

# Common Structural Rules for Bulk Carriers, January 2006

## Background Document

### CHAPTER 11 – CONSTRUCTION AND TESTING

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- This TB is published to improve the transparency of CSRs and increase the understanding of CSRs in the industry.
- The content of the TB is not to be considered as requirements.
- This TB cannot be used to avoid any requirements in CSRs, and in cases where this TB deviates from the Rules, the Rules have precedence.
- This TB provides the background for the first version (January 2006) of the CSRs, and is not subject to maintenance.

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## SECTION 1 – CONSTRUCTION

### 1. STRUCTURAL DETAILS

#### 1.1 Cut-outs, plate edges

##### 1.1.1

1.1.1.a Typical precautions related to forming cut-outs and edge preparation are based on RINA Rules.

##### 1.1.2

1.1.2.a The fatigue strength for hatch corner is checked in accordance with Ch 8 Sec.5. The stress concentration factor depends on the edge treatment as well as hatch corner configuration. Since the stress concentration factor of hatch corners without machine cut is too large to comply with the fatigue requirement, hatch corner without machine cut should not be accepted. Furthermore, this practice is in accordance with the practice of shipyards.

#### 1.2 Cold forming

##### 1.2.1

1.2.1.a The bending radius for cold forming was specified as the standard radius when bending corrugated bulkhead in IACS Rec. No. 47. General regulations related to cold forming were specified based on RINA Rules.

#### 1.3 Assembly, alignment

##### 1.3.1

1.3.1.a Typical misalignment standards for weld joints in IACS Rec. No. 47 are described here. With regard to this matter, considering that the IACS Rec. is not a mandatory requirement, and reflecting the opinion of the industry that reliable standards such as the Japanese Shipbuilding Quality Standard should be approved, it was decided that the classification society could approve standards if it deems them appropriate.

## SECTION 2 – WELDING

### 1. GENERAL

#### 1.1 Application

##### 1.1.1

1.1.1.a General regulations related to welding were established referring to the regulations of various classification societies. Basically, the regulations were in accordance with the regulations related to welding of various Classification Societies.

##### 1.1.2

1.1.2.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.1.3

1.1.3.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.1.4

1.1.4.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.1.5

1.1.5.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.1.6

1.1.6.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.1.7

1.1.7.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

#### 1.2 Welding consumables and procedures

##### 1.2.1

1.2.1.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

##### 1.2.2

1.2.2.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

### **1.2.3**

- 1.2.3.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

## **1.3 Welders and NDE operators**

### **1.3.1 Welders**

- 1.3.1.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

### **1.3.2 Automatic welding operators**

- 1.3.2.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

### **1.3.3 NDE operator**

- 1.3.3.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

## **1.4 Documentation to be submitted**

### **1.4.1**

- 1.4.1.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

### **1.4.2**

- 1.4.2.a It is considered that for this topic, no information in addition to that shown in the Rules is necessary to explain the background.

## **2. TYPE OF WELDED CONNECTIONS**

### **2.1 General**

#### **2.1.1**

- 2.1.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.2 Butt welding**

#### **2.2.1 General**

- 2.2.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

#### **2.2.2 Welding of plates with different thicknesses**

- 2.2.2.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.2.3 Edge preparation, root gap**

2.2.3.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **2.3 Tee or cross joints**

### **2.3.1 General**

2.3.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **2.4 Full penetration welds**

### **2.4.1 Application**

2.4.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.4.2**

2.4.2.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.4.3**

2.4.3.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.4.4**

2.4.4.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.4.5**

2.4.5.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **2.5 Deep penetration weld**

### **2.5.1**

2.5.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **2.6 Fillet welds**

### **2.6.1 Kinds and size of fillet welds and their applications**

2.6.1.a The regulation related to leg length of fillet weld was set for plating thickness up to 50 mm referring to the regulations of Chapter 1, Part C of the existing Rules and referring to existing welding practice. Dimensions of fillet welds are generally denoted by leg length or throat thickness; here, leg length is indicated because it can be checked easily on site. The corrosion addition required in Section 2, Chapter 3 is set according to the corrosive environment. The effects of corrosion must also be

considered when deciding the dimensions of fillet welds. However, it was decided to take the full corrosion addition for structural members because leg lengths of welds applied to one side of structural members forming boundaries of compartments are different from those applied to the other side since welds are exposed to only one corrosive environment, and such a situation could lead to confusion at the manufacturing site. Since the corrosion addition of plate member was 4 mm as a standard, if the corrosion addition for structural member considered is greater than 4 mm, the weld leg length has to be increased. If the corrosion addition of structural member is less than 4 mm, only 0.5 mm is to be reduced.

During actual operation, considering that the number of locations where intermittent welds are used is small, new criteria were developed taking F3 of double continuous welds at locations where F3 in Part C of the existing Rules for the Survey and Construction of Steel Ships is required. (See Fig. 11.1)

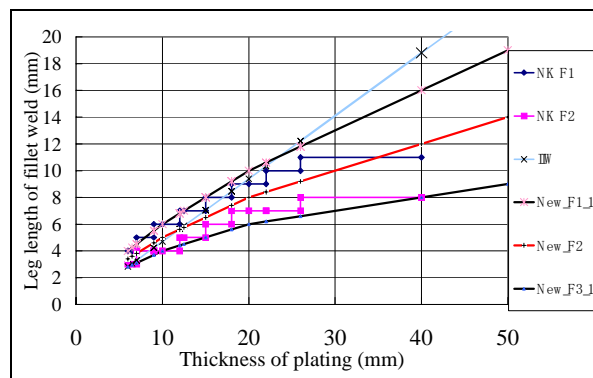


Fig. 11.1 Weld leg length

The steps shown in the figure from the top are F1 and F2 respectively of the existing rules. Leg lengths based on the guidelines of the International Institute of Welding (IIW) are said to be equivalent to F1, generally used in the existing Rules for the Survey and Construction of Steel Ships. The weld leg length specified in CSR if adjusted for corrosion addition is almost the same as the upper limiting line in the existing Rules for the Survey and Construction of Steel Ships. F3 specified in CSR was set so that it became equivalent to the lower limiting line of F2 in the existing Rules for the Survey and Construction of Steel Ships.

## 2.6.2 Intermittent welds

2.6.2.a This regulation is based on NK Rules Part C Chapter 1 1.2.

## 2.6.3 Size of fillet weld for abutting plating with small angle

2.6.3.a Where the angle between an abutting plate and the connected plate is not 90 degree, the throat thickness of the fillet weld with larger angle is generally smaller than that with smaller angle, in case of the same leg length of fillet weld. In order to ensure the sufficient strength of fillet weld with larger angle, this requirement is provided.

## 2.6.4 Deep penetration welds

2.6.4.a This requirement is based on the current practice.



## **2.7 Lap joint welds**

### **2.7.1 General**

2.7.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.7.2 Fillet welds**

2.7.2.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **2.8 Slot welds**

### **2.8.1 General**

2.8.1.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

### **2.8.2 Size of fillet welds**

2.8.2.a Regulations of this sub-section are based on the rules of various classification societies and on IACS UR S18.

## **3. CONNECTION DETAILS**

### **3.1 Bilge keel connection**

#### **3.1.1**

3.1.1.a The weld details for bilge keel were established referring to the regulation in B2.4, Sec. 19, Chapter I-1-1 of the GL Rules.

#### **3.1.2**

3.1.2.a The weld details for bilge keel were established referring to the regulation in B2.4, Sec. 19, Chapter I-1-1 of the GL Rules.

#### **3.1.3**

3.1.3.a The weld details for bilge keel were established referring to the regulation in B2.4, Sec. 19, Chapter I-1-1 of the GL Rules.

## SECTION 3 – TESTING OF COMPARTMENTS

### 1. GENERAL

#### 1.1 Definitions

##### 1.1.1 Shop primer

1.1.1.a This regulation incorporates the regulation of IACS UR S14.

##### 1.1.2 Protective coating

1.1.2.a It is considered that for this topic, no information in addition to that shown in the Rules, is necessary to explain the background.

##### 1.1.3 Structural testing

1.1.3.a This regulation incorporates the regulation of IACS UR S14.

##### 1.1.4 Hydropneumatic testing

1.1.4.a This regulation incorporates the regulation of IACS UR S14.

##### 1.1.5 Leak testing

1.1.5.a This regulation incorporates the regulation of IACS UR S14.

##### 1.1.6 Hose testing

1.1.6.a This regulation incorporates the regulation of IACS UR S14.

#### 1.2 Application

##### 1.2.1

1.2.1.a This regulation incorporates the regulation of IACS UR S14.

##### 1.2.2

1.2.2.a This regulation incorporates the regulation of IACS UR S14.

### 2. TESTING METHODS

#### 2.1 Structural testing

##### 2.1.1

2.1.1.a This regulation incorporates the regulation of IACS UR S14.

##### 2.1.2

2.1.2.a This regulation incorporates the regulation of IACS UR S14.

##### 2.1.3

2.1.3.a This regulation incorporates the regulation of IACS UR S14.

## **2.2 Leak testing**

### **2.2.1**

2.2.1.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.2**

2.2.2.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.3**

2.2.3.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.4**

2.2.4.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.5**

2.2.5.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.6**

2.2.6.a This regulation incorporates the regulation of IACS UR S14.

### **2.2.7**

2.2.7.a This regulation incorporates the regulation of IACS UR S14.

## **2.3 Hose testing**

### **2.3.1**

2.3.1.a This regulation incorporates the regulation of IACS UR S14.

## **2.4 Hydropneumatic testing**

### **2.4.1**

2.4.1.a This regulation incorporates the regulation of IACS UR S14.

## **2.5 Other testing methods**

### **2.5.1**

2.5.1.a This regulation incorporates the regulation of IACS UR S14.

## **3. TESTING REQUIREMENTS**

### **3.1 General**

#### **3.1.1**

3.1.1.a This regulation incorporates the regulation of IACS UR S14.