

# S12 Side Structures in Single Side Skin Bulk Carriers

(1992)

(Rev.1

1997)

(Rev.2.1

1997)

(Rev.3

Sept

2000)

(Rev.4

July

2004)

(Rev.5

May

2010)

## S12.1 Application and definitions

These requirements apply to side structures of cargo holds bounded by the side shell only of bulk carriers constructed with single deck, topside tanks and hopper tanks in cargo spaces intended primarily to carry dry cargo in bulk, which are contracted for construction on or after 1st July 1998.

This UR does not apply to CSR Bulk Carriers.

## S12.2 Scantlings of side structures

The thickness of the side shell plating and the section modulus and shear area of side frames are to be determined according to the Society's criteria.

The scantlings of side hold frames immediately adjacent to the collision bulkhead are to be increased in order to prevent excessive imposed deformation on the shell plating. As an alternative, supporting structures are to be fitted which maintain the continuity of forepeak stringers within the foremost hold.

## S12.3 Minimum thickness of frame webs

The thickness of frame webs within the cargo area is not to be less than  $t_{w,min}$ , in mm, given by:

$$t_{w,min} = C(7.0 + 0.03L)$$

C = 1.15 for the frame webs in way of the foremost hold;  
1.0 for the frame webs in way of other holds.

where L is the Rule length, in m, as defined in UR S2 but need not be taken greater than 200 m.

## S12.4 Lower and upper brackets

The thickness of the frame lower brackets is not to be less than the greater of  $t_w$  and  $t_{w,min} + 2$  mm, where  $t_w$  is the fitted thickness of the side frame web. The thickness of the frame upper bracket is not to be less than the greater of  $t_w$  and  $t_{w,min}$ .

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Note:

1. Changes introduced in Rev.3 are to be uniformly implemented by IACS Members and Associates from 1 July 2001.
2. The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural Requirement (PR) No. 29.

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The section modulus SM of the frame and bracket or integral bracket, and associated shell plating, at the locations shown in Figure 1, is not to be less than twice the section modulus  $SM_F$  required for the frame midspan area.

The dimensions of the lower and upper brackets are not to be less than those shown in Figure 2.

Structural continuity with the upper and lower end connections of side frames is to be ensured within topsides and hopper tanks by connecting brackets as shown in Figure 3. The brackets are to be stiffened against buckling according to the Society's criteria.

The section moduli of the side longitudinals and sloping bulkhead longitudinals which support the connecting brackets are to be determined according to the Society's criteria with the span taken between transverses. Other arrangements may be adopted at the Society's discretion. In these cases, the section moduli of the side longitudinals and sloping bulkhead longitudinals are to be determined according to the Society's criteria for the purpose of effectively supporting the brackets.

### S12.5 Side frame sections

Frames are to be fabricated symmetrical sections with integral upper and lower brackets and are to be arranged with soft toes.

The side frame flange is to be curved (not knuckled) at the connection with the end brackets. The radius of curvature is not to be less than  $r$ , in mm, given by:

$$r = \frac{0.4b_f^2}{t_f}$$

where  $b_f$  and  $t_f$  are the flange width and thickness of the brackets, respectively, in mm. The end of the flange is to be sniped.

In ships less than 190 m in length, mild steel frames may be asymmetric and fitted with separate brackets. The face plate or flange of the bracket is to be sniped at both ends. Brackets are to be arranged with soft toes.

The web depth to thickness ratio of frames is not to exceed the following values:

- $60 k^{0.5}$  for symmetrically flanged frames
- $50 k^{0.5}$  for asymmetrically flanged frames

where  $k = 1.0$  for ordinary hull structural steel and  $k < 1$  for higher tensile steel according to UR S4.

The outstanding flange is not to exceed  $10 k^{0.5}$  times the flange thickness.

### S12.6 Tripping brackets

In way of the foremost hold, side frames of asymmetrical section are to be fitted with tripping brackets at every two frames, as shown in Figure 4.

**S12**  
(cont)**S12.7 Weld connections of frames and end brackets**

Double continuous welding is to be adopted for the connections of frames and brackets to side shell, hopper and upper wing tank plating and web to face plates.

For this purpose, the weld throat is to be (see Figure 1):

- 0.44 t in zone "a"
- 0.4 t in zone "b"

where t is the thinner of the two connected members.

Where the hull form is such to prohibit an effective fillet weld, edge preparation of the web of frame and bracket may be required, in order to ensure the same efficiency as the weld connection stated above.

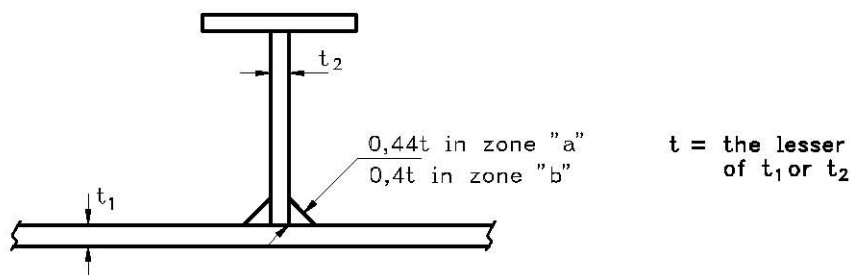
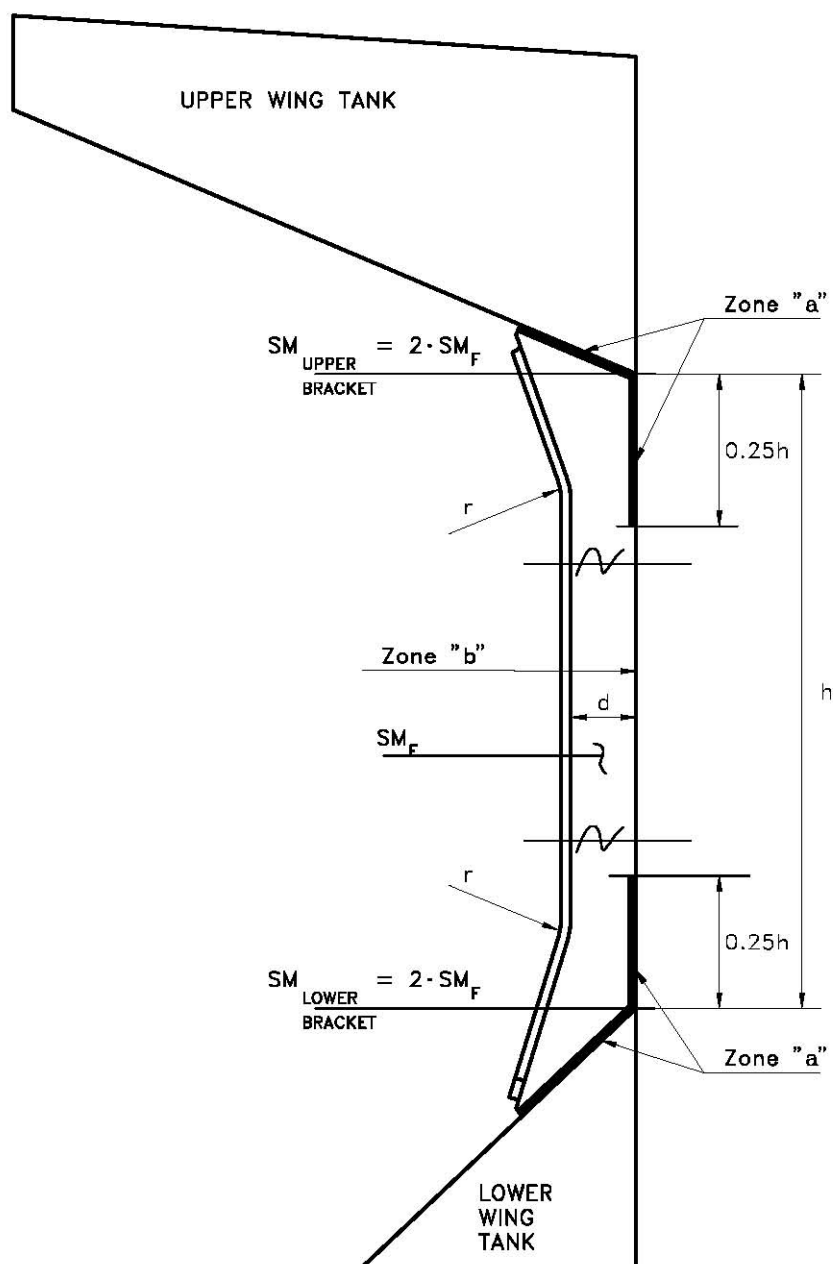
**S12.8 Minimum thickness of side shell plating**

The thickness of side shell plating located between hopper and upper wing tanks is not to be less than  $t_{p,min}$  in mm, given by:

$$t_{p,min} = \sqrt{L}$$

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Figure 1



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Figure 2

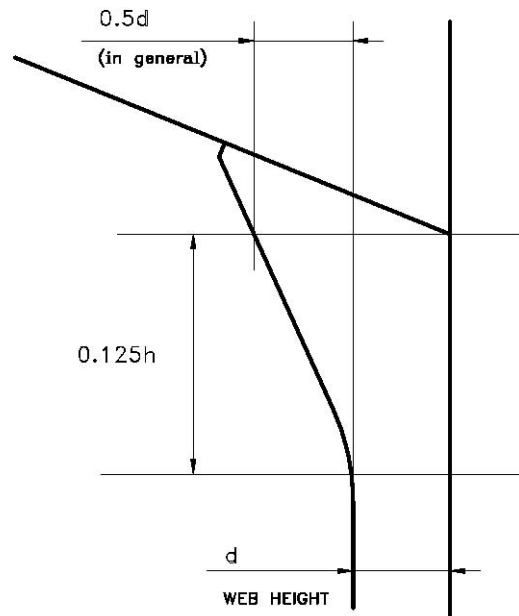
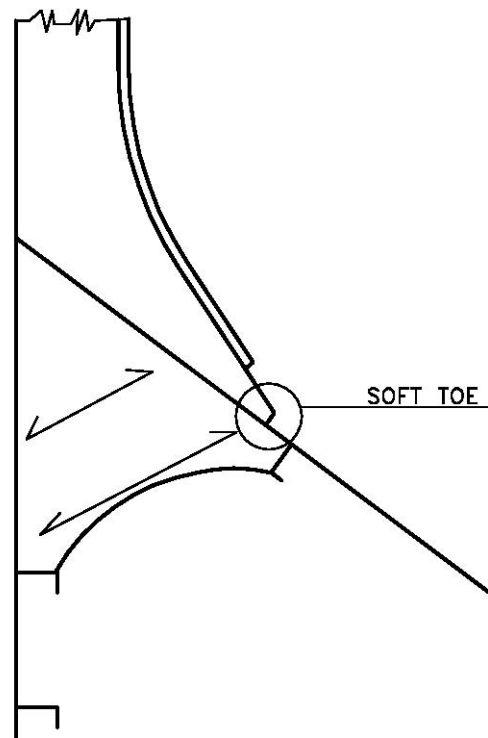


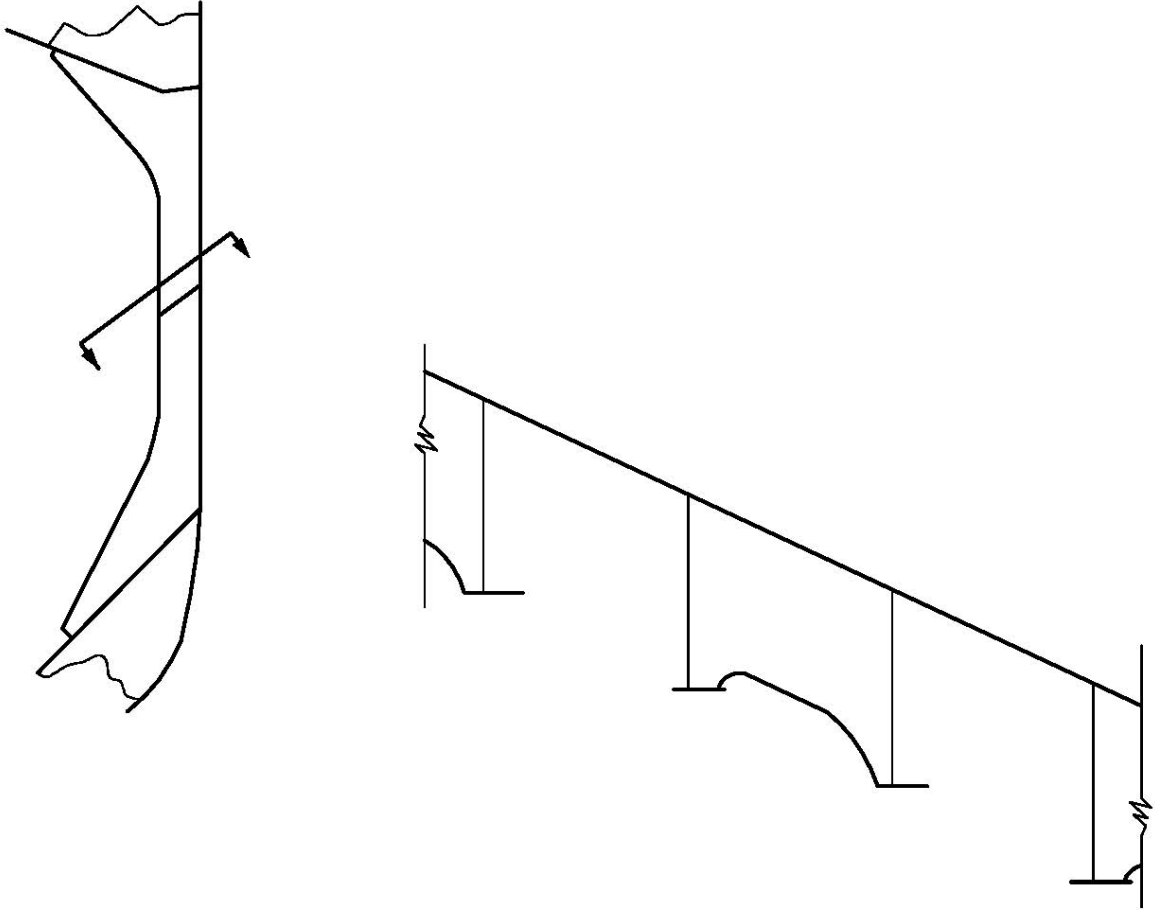
Figure 3



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Figure 4

Tripping brackets to be fitted in way of foremost hold



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