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# W29 Requirements for manufacture of anchors

(June  
2005)

## 1. General requirements

### 1.1 Scope

These Rules apply to the materials, manufacture and testing, and certification of anchors, shanks and anchor shackles produced from cast or forged steel, or fabricated by welded rolled steel plate and bars. Frequent reference is made to UR A1.

With regard to holding power tests at sea for high holding power (HHP) and super high holding power (SHHP) anchors, refer to UR A1.

### 1.2 Types of anchor

The types of anchor covered include:

- a) Ordinary anchors. Refer to UR A1.4.1.1
  - i) Stockless anchors
  - ii) Stocked anchors
- b) HHP anchors. Refer to UR A1.4.1.2
- c) SHHP anchors, not exceeding 1500kg in mass. Refer to UR A1.4.1.3

Any changes to the design made during manufacture are to have prior written agreement from the Classification Society.

## 2. Materials

### 2.1 Materials for anchors

All anchors are to be manufactured from materials meeting the requirements of the UR Ws as indicted below:

- a) Cast steel anchor flukes, shanks, swivels and shackles are to be manufactured and tested in accordance with the requirements of UR W8 and comply with the requirements for castings for welded construction. The steel is to be fine grain treated with Aluminium. If test programme B is selected in Section 4.2 then Charpy V notch (CVN) impact testing of cast material is required. Special consideration is to be given to the use of other grades of steels for the manufacture of swivels.
- b) Forged steel anchor pins, shanks, swivels and shackles are to be manufactured and tested in accordance with the requirements of UR W7. Shanks, swivels and shackles are to comply with the requirements for carbon and carbon-manganese steels for welded construction. Special consideration is to be given to the use of other grades of steels for the manufacture of swivels.

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Note: This UR is to be uniformly implemented by IACS Societies in respect of anchors, the manufacturing of which is commenced on or after 1 January 2007.

- c) Rolled billets, plate and bar for fabricated steel anchors are to be manufactured and tested in accordance with the requirements of UR W11.
- d) Rolled bar intended for pins, swivels and shackles are to be manufactured and tested in accordance with the requirements of UR W7 or UR W11.

## 2.2 Materials for SHHP anchors

In addition to the requirements of 2.1 above, SHHP anchors are to be produced in accordance with the material toughness requirements of UR A1.4.4.

## 3. Manufacture of anchors

### 3.1 Tolerance

If not otherwise specified on standards or on drawings demonstrated to be appropriate, the following assembly and fitting tolerance are to be applied.

The clearance either side of the shank within the shackle jaws is to be no more than 3mm for small anchors up to 3 tonnes weight, 4mm for anchors up to 5 tonnes weight, 6mm for anchors up to 7 tonnes weight and is not to exceed 12 mm for larger anchors.

The shackle pin is to be a push fit in the eyes of the shackle, which are to be chamfered on the outside to ensure a good tightness when the pin is clenched over on fitting. The shackle pin to hole tolerance is to be no more than 0.5mm for pins up to 57mm and 1.0mm for pins of larger diameter.

The trunnion pin is to be a snug fit within the chamber and be long enough to prevent horizontal movement. The gap is to be no more than 1% of the chamber length.

The lateral movement of the shank is not to exceed 3 degrees, see Figure 1.

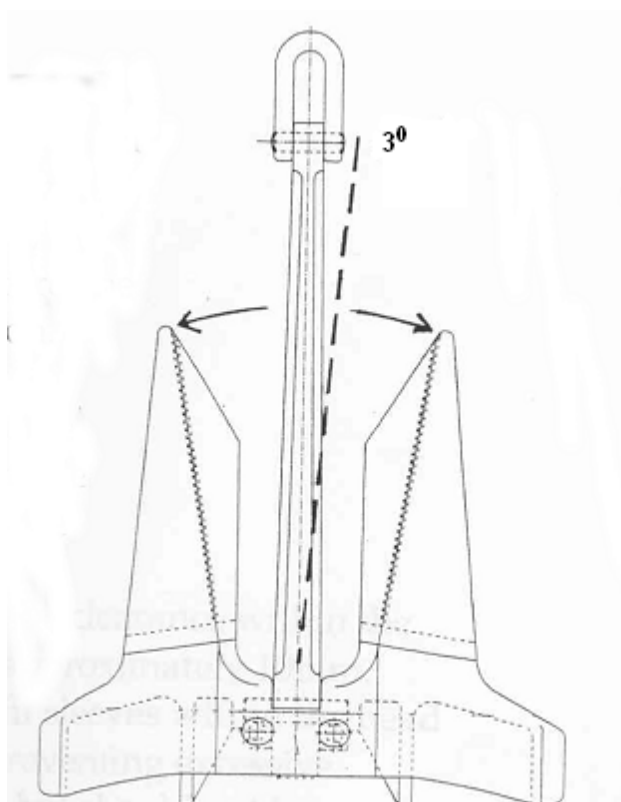


Figure 1 Allowable lateral movement of shank

### **3.2 Welding of anchors**

Welded construction of fabricated anchors is to be done in accordance with procedures approved by the Classification Society. Welding is to be carried out by qualified welders, following the approved welding procedures qualified in accordance with UR W28, using consumables manufactured in accordance with the requirements of UR W17. NDE is to be carried in accordance with the requirements of 4.2 Product tests.

### **3.3 Heat treatment**

Components for cast or forged anchors are to properly heat treated; fully annealed; normalised or normalised and tempered in accordance with UR W7 and UR W8.

Fabricated anchors may require stress relief after welding depending upon weld thickness. Stress relief is to be carried out as indicated in the approved welding procedure. Stress relief temperatures are not to exceed the tempering temperature of the base material.

### **3.4 Freedom from defects**

All parts are to have a clean surface consistent with the method of manufacture and be free from cracks, notches, inclusions and other defects that would impair the performance of the product.

### **3.5 Repairs**

Any necessary repairs to forged and cast anchors are to be agreed by the Surveyor and carried out in accordance with the repair criteria indicated in UR W7 and UR W8. Repairs to fabricated anchors are to be agreed by the Surveyor and carried out in accordance with qualified weld procedures, by qualified welders, following the parameters of the welding procedures used in construction.

### **3.6 Anchor assembly**

Assembly and fitting are to be done in accordance with the design details.

Securing of the anchor pin, shackle pin or swivel nut by welding is to be done in accordance with an approved procedure.

## **4. Testing and certification**

### **4.1 Proof load test**

Proof load tests are to be carried out by an approved testing facility.

Proof load testing for Ordinary, HHP and SHHP anchors is to be carried out in accordance with the pertinent requirements of UR A1.4.3.

### **4.2 Product tests**

#### 4.2.1 Product Test Programmes

The Classification Society can request that either programme A or programme B be applied.

**Table 1 Applicable programmes for each product form**

Product test	Product form		
	Cast components	Forged components	Fabricated/Welded components
Programme A	Applicable	Not applicable	Not applicable
Programme B	Applicable <sup>(1)</sup>	Applicable	Applicable

Notes : (1) CVN impact tests are to be carried out to demonstrate at least 27 joules average at 0°C. Refer to 2.1 a).

**Table 2 Product test requirements for programme A and B**

Programme A	Programme B
Drop test	—
Hammering test	—
Visual inspection	Visual inspection
General NDE	General NDE
—	Extended NDE

#### 4.2.2 Drop test

Each anchor fluke and shank is individually raised to a height of 4m and dropped on to a steel slab without fracturing. The steel slab is to be suitable to resist the impact of the dropped component.

#### 4.2.3 Hammering test

After the drop test, hammering tests are carried out on each anchor fluke and shank, which is slung clear of the ground, using a non-metallic sling, and hammered to check the soundness of the component. A hammer of at least 3kg mass is to be used.

#### 4.2.4 Visual inspection

After proof loading visual inspection of all accessible surfaces is to be carried out.

#### 4.2.5 General non-destructive examination

After proof loading general NDE is to be carried out as indicated in the following Tables 3 and 4.

**Table 3 General NDE for Ordinary and HHP anchors**

Location	Method of NDE
Feeders of castings	PT or MT
Risers of castings	PT or MT
Weld repairs	PT or MT
Forged components	Not required
Fabrication welds	PT or MT

**Table 4 General NDE for SHHP anchors**

Location	Method of NDE
Feeders of castings	PT or MT and UT
Risers of castings	PT or MT and UT
All surfaces of castings	PT or MT
Weld repairs	PT or MT
Forged components	Not required
Fabrication welds	PT or MT

IACS Recommendation No. 69 "Guidelines for non-destructive examination of marine steel castings" is regarded as an example of an acceptable standard for surface and volumetric examination.

#### 4.2.6 Extended non-destructive examination

After proof loading general NDE is to be carried out as indicated in the following Table 5.

**Table 5 Extended NDE for Ordinary, HHP and SHHP anchors**

<b>Location</b>	<b>Method of NDE</b>
Feeders of castings	PT or MT and UT
Risers of castings	PT or MT and UT
All surfaces of castings	PT or MT
Random areas of castings	UT
Weld repairs	PT or MT
Forged components	Not required
Fabrication welds	PT or MT

IACS Recommendation No. 69 "Guidelines for non-destructive examination of marine steel castings" is regarded as an example of an acceptable standard for surface and volumetric examination.

#### **4.2.7 Repair criteria**

If defects are detected by NDE, repairs are to be carried out in accordance with 3.5. For fracture and unsoundness detected in a drop test or hammering test, repairs are not permitted and the component is to be rejected.

#### **4.3 Mass and dimensional inspection**

Unless otherwise agreed, the verification of mass and dimensions is the responsibility of the manufacturer. The Surveyor is only required to monitor this inspection. The mass of the anchor is to exclude the mass of the swivel, unless this is an integral component.

#### **4.4 Retests**

Mechanical retest are permitted in accordance with the requirements of UR W2.

#### **4.5 Marking**

Anchors which meet the requirements are to be stamped on the shank and the fluke. The markings on the shank are to be approximately level with the fluke tips. On the fluke, these markings are to be approximately at a distance of two thirds from the tip of the bill to the center line of the crown on the right hand fluke looking from the crown towards the shank. The markings are to include:

- Mass of anchor
- Identification, e.g. test No. or certificate No.
- Society's stamp
- Manufacturer's mark

Additionally the unique cast identification is to be cast on the shank and the fluke.

#### **4.6 Certification**

Anchors which meet the requirements are to be certified by the Society at least with the following items:

- Manufacturer's name
- Type
- Mass
- Fluke and Shank identification numbers
- Grade of materials
- Proof test loads
- Heat treatment
- Marking applied to anchor

#### **4.7 Painting**

All types of anchor are not to be painted until all tests and inspections have been completed.

**END**