lifting Appliances Guide*.

# APPENDIX 1 Summary of ABS Requirements

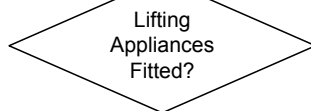
## Vessels (Other Than High-Speed Craft) Having Moveable Decks for Vehicle Loading



\* Also applicable to Steel Vessels Under 90 meters

MOVDK

### Lifting Appliances



Lifting Appliances Guide - Chapter 6  
"Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)"

