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CARGOES AND CONTAINERS  
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Agenda item 8

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**UNIFIED INTERPRETATION OF PROVISIONS OF IMO SAFETY, SECURITY, AND  
ENVIRONMENT-RELATED CONVENTIONS**

**Tee welds in type A or type B independent tanks and  
welds of type C independent bi-lobe tank with centreline bulkhead**

**Submitted by IACS**

**SUMMARY**

*Executive summary:* The annexes to this document provide copies of IACS Unified Interpretations GC20 and GC21 relating to paragraphs 4.20.1.1 and 4.20.1.2, respectively, of the "revised" IGC Code (resolution MSC.370(93)). In particular, the document discusses where tee welds can be accepted in type A or type B independent tanks; and the welding of type C independent tanks including bi-lobe tanks, primarily constructed of curved surfaces fitted with a centreline bulkhead.

*Strategic direction, if applicable:* 6

*Output:* 6.1

*Action to be taken:* Paragraph 11

*Related documents:* None

**Introduction**

1 IACS notes that paragraphs 4.20.1.1 and 4.20.1.2 of the International Code for the Construction and Equipment of Ships Carrying Liquid Gases in Bulk, as amended by resolution MSC.370(93) (hereafter referred to as the "revised" IGC Code), state:

"4.20.1.1 All welded joints of the shells of independent tanks shall be of the in-plane butt weld full penetration type. For dome-to-shell connections only, tee welds of the full penetration type may be used depending on the results of the tests carried out at the approval of the welding procedure. Except for small penetrations on domes, nozzle welds shall also be designed with full penetration.

4.20.1.2 Welding joint details for type C independent tanks, and for the liquid-tight primary barriers of type B independent tanks primarily constructed of curved surfaces, shall be as follows:

- .1 all longitudinal and circumferential joints shall be of butt welded, full penetration, double vee or single vee type. Full penetration butt welds shall be obtained by double welding or by the use of backing rings. If used, backing rings shall be removed except from very small process pressure vessels. Other edge preparations may be permitted, depending on the results of the tests carried out at the approval of the welding procedure; and
- .2 the bevel preparation of the joints between the tank body and domes and between domes and relevant fittings shall be designed according to a standard acceptable to the Administration or recognized organization acting on its behalf. All welds connecting nozzles, domes or other penetrations of the vessel and all welds connecting flanges to the vessel or nozzles shall be full penetration welds."

## Discussion

### *Tee welds in type A or type B independent tanks*

2 IACS members have reviewed paragraph 4.20.1.1 of the revised IGC Code and noted that the in-plane butt weld of the full penetration type is applicable to tanks primarily constructed of plane surfaces, i.e. to type A or type B independent tanks. Consequently, the welded corners (i.e. corners made of weld metal) shall not be used in the main tank shell construction, i.e.:

- .1 corners between shell side (sloped plane surfaces parallel to hopper or top side inclusive if any) and bottom or top of the tank; and
- .2 between tank end transverse bulkheads and bottom, top or shell sides (sloped plane surfaces inclusive if any) of the tank.

3 Instead, tank corners which are constructed using bent plating aligned with the tank surfaces and connected with in-plane welds are to be used.

4 After careful consideration, IACS members have agreed that the tee welds clearly referred to "for dome-to-shell connections" can be accepted for other localized connections of the shell, such as at the suction well, sump, dome, etc. In these cases, tee welds of the full penetration type shall be used.

5 The interpretation is based on:

- .1 the addition of the words "in-plane" and "only" in the "revised" IGC Code (resolution MSC.370(93)) compared to the previous version was agreed only in order to eliminate welded corners on prismatic tanks. This is well founded recognizing that where two flat plates form a corner made up of pure weld metal the throat of the weld is subject to high bending stress; and
- .2 no incident has been noted in tank connections when localized tee welds have been utilized, such as at the sumps or the suction wells.

**Welds of type C independent bi-lobe tank with centreline bulkhead**

6 IACS members have reviewed regulation 4.20.1.2 of the revised IGC Code and noted that the longitudinal cruciform welds between the shell of a bi-lobe tank and the centreline bulkhead are not clearly addressed.

7 Again, after careful consideration, IACS members have agreed that the longitudinal cruciform welds between the shell of a bi-lobe tank and the centreline bulkhead are covered by the "other edge preparations" with additional clarifications regarding the weld preparation and that the approval is based on test results.

8 The interpretation is based on:

- .1 no incident has been noted on bi-lobe tanks with the centreline bulkhead constructed with cruciform full penetration welds approved by the Administration or recognized organization, in relation to what are considered as classical and well-proven designs; and
- .2 typical cruciform joint preparation, as shown in figure 1 (noting that other preparations are acceptable).

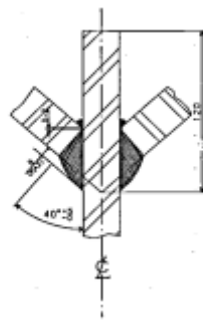


Figure 1: Typical cruciform joint at centreline bulkhead

**IACS Unified Interpretations GC20 and GC21**

9 Based on the above, and in order to facilitate efficient and safe implementation of these mandatory provisions, IACS has developed and adopted Unified Interpretations (UI) GC20, which provides an interpretation of the expression "for dome-to-shell connections only" in relation to tee welds of the full penetration type; and GC21, which provides an interpretation of the expression "other edge preparations" applicable to the cruciform full penetration welded joints in a bi-lobe tank with a centreline bulkhead.

10 The Sub-Committee is invited to note that IACS members will uniformly implement IACS UI GC20 and UI GC21 on ships contracted for construction on or after 1 July 2020, unless they are provided with written instruction to apply different interpretations by the Administration on whose behalf they are authorized to act as a recognized organization; and that the provisions of these UIs may be applied by IACS members earlier than the aforementioned implementation date when design difficulties are encountered during the approval of type A or type B independent tanks or type C independent bi-lobe tanks with a centreline bulkhead on gas carriers to which the revised IGC Code applies.

**Action requested of the Sub-Committee**

11 The Sub-Committee is invited to consider the foregoing and the copies of the IACS unified interpretations provided at annexes 1 and 2 to this document and the implementation provisions as explained in paragraph 10 above; and take action as appropriate.

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## ANNEX 1

# GC20 Tee welds in type A or type B independent tanks

(Apr 2019)

**Regulation 4.20.1.1 of the International Code for the Construction and Equipment of Ships Carrying Liquid Gases in Bulk (IGC Code) as amended by resolution MSC.370(93), states:**

*"All welded joints of the shells of independent tanks shall be of the in-plane butt weld full penetration type. For dome-to-shell connections only, tee welds of the full penetration type may be used depending on the results of the tests carried out at the approval of the welding procedure. Except for small penetrations on domes, nozzle welds shall also be designed with full penetration."*

### Interpretation

The regulation 4.20.1.1 is applicable to independent tanks of type A or type B, primarily constructed of plane surfaces. This includes the tank corners which are constructed using bent plating which is aligned with the tank surfaces and connected with in-plane welds.

The applicability of the expression "For dome-to-shell connections only" is clarified as follows:

- Welded corners (i.e. corners made of weld metal) shall not be used in the main tank shell construction, i.e. corners between shell side (sloped plane surfaces parallel to hopper or top side inclusive if any) and bottom or top of the tank, and between tank end transverse bulkheads and bottom, top or shell sides (sloped plane surfaces inclusive if any) of the tank. Instead, tank corners which are constructed using bent plating aligned with the tank surfaces and connected with in-plane welds are to be used.
- Tee welds can be accepted for other localized constructions of the shell such as suction well, sump, dome, etc. where tee welds of full penetration type shall also be used.

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### Note:

1. This unified interpretation is to be uniformly implemented by IACS Societies on ships contracted for construction on or after 1 July 2020 when encountering design difficulties during the approval of type A or type B independent tanks of gas carriers covered by the IGC Code (MSC.370(93)). The provisions of this unified interpretation will also be applied when design difficulties are encountered during the approval of type A or type B independent tanks of gas carriers covered by the IGC Code (MSC.370(93)) on ships contracted for construction earlier than 1 July 2020 unless they are instructed otherwise in writing by the Administration on whose behalf they are authorized to act as a recognized organization.
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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ANNEX 2

## GC21 Welds of type C independent bi-lobe tank with centreline bulkhead

(Apr 2019)

Regulation 4.20.1.2 of the International Code for the Construction and Equipment of Ships Carrying Liquid Gases in Bulk (IGC Code) as amended by resolution MSC.370(93), reads:

*"Welding joint details for type C independent tanks, and for the liquid-tight primary barriers of type B independent tanks primarily constructed of curved surfaces, shall be as follows:*

- 1. all longitudinal and circumferential joints shall be of butt welded, full penetration, double vee or single vee type. Full penetration butt welds shall be obtained by double welding or by the use of backing rings. If used, backing rings shall be removed except from very small process pressure vessels. Other edge preparations may be permitted, depending on the results of the tests carried out at the approval of the welding procedure; and*
- 2. the bevel preparation of the joints between the tank body and domes and between domes and relevant fittings shall be designed according to a standard acceptable to the Administration or recognized organization acting on its behalf. All welds connecting nozzles, domes or other penetrations of the vessel and all welds connecting flanges to the vessel or nozzles shall be full penetration welds."*

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Note:

1. This unified interpretation is to be uniformly implemented by IACS Societies on ships contracted for construction on or after 1 July 2020 when encountering design difficulties during the approval of type C independent bi-lobe tank with centreline bulkhead of gas carriers covered by the IGC Code (MSC.370(93)). The provisions of this unified interpretation will also be applied when design difficulties are encountered during the approval of type C independent bi-lobe tank with centreline bulkhead of gas carriers covered by the IGC Code (MSC.370(93)) on ships contracted for construction earlier than 1 July 2020 unless they are instructed otherwise in writing by the Administration on whose behalf they are authorized to act as a recognized organization.
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.

### Interpretation

The regulation 4.20.1.2 is applicable to type C independent tanks including bi-lobe tanks, primarily constructed of curved surfaces fitted with a centreline bulkhead.

The applicability of the expression "Other edge preparations" is clarified as follows:

- Cruciform full penetration welded joints in a bi-lobe tank with centreline bulkhead can be accepted for the tank structure construction at tank centreline welds with bevel preparation subject to the approval of the Administration or recognized organization acting on its behalf, based on the results of the tests carried out at the approval of the welding procedure. (See below example.)

