# RUSSIAN MARITIME REGISTER OF SHIPPING

HEAD OFFICE

**CIRCULAR LETTER** **№ 314-53-.709c** dated 27.12.2013г.

Re: IACS Unified Requirement (UR) W31 (Jan 2013)
"Application of YP47 Steel Plates".

Item of technical supervision:
YP47 steel plates

| | |
|---|---|
| Implementation since | 01.01.2014 |
| Valid: until | ND re-publication |
| Validity period extended till | . |
| Cancels/amends/adds Circular letter № | - dated - |
| Number of pages: | 1+6 |
| Appendices: | Amendments to the Rules – 6 pages |

Director of Classification Directorate V.I. Evenko

Amends Rules for the Classification and Construction of Sea-Going Ships, ND No. 2-020101-077

We hereby inform you that IACS Unified Requirement (UR) IACS W31 (Jan 2013) "Application of YP47 Steel Plates" comes into force since 1 January 2014. UR specifies requirements for use of YP47 steel plates.

In view of the above, the amendments given in the Appendix to the Circular Letter shall be introduced into the Rules for the Classification and Construction of Sea-Going Ships, ND No. 2-020101-077.

It is necessary to do the following:

1. Apply the amendments to the RS Rules given in the Appendix to the Circular Letter.
2. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.

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DMS «THESIS": 13-244025 26.11.2013

APPENDIX to Circular letter No.
№ 314-53-709c of 27.12.13г.

# Amendments to be introduced to the Rules for the Classification and Construction of Sea-Going Ships (2014)

## PART XIII. MATERIALS

**Section 3** shall supplemented with the following text:

### "3.19 APPLICATION OF YP47 STEEL PLATES

**3.19.1 Application.**

**3.19.1.1** General.

**3.19.1.1.1** These requirements apply to container carriers incorporating extremely thick steel plates in accordance with 3.19.1.2.1.

**3.19.1.1.2** This section gives the basic concepts for application of YP47 steel plates to longitudinal structural members in the upper deck region of container carriers (such as hatch side coaming, hatch coaming top and the attached longitudinals). Application of YP47 steel plate for other hull structures shall be subject to special consideration by the Register.

**3.19.1.1.3** Unless otherwise specified, the requirements of 3.2 shall be applied to YP47 steel plates.

**3.19.1.1.4** YP47 steel plates mean the steel plates of specified minimum yield stress of 460 $N/mm^2$. The scope of application is defined under 3.19.1.2 and 3.19.1.3.

**3.19.1.2** Thickness.

**3.19.1.2.1** This section gives the requirements for steel plates with thickness of over 50 mm and not greater than 100 mm.

**3.19.1.2.2** For YP47 steel plates outside of this thickness range, shall be subject to special consideration and approval by the Register.

**3.19.1.3** Application.

**3.19.1.3.1** In the case that YP47 steel plates are used for longitudinal structural members in the upper deck region (such as hatch side coaming and hatch coaming top and their attached longitudinals), the grade of YP47 steel plates shall be EH47 specified hereinafter.

**3.19.2 General.**

**3.19.2.1** Hull structures.

**3.19.2.1.1** Material factor of high tensile steel *K*.

Material factor of high tensile steel *K* used for assessment of hull girder strength shall be taken 0,62.

**3.19.2.1.2** Fatigue assessment.

Fatigue assessment on the longitudinal structural members shall be performed in accordance with the Register procedure.

**3.19.2.1.3** Details of construction design.

Special consideration shall be paid to the details of constructions of structural members where YP47 steel plates are applied such as connections between outfitting and hull structures. Connections shall be in accordance with the documents approved by the Register.

**3.19.2.2** Material specifications.

**3.19.2.2.1** Material specifications for YP47 steel plates are given in Tables 3.19.2.2.1-1 and 3.19.2.2.1-2.

Table 3.19.2.2.1-1

**Conditions of supply, grade and mechanical properties for YP47 steel plates**

| Supply condition | Grade | Mechanical properties | | | Impact test | | | |
|---|---|---|---|---|---|---|---|---|
| | | Yield strength, MPa, min | Tensile strength, MPa | Elongation, %, min | Test temperature, °C | Average impact energy, J, min. | | |
| | | | | | | 50< $t \leq 70$ | 70 < $t \leq 85$ | 85 < $t \leq 100$ |
| TMCP* | EH47 | 460 | 570/720 | 17 | – 40 | 53 | 64 | 75 |
| [1]Other conditions of supply shall be agreed with the Register.<br>Note. $t$ – thickness, in mm. | | | | | | | | |

Table 3.19.2.2.1-2

**Chemical compositions for YP47 steel plates**

| Chemical composition | $C_{eq}$ [1] | $P_{cm}$ [2] |
|---|---|---|
| As agreed with the Register | $\leq 0{,}49$ | $\leq 0{,}22$ |

[1] The carbon equivalent $C_{eq}$ value shall be calculated from the ladle analysis using the formula $C_{eq} = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$, %.

[2] Cold cracking susceptibility shall be calculated using the formula

$P_{cm} = C + Si/30 + Mn/20 + Cu/20 + Ni/60 + Cr/20 + Mo/15 + V/10 + 5B$, %.

The tests shall be conducted in compliance with 3.2.

**3. 19.2.3** Manufacturing approval test.

**3.19.2.3.1** General.

Approval test items, test methods and acceptance criteria not specified in this Chapter shall be in compliance with 1.3.

**3.19.2.3.2** Range of approval.

One test product with the maximum thickness to be approved (to obtain a Type Approval Certificate) shall be submitted by the manufacturer, provided the approved target chemical composition range remains unchanged.

**3.19.2.3.3** Base metal test.

**3.19.2.3.3.1** Charpy V-notch impact tests (*KV*).

Generally Charpy V-notch impact testing shall be carried out in compliance with 2.2.3.
Test samples shall be taken from the plate corresponding to the top of the ingot, unless otherwise specified.
In the case of continuous castings, test samples shall be taken from a randomly selected plate.
The location of the test sample shall be at the square cut end of the plate, approximately one quarter width from an edge, as shown in Fig. 3.19.2.3.3.1.

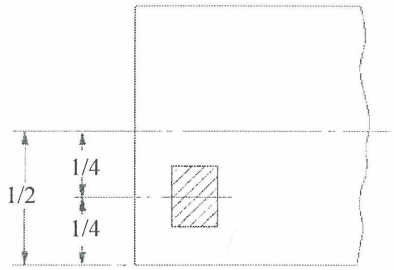


Fig.3.19.2.3.3.1 Plates and flats

Samples shall be taken with respect to the principal rolling direction of the plate at locations representing the top and bottom of the plate as follows:

longitudinal Charpy V-notch impact tests (*KVL)* – top and bottom;
transverse Charpy V-notch impact tests (*KVT)* – top only;
aged longitudinal Charpy V-notch impact tests – top only.

Charpy V-notch impact tests (*KV)* are required from both the quarter and mid thickness locations of the test samples.
One set of 3 Charpy V-notch impact specimens (*KV)* is required for each impact test. The pact test temperature shall be – 40 °C .
In addition to the determination of the energy value, during impact tests the percentage crystallinity shall be also determined.

The aged samples shall be strained to 5 per cent followed by heating to 250 °C for 1 h prior to testing.
Additionally at each location, Charpy V-notch impact tests shall be carried out with appropriate temperature intervals to properly define the full transition range (– 20 °C, – 40 °C – 60 °C, – 80 °C).

**3.19.2.3.3.2** Brittle fracture initiation test.

*CTOD* test shall be carried out and the result shall be reported.

Test methods shall be in compliance with 2.2, Part XII "Materials" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms.

**3.19.2.3.3.3** Drop-weight testing for determination of nil-ductility temperature.

Test methods shall be in compliance with ASTM E208, 2.3, Part XII "Materials" of the Rules for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms.
Nil-ductility temperature *NDT* shall be reported for reference.

**3.19.2.3.3.4** Brittle crack stopping test.

Standard ESSO test described in 3.20.6 or other alternative test (double tension test) shall be carried out in order to obtain the brittle crack stopping toughness. The results are given for reference.

**3.19.2.3.4** Weldability test.

**3.19.2.3.4.1** Charpy V-notch impact test (*KV*).

Charpy V-notch impact tests shall be taken at a position of 1/4 thickness from the plate surface on the face side of the weld with the notch perpendicular to the plate surface.

One set of the specimens transverse to the weld shall be taken with the notch located at the fusion line and at a distance 2,5 and minimum 20 mm from the fusion line. The fusion boundary shall be identified by etching the specimens with a suitable reagent. One additional set of the specimens shall be taken from the root side of the weld with the notch located at the same position and at the same depth as for the face side.

The impact test temperature shall be – 40 °C.

Additionally at each location, impact tests shall be carried out with appropriate temperature intervals to properly define the full transition range.

**3.19.2.3.4.2** Y-shape weld crack resistance test (Hydrogen crack test)

The test methods shall be in compliance with recognized national standards such as
GOST 26388, ISO 17 642 (2), KS B 0870, JIS Z 3158, GB 4675.1.
Acceptance criteria shall be in accordance with the Register practice.

**3.19.2.3.4.3 Test of resistance to** brittle fracture .

*CTOD* test shall be carried out.
Test method and results shall be considered appropriate by approved documentation.

**3.19.2.4** Welding.

**3.19.2.4.1** Welders.

Welders engaged in YP47 steel welding shall possess welder's qualifications specified in accordance with Section 4, Part III "Technical Supervision during Manufacture of Materials" of the

Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

**3.19.2.4.2** Short beads.

Short bead length for tack and repairs of welds by welding shall not be less than 50 mm.

In the case where $P_{cm} \leq 0{,}19$, 25 mm of short bead length may be adopted upon agreement with the Register.

**3.19.2.4.3** Preheating.

Preheating shall be 50 °C or over when air temperature is 5 °C or below.
In the case where $P_{cm} \leq 0{,}19$, air temperature of 0 °C or below may be adopted upon agreement with the Register.

**3.19.2.4.4** Welding consumables.

Specifications of welding consumables for YP47 steel plates are given in Table 3.19.2.4.4-1.

Table 3.19.2.4.4-1

Mechanical properties for deposited metal tests for welding consumables

| Mechanical properties | | | Impact test | |
|---|---|---|---|---|
| Yield strength, MPa, min. | Tensile strength, MPa | Elongation, %, min. | Test temperature, °C | Average impact energy, J, min. |
| 460 | 570/720 | 19 | – 20 | 53 |

Consumable tests for butt weld assemblies shall be in accordance with Table 3.19.2.4.4-2.

Table 3.19.2.4.4-2

Mechanical properties for butt weld tests for welding consumables

| Tensile strength, MPa | Bend test ratio: $D/t$ | Charpy V-notch impact tests | | |
|---|---|---|---|---|
| | | Test temperature, °C | Average impact energy, J, min. | |
| | | | Welding position | |
| | | | Downhand, horizontal-vertical, overhead | Vertical (upward and downward) |
| 570 – 720 | 4 | – 20 | 53 | 53 |

**3.19.2.4.5** Others.
Special care shall be paid to the final welding so that harmful defects do not remain.

Jigs shall be completely removed with no defects, otherwise the treatment of the jigs shall be agreed with the Register.

**3.19.2.5** Welding procedure qualification test.

**3.19.2.5.1** General.

Unless otherwise specified in this Chapter, qualification test items, test methods and acceptance criteria shall be in compliance with Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

**3.19.2.5.2** Range of approval.

The requirements of Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships shall be followed for range of approval.

**3.19.2.5.3** Charpy V-notch impact test (*KV*)

The requirements of Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships shall be followed for Charpy V-notch impact test. Average impact energy 64 J at – 20 °C shall be satisfied for impact test.

**3.19.2.5.4** Hardness.

Vickers hardness HV10, as defined in Section 6, Part III "Technical Supervision during Manufacture of Materials" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships shall be not more than 380. Measurement points shall include mid-thickness position in addition to the points required by Section 6.

**3.19.2.5.5** Tensile test.

Tensile strength in transverse tensile test shall be not less than 570 $N/mm^2$.

**3.19.2.5.6** Test of resistance to brittle fracture .

*CTOD* test may be required.
Test methods and results shall be in compliance with 2.2, Part XII "Materials", Rues for the Classification, Construction and Equipment of Mobile Offshore Drilling Units and Fixed Offshore Platforms.