

**PART II RULES FOR THE CONSTRUCTION
AND CLASSIFICATION OF SHIPS
IDENTIFIED BY THEIR MISSION**

TITLE 34 LIQUEFIED GAS CARRIER

**INTERNATIONAL CODE FOR THE
CONSTRUCTION AND EQUIPMENT OF SHIPS
CARRYING LIQUEFIED GASES IN BULK, 2006, AS
AMENDED**

SECTION 2 STRUCTURE

CHAPTERS

A. MATERIALS OF CONSTRUCTION

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International Code for The Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1983, as amended 1990, 1992, 1994, 1996, 2006

PREAMBLE

The present Title 34 is a transcription of the International Code for The Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1983, as amended 1990, 1992, 1994, 1996, 2006.

The Code has been divided into Sections numbered according to the RBNA Rules (Part I, Title 01, Section 1, Chapter D), but the original item numbers of the Code have been maintained immediately to the side of the RBNA item numbers.

The correspondence between RBNA Chapters and Code Chapters is given below:

RBNA Section	RBNA Chapter	RBNA Subchapter	RBNA Topic	IGC Code Chapter	IGC Code Topic	
2	A	A1		11.0		MATERIALS OF CONSTRUCTION
		A1	100		6.1	General
			200		6.2	Materials and requirements
			300		6.3	Welding and non-destructive testing

**CHAPTER A
MATERIALS OF CONSTRUCTION**

CHAPTER CONTENTS

A1. MATERIALS OF CONSTRUCTION

A1. MATERIALS OF CONSTRUCTION

100. 6.1 General

101. 6.1.1 Administrations should take appropriate steps to ensure uniformity in the implementation and application of the provisions of this chapter.*

* Reference is made to the published Rules of members and associate members of the International Association of Classification Societies and in particular to IACS Unified Requirement No. W1.

102. 6.1.2 This chapter gives the requirements for plates, sections, pipes, forgings, castings and weldments used in the construction of cargo tanks, cargo process pressure vessels, cargo and process piping, secondary

barriers and contiguous hull structures associated with the transportation of the products. The requirements for rolled materials, forgings and castings are given in A1.200 (6.2) and tables T.A1.201.1 to T.1.2012.5 (6.1 to 6.5). The requirements for weldments are given in A1.300 (6.3).

103. 6.1.3 The manufacture, testing, inspection and documentation should be in accordance with Recognized Standards and the specific requirements given in this Code.

104. 6.1.4.1 Acceptance tests should include Charpy V-notch toughness tests unless otherwise specified by the Administration. The specified Charpy V-notch requirements are minimum average energy values for three full size (10 mm x 10 mm) specimens and minimum single energy values for individual specimens. Dimensions and tolerances of Charpy V-notch specimens should be in accordance with Recognized Standards. The testing and requirements for specimens smaller than 5.0 mm size should be in accordance with Recognized Standards. Minimum average values for subsized specimens should be:

200. Material and requirements

201. See Tables T.A1.201.1 to T.A1.201.5 below.

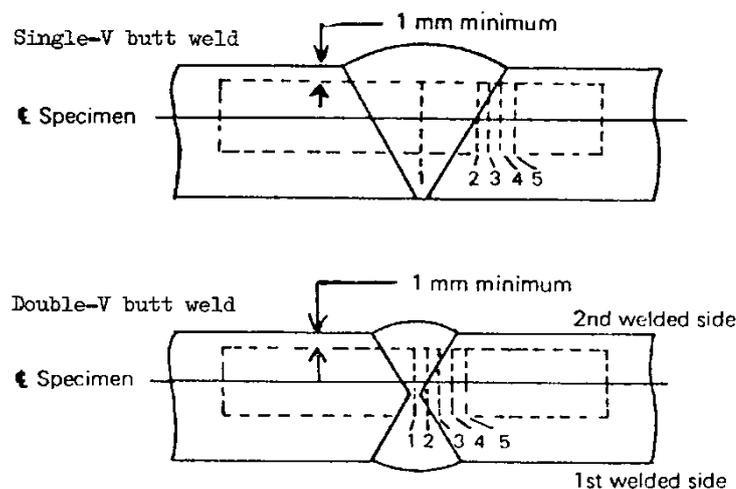
TABLE T.A1.104.1 – CHARPY V-NOTCH TEST

<i>Charpy V-notch specimen size</i>	<i>Minimum energy average of three specimens</i>
10 x 10 mm	E
10 x 7.5 mm	5/6 E
10 x 5.0 mm	2/3 E

where: E = the energy values (J) specified in tables 6.1 to 6.4.

Only one individual value may be below the specified average value provided it is not less than 70% of that value.

Figure F.A1.104.1 (6.1) - Orientation of weld test specimen



Notch location:

- 1 Centre of weld
- 2 On fusion line
- 3 In heat effected zone (HAZ), 1 mm from fusion line
- 4 In HAZ, 3 mm from fusion line
- 5 In HAZ, 5 mm from fusion line

106. The largest-size Charpy specimen possible for the material thickness should be machined with the centre of the specimens located as near as practicable to a point midway between the surface and the centre of the thickness. In all cases, the distance from the surface of the material to the edge of the specimen should be approximately 1 mm or greater. In addition, for double-V butt welds, specimens should be machined closer to the surface of the second welded section.

107. 6.1.4.2 In all cases, the largest size Charpy specimens possible for the material thickness should be machined with the specimens located as near as practicable to a point midway between the surface and the centre of the thickness and the length of the notch perpendicular to the surface (see figure F.A1.104.1 (6.1)). If the average value of the three initial Charpy V-notch specimens fails to meet the stated requirements, or the value for more than one specimen is below the required average value, or when the value for one specimen is below the minimum value permitted for a single specimen, three additional specimens from the same material may be tested and the results combined with those previously

obtained to form a new average. If this new average complies with the requirements and if no more than two individual results are lower than the required average and no more than one result is lower than the required value for a single specimen, the piece or batch may be accepted. At the discretion of the RBNA other types of toughness tests, such as a drop weight test, may be used. This may be in addition to or in lieu of the Charpy V-notch test.

108. 6.1.5 Tensile strength, yield stress and elongation should be to the satisfaction of the Administration. For carbon-manganese steel and other materials with definitive yield points, consideration should be given to the limitation of the yield to tensile ratio.

109. 6.1.6 The bend test may be omitted as a material acceptance test, but is required for weld tests.

110. 6.1.7 Materials with alternative chemical composition or mechanical properties may be accepted by the Administration.

111. 6.1.8 Where post-weld heat treatment is specified or required, the properties of the base material should be determined in the heat treated condition in

accordance with the applicable table of this chapter and the weld properties should be determined in the heat treated condition in accordance with A1.300 (6.3). In cases where a post-weld heat treatment is applied, the test requirements may be modified at the discretion of the Administration.

112. 6.1.9 Where reference is made in this chapter to A, B, D, E, AH, DH and EH hull structural steels, these steel grades are hull structural steels according to Recognized Standards.

200. 6.2 Material requirements

201. The requirements for materials of construction are shown in the tables as follows:

a. Table 6.1: Plates, pipes (seamless and welded), sections and forgings for cargo tanks and process pressure vessels for design temperatures not lower than 0°C.

b. Table 6.2: Plates, sections and forgings for cargo tanks, secondary barriers and process pressure vessels for design temperatures below 0°C and down to -55°C.

c. Table 6.3: Plates, sections and forgings for cargo tanks, secondary barriers and process pressure vessels for design temperatures below -55°C and down to -165°C.

d. Table 6.4: Pipes (seamless and welded), forgings and castings for cargo and process piping for design temperatures below 0°C and down to -165°C.

e. Table 6.5: Plates and sections for hull structures required by Part II, Title 34, Section 6, A2.900 (4.9.1 and 4.9.4).

TABLE T.A1.201.1 (6.1)

<i>PLATES, PIPES (SEAMLESS AND WELDED), *1 SECTIONS AND FORGINGS FOR CARGO TANKS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURE NOT LOWER THAN 0°C.</i>		
<i>CHEMICAL COMPOSITION AND HEAT TREATMENT:</i>		
CARBON-MANGANESE STEEL Fully killed		
Fine grain steel where thickness exceeds 20 mm		
Small additions of alloying elements by agreement with the Administration		
Composition limits to be approved by the Administration		
Normalized, or quenched and tempered */2		
<i>TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS:</i>		
PLATES	Each "piece" to be tested	
SECTIONS AND FORGINGS	Batch test.	
TENSILE PROPERTIES	Specified minimum yield stress not to exceed 410 N/mm ² */3	
CHARPY V-NOTCH TEST PLATES	Transverse test pieces. Minimum average energy value (E) 27 J.	
SECTIONS AND FORGINGS	Longitudinal test pieces. Minimum average energy value (E) 41 J.	
TEST TEMPERATURE	Thickness t (mm)	Test temperature (°C)
	t ≤ 20	0
	20 < t ≤ 40	-20

NOTES

*/1 For seamless pipes and fittings normal practice applies. The use of longitudinally and spirally welded pipes should be specially approved by the Administration.

*/2 A controlled rolling procedure may be used as an alternative to normalizing or quenching and tempering, subject to special approval by the Administration.

*/3 Materials with specified minimum yield stress exceeding 410 N/mm² may be specially approved by the Administration. For these materials, particular attention should be given to the hardness of the weld and heat affected zone.

TABLE T.A1.201.2 (6.2).

<p><i>PLATES, SECTIONS AND FORGINGS */1 FOR CARGO TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW 0°C AND DOWN TO -55°C.</i></p> <p>Maximum thickness 25 mm. */2</p>																							
<p><i>CHEMICAL COMPOSITION AND HEAT TREATMENT.</i></p> <p>Carbon Manganese Steel Fully killed. Aluminium treated fine grain steel.</p> <p>Chemical composition (ladle analyses).</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">C</th> <th style="text-align: center;">Mn</th> <th style="text-align: center;">Si</th> <th style="text-align: center;">S</th> <th style="text-align: center;">P</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0.16 % max*/3</td> <td style="text-align: center;">0.70 - 1.60%</td> <td style="text-align: center;">0.10 - 0.50%</td> <td style="text-align: center;">0.035% max</td> <td style="text-align: center;">0.035% max</td> </tr> </tbody> </table> <p><i>Optional additions:</i></p> <p>Alloys and grain refining elements may be generally in accordance with the following:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Ni</th> <th style="text-align: center;">Cr</th> <th style="text-align: center;">Mo</th> <th style="text-align: center;">Cu</th> <th style="text-align: center;">Nb</th> <th style="text-align: center;">V</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0.80% max</td> <td style="text-align: center;">0.25% max</td> <td style="text-align: center;">0.08% max</td> <td style="text-align: center;">0.35% max</td> <td style="text-align: center;">0.05% max</td> <td style="text-align: center;">0.10% max</td> </tr> </tbody> </table> <p>Normalized or quenched and tempered */4</p>		C	Mn	Si	S	P	0.16 % max*/3	0.70 - 1.60%	0.10 - 0.50%	0.035% max	0.035% max	Ni	Cr	Mo	Cu	Nb	V	0.80% max	0.25% max	0.08% max	0.35% max	0.05% max	0.10% max
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<p><i>TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS</i></p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 20%;">Plates</td> <td>Each "piece" to be tested</td> </tr> <tr> <td>Sections and forgings</td> <td>Batch test</td> </tr> <tr> <td>Charpy V-notch Test</td> <td>Test temperatures 5°C below the design temperature or -20°C whichever is lower</td> </tr> <tr> <td>Plates</td> <td>Transverse test pieces. Minimum average energy value (E) 27 J</td> </tr> <tr> <td>Sections and forgings*/1</td> <td>Longitudinal test pieces. Minimum average energy value (E) 41 J</td> </tr> </tbody> </table>		Plates	Each "piece" to be tested	Sections and forgings	Batch test	Charpy V-notch Test	Test temperatures 5°C below the design temperature or -20°C whichever is lower	Plates	Transverse test pieces. Minimum average energy value (E) 27 J	Sections and forgings*/1	Longitudinal test pieces. Minimum average energy value (E) 41 J												
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NOTES

*/1 The Charpy V-notch and chemistry requirements for forgings may be specially considered by the Administration.

*/2 For material thickness of more than 25 mm, Charpy V-notch tests should be conducted as follows:

Material thickness (mm)	Test temperature (°C)
$25 < t \leq 30$	10° below design temperature or -20° whichever is lower
$30 < t \leq 35$	15° below design temperature or -20° whichever is lower
$35 < t \leq 40$	20° below design temperature

202. The impact energy value should be in accordance with the table for the applicable type of test specimen. For material thickness of more than 40 mm, the Charpy V-notch values should be specially considered. Materials for tanks and parts of tanks which are completely thermally stress relieved after welding may be tested at a temperature 5°C below design temperature or -20°C whichever is lower. For thermally stress relieved reinforcements and other fittings, the test temperature should be the same as that required for the adjacent tank-shell thickness.

*/3 By special agreement with the Administration, the carbon content may be increased to 0.18% maximum provided the design temperature is not lower than -40°C.

*/4 A controlled rolling procedure may be used as an alternative to normalizing or quenching and tempering, subject to special approval by the Administration.

203. Guidance: For materials exceeding 25 mm in thickness for which the test temperature is -60° or lower, the application of specially treated steels or steels in accordance with table 6.3 may be necessary.

TABLE T.A1.201.3 (6.3).

PLATES, SECTIONS AND FORGINGS ^{*/1} FOR CARGO TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW -55 AND DOWN TO -165°C. ^{*/2} Maximum thickness 25 mm. ^{*/3}		
Minimum design temp.(°C)	Chemical composition and heat treatment ^{*/4}	Impact test temp.(°C)
-60	1.5% nickel steel – normalized	-65
-65	2.25% nickel steel – normalized or normalized and tempered ^{*/5}	-70
-90	3.5% nickel steel - normalized or normalized and tempered ^{*/5}	-95
-105	5% nickel steel -normalized or normalized and tempered ^{*/5} ^{*/6}	-110
-165	9% nickel steel – double normalized and tempered or quenched and tempered	-196
-165	Austenitic steels, such as types 304, 304L, 316, 316L, 321 and 347 solution treated ^{*/7}	-196
-165	Aluminium alloys; such as type 5083 annealed	Not required
-165	Austenitic Fe-Ni alloy (36% nickel) Heat treatment as agreed	Not required
TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS		
Plates	Each "piece" to be tested	
Plates	Transverse test pieces. Minimum average energy value (E)27J	
Sections and Forgings	Longitudinal test pieces. Minimum average energy value (E)41J	

NOTES

*1 The impact test required for forgings used in critical applications should be subject to special consideration by the Administration.

*2 The requirements for design temperatures below -165°C should be specially agreed with the Administration.

*3 For materials 1.5% Ni, 2.25% Ni, 3.5% Ni and 5% Ni, with thicknesses greater than 25 mm, the impact tests should be conducted as follows:

Material thickness (mm)	Test temperature (°C)
$25 < t \leq 30$	10° below design temperature
$30 < t \leq 35$	15° below design temperature
$35 < t \leq 40$	20° below design temperature

204. The energy value should be in accordance with the table for the applicable type of test specimen. For material thickness of more than 40 mm, the Charpy V-notch values should be specially considered.

205. For 9% Ni, austenitic stainless steels and aluminium alloys, thicknesses greater than 25 mm may be used at the discretion of the Administration.

*4 The chemical composition limits should be approved by the Administration.

*5 A lower minimum design temperature for quenched and tempered steels may be specially agreed with the Administration.

*6 A specially heat treated 5% nickel steel, for example triple heat treated 5% nickel steel, may be used down to -165°C upon special agreement with the Administration, provided that the impact tests are carried out at -196°C.

*7 The impact test may be omitted subject to agreement with the Administration.

TABLE T.A1.201.4 (6.4).

<i>PIPES (SEAMLESS AND WELDED), *1 FORGINGS *2 AND CASTINGS *2 FOR CARGO AND PROCESS PIPING FOR DESIGN TEMPERATURES BELOW 0°C AND DOWN TO -165°C. *3 Maximum thickness 25 mm.</i>			
Minimum design temp (°C)	Chemical composition *5 and heat treatment	Impact test	
		Test temp. (°C)	Minimum average energy (E) (J)
-55	Carbon manganese steel. Fully killed fine grain. Normalized or as agreed. *6	*4	27
-65	2.25% nickel steel. Normalized or normalized and tempered. *6	-70	34
-90	3.5% nickel steel. Normalized or normalized and tempered. *6	-95	34
-165	9% nickel steel *7. Double normalized and tempered or quenched and tempered	-196	41
	Austenitic steels, such as types 304, 304L, 316, 316L 321 and 347. Solution treated. *8	-196	41
	Aluminium alloys, such as type 5083 annealed		Not required
TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS			
Each batch to be tested			
Impact test		Longitudinal test pieces	

NOTES

- *1 The use of longitudinally or spirally welded pipes should be specially approved by the Administration.
- *2 The requirements for forgings and castings may be subject to special consideration by the Administration.
- *3 The requirements for design temperatures below -165°C should be specially agreed with the Administration.
- *4 The test temperature should be 5°C below the design temperature or -20°C whichever is lower.
- *5 The composition limits should be approved by the Administration.
- *6 A lower design temperature may be specially agreed with the Administration for quenched and tempered materials. *7 This chemical composition is not suitable for castings.
- *7 Impact tests may be omitted subject to agreement with the Administration.

TABLE T.A1.2001.5 (6.5).

<i>PLATES AND SECTIONS FOR HULL STRUCTURES REQUIRED BY PART II, TITLE 34, SECTION 6, CHAPTER A, A2.301 AND A2.304 (4.9.1 AND 4.9.4).</i>							
Minimum design temperature of hull structure (°C)	Maximum thickness (mm) for steel grades in accordance with 6.1.9						
	A	B	D	E	AH	DH	EH
0 and above ^{*/1}	Normal practice						
-5 and above ^{*/2}	Normal practice						
down to -5	15	25	30	50	25	45	50
down to -10	x	20	25	50	20	40	50
down to -20	x	x	20	50	x	30	50
down to -30	x	x	x	40	x	20	40
Below -30	In accordance with table 6.2 except that the thickness limitation given in table 6.2 and in footnote ^{*/2} of that table does not apply.						

NOTES

"x" means steel grade not to be used.

^{*/1} For the purpose of Part II, Title 34, Section 6, Chapter A, A1.904 (4.9.4).

^{*/2} For the purpose of of Part II, Title 34, Section 6, Chapter A, A1.901 4.9.1.

300. 6.3 Welding and non-destructive testing

301. 6.3.1 General

302. The requirements of this section are those generally employed for carbon, carbon-manganese, nickel alloy and stainless steels, and may form the basis for acceptance testing of other material. At the discretion of the Administration, impact testing of stainless steel and aluminium alloy weldments may be omitted and other tests may be specially required for any material.

303. 6.3.2 Welding consumables

304. Welding consumables intended for welding of cargo tanks should be in accordance with Recognized Standards unless otherwise agreed with the RBNA. Deposited weld metal tests and butt weld tests should be required for all welding consumables, unless otherwise specially agreed with the RBNA.

The results obtained from tensile and Charpy V-notch impact tests should be in accordance with Recognized Standards. The chemical composition of the deposited weld metal should be recorded for information and approval.

305. 6.3.3 Welding procedure tests for cargo tanks and process pressure vessels

306. 6.3.3.1 Welding procedure tests for cargo tanks and process pressure vessels are required for all butt welds and the test assemblies should be representative of:

- a. each base material
- b. each type of consumable and welding process
- c. each welding position.

307. For butt welds in plates, the test assemblies should be so prepared that the rolling direction is parallel to the direction of welding. The range of thickness qualified by each welding procedure test should be in accordance with Recognized Standards. Radiographic or ultrasonic testing may be performed at the option of the fabricator or the Administration. Procedure tests for consumables intended for fillet welding should be in accordance with Recognized Standards. In such cases consumables should be selected which exhibit satisfactory impact properties.

308. 6.3.3.2 The following welding procedure tests for cargo tanks and process pressure vessels should be made from each test assembly:

- a. 1 Cross-weld tensile tests.
- b. 2 Transverse bend tests which may be face, root or side bends at the discretion of the Administration. However, longitudinal bend tests may be required in lieu of transverse bend tests in cases where the base material and weld metal have different strength levels.
- c. 3 One set of three Charpy V-notch impacts, generally at each of the following locations, as shown in figure 6.1:
 - c.1. Centreline of the welds
 - c.2. Fusion line (F.L.)
 - c.3. 1 mm from the F.L.
 - c.4. 3 mm from the F.L.
 - c.5. 5 mm from the F.L.
- d. 4 Macrosection, microsection and hardness survey may also be required by the Administration.

309. 6.3.4 *Test requirements*

310. 6.3.4.1 **Tensile tests:** Generally, tensile strength should not be less than the specified minimum tensile strength for the appropriate parent materials. The Administration may also require that the transverse weld tensile strength should not be less than the specified minimum tensile strength for the weld metal, where the weld metal has a lower tensile strength than that of the parent metal. In every case, the position of fracture is to be reported for information.

311. 6.3.4.2 **Bend tests:** No fracture is acceptable after a 180° bend over a former of a diameter 4 times the thickness of the test pieces, unless otherwise specially required by or agreed with the Administration.

312. 6.3.4.3 **Charpy V-notch impact tests:** Charpy tests should be conducted at the temperature prescribed for the base material being joined. The results of weld metal impact tests, minimum average energy (E), should be no less than 27 J. The weld metal requirements for subsize specimens and single energy values should be in accordance with 6.1.4. The results of fusion line and heat affected zone impact tests should show a minimum average energy (E) in accordance with the transverse or longitudinal requirements of the base material, whichever is applicable, and for subsize specimens, the minimum average energy (E) should be in accordance with A1.104 (6.1.4). If the material thickness does not permit machining either full-size or standard subsize specimens,

the testing procedure and acceptance standards should be in accordance with Recognized Standards.

313. 6.3.5 *Welding procedure tests for piping*

Welding procedure tests for piping should be carried out and should be similar to those detailed for cargo tanks in A1.303 (6.3.3). Unless otherwise specially agreed with the RBNA, the test requirements should be in accordance with A1.304 (6.3.4).

314. 6.3.6 *Production weld tests*

315. 6.3.6.1 For all cargo tanks and process pressure vessels except integral and membrane tanks, production weld tests should generally be performed for approximately each 50 m of butt weld joints and should be representative of each welding position. For secondary barriers, the same type production tests as required for primary tanks should be performed except that the number of tests may be reduced subject to agreement with the Administration. Tests, other than those specified in A1.306.b, c, d (6.3.6.2), .3 and .4, may be required for cargo tanks or secondary barriers at the discretion of the RBNA.

316. 6.3.6.2 The production tests for types A and B independent tanks and semi-membrane tanks should include the following tests:

a. 1 Bend tests, and where required for procedure tests one set of three Charpy V-notch tests should be made for each 50 m of weld. The Charpy V-notch tests should be made with specimens having the notch alternately located in the centre of the weld and in the heat affected zone (most critical location based on procedure qualification results). For austenitic stainless steel, all notches should be in the centre of the weld.

b. 2 The test requirements are the same as the applicable test requirements listed in A1.304 (6.3.4) except that impact tests that do not meet the prescribed energy requirements may still be accepted, upon special consideration by the Administration, by passing a drop weight test. In such cases, two drop weight specimens should be tested for each set of Charpy specimens that failed and both must show "no break" performance at the temperature at which the Charpy tests were conducted.

317. 6.3.6.3 In addition to those tests listed in A1.316.a (6.3.6.2.1) for Type C independent tanks and process pressure vessels, transverse weld tensile tests are required. The test requirements are listed in A1.304 (6.3.4) except that impact tests that do not meet the prescribed energy requirements may still be accepted upon special consideration by the RBNA, by passing a drop weight test. In such cases, two drop weight specimens should be tested for each set of Charpy specimens that failed, and both must show "no break" performance at the temperature at which the Charpy tests were conducted.

318. 6.3.6.4 Production tests for integral and membrane tanks should be in accordance with Recognized Standards.

butts and seams in the side shell should be tested by radiography.

319. 6.3.7 *Non-destructive testing*

320. 6.3.7.1 For type A independent tanks and semi-membrane tanks where the design temperature is -20°C or less, and for type B independent tanks regardless of temperature, all full penetration butt welds of the shell plating of cargo tanks should be subjected to 100% radiographic inspection.

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321. 6.3.7.1.1 Where the design temperature is higher than -20°C , all full penetration butt welds in way of intersections and at least 10% of the remaining full penetration welds of tank structures should be subjected to radiographic inspection.

322. 6.3.7.1.2 In each case the remaining tank structure including the welding of stiffeners and other fittings and attachments should be examined by magnetic particle or dye penetrant methods as considered necessary by the Administration.

323. 6.3.7.1.3 All test procedures and acceptance standards should be in accordance with Recognized Standards. The RBNA may accept an approved ultrasonic test procedure in lieu of radiographic inspection, but may in addition require supplementary inspection by radiography at selected locations. Further, the Administration may require ultrasonic testing in addition to normal radiographic inspection.

324. 6.3.7.2 Inspection of type C independent tanks and process pressure vessels should be carried out in accordance with Part II, Title 34, Section 6, Chapter A, B1.100 (4.10.9).

325. 6.3.7.3 For integral and membrane tanks, special weld inspection procedures and acceptance criteria should be in accordance with Recognized Standards.

326. 6.3.7.4 The inspection and non-destructive testing of the inner hull or the independent tank structures supporting internal insulation tanks should take into account the design criteria given in Part II, Title 34, Section 6, Chapter A, A1.407 (4.4.7). The schedule for inspection and non-destructive testing should be to the satisfaction of the Administration.

327. 6.3.7.5 Inspection of piping should be carried out in accordance with the requirements of Part II, Title 34, Section 6, Chapter D (chapter 5).

328. 6.3.7.6 The secondary barrier should be radiographed as considered necessary by the RBNA. Where the outer shell of the hull is part of the secondary barrier, all sheer strake butts and the intersections of all