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## Z7.2 Hull Surveys for Liquefied Gas Carriers

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**Z7.2**  
(cont)**ENCLOSURES:**

- Table I: Minimum requirements for Close-up Surveys at Hull Special Surveys of Liquefied Gas Carriers
- Table II: Minimum requirements for Thickness Measurements at Hull Special Surveys of Liquefied Gas Carriers
- Table III: Minimum requirements for Close-up Surveys at Hull Intermediate Surveys of Liquefied Gas Carriers
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- Table V: Guidance for Additional Thickness Measurements in Way of Substantial Corrosion
- Figure 1: Typical midship sections of Liquefied Gas Carriers.

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**Note:**

1. This UR is to be uniformly applied by all Member Societies and Associates on surveys commenced on or after 1st July 2008. However, as for the requirements regarding semi-hard coatings, these coatings, if already applied, will not be accepted from the next special or intermediate survey commenced on or after 1st January 2010, whichever comes first, with respect to waiving the annual internal examination of the ballast tanks.
2. Changes introduced in Rev.1 are to be uniformly applied by IACS Societies for surveys commenced on or after the 1 January 2009.
3. Changes introduced in Rev.2 are to be uniformly applied by IACS Societies for surveys commenced on or after 1 July 2010.

As for the requirements regarding semi-hard coatings, these coatings, if already applied, will not be accepted from the next special or intermediate survey commenced on or after 1 July 2010, whichever comes first, with respect to waiving the annual internal examination of the ballast tanks.

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### 1. GENERAL

#### 1.1 Application

1.1.1 The requirements apply to all self-propelled ships carrying liquefied gases in bulk.

1.1.2 The requirements apply to surveys of hull structure and piping systems, except piping covered by UR Z16, in way of pump rooms, compressor rooms, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks.

The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to UR Z7.

Refer to UR Z16 for periodical surveys of cargo installations on ships carrying liquefied gases in bulk.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

#### 1.2 Definitions

##### 1.2.1 Ballast Tank

A Ballast Tank is a tank which is used solely for the carriage of salt water ballast.

##### 1.2.2 Overall Survey

An Overall Survey is a survey intended to report on the overall condition of the hull structure and determine the extent of additional Close-up Surveys.

##### 1.2.3 Close-up Survey

A Close-up Survey is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

##### 1.2.4 Transverse Section

A Transverse Section includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom and longitudinal bulkheads.

##### 1.2.5 Representative Tank

Representative Tanks are those which are expected to reflect the condition of other Tanks of similar type and service and with similar corrosion prevention systems. When selecting Representative Tanks account is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

##### 1.2.6 Critical Structural Areas

Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar ships or sister ships, if applicable, to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

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**(cont)**

## 1.2.7 Suspect Areas

Suspect Areas are locations showing Substantial Corrosion and/or are considered by the surveyor to be prone to rapid wastage.

## 1.2.8 Substantial Corrosion

Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits.

## 1.2.9 Corrosion Prevention System

A Corrosion Prevention System is normally considered a full hard protective coating. Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

## 1.2.10 Coating Condition

Coating Condition is defined as follows:

GOOD	condition with only minor spot rusting.
FAIR	condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.
POOR	condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

## 1.2.11 Cargo Area

Cargo Area is that part of the ship which contains cargo tanks, cargo/ballast pump rooms, compressor rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

## 1.2.12 Special Consideration

Special Consideration or specially considered (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are to be taken to confirm the actual average condition of the structure under the coating.

## 1.2.13 Prompt and Thorough Repair

A Prompt and Through Repair is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification.

**Z7.2**  
(cont)**1.3 Repairs**

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Surveyor, will affect the vessel's structural, watertight or weathertight integrity, is to be promptly and thoroughly (see 1.2.13) repaired. Areas to be considered include:

- side structure and side plating;
- deck structure and deck plating;
- bottom structure and bottom plating;
- watertight bulkheads;
- items in 3.2.3.5, 3.2.3.6 and 3.2.3.8 of UR Z7.

For locations where adequate repair facilities are not available, consideration may be given to allow the vessel to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of structural defects or corrosion, either of which, in the opinion of the surveyor, will impair the vessel's fitness for continued service, remedial measures are to be implemented before the ship continues in service.

**1.4 Thickness measurements and close-up surveys**

In any kind of survey, i.e. special, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required, shall be carried out simultaneously with close-up surveys.

**Z7.2**  
(cont)**2. SPECIAL SURVEY\*****2.1 Schedule**

2.1.1 Special Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

2.1.2 The first Special Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Special Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Special Survey before the extension was granted.

2.1.3 For surveys completed within 3 months before the expiry date of the Special Survey, the next period of class will start from the expiry date of the Special Survey. For surveys completed more than 3 months before the expiry date of the Special Survey, the period of class will start from the survey completion date.

2.1.4 The Special Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Special Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Special Survey.

2.1.5 A survey planning meeting is to be held prior to the commencement of the survey.

2.1.6 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

**2.2 Scope****2.2.1 General**

2.2.1.1 The Special Survey is to include, in addition to the requirements of the Annual Surveys, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.2.1.3, are in a satisfactory condition and fit for the intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.2.1.2 Ballast tanks, including double bottom tanks, pump rooms, compressor rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in 2.4 and 2.5, to ensure that the structural integrity remains effective.

The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

2.2.1.3 All piping systems within the above spaces, except those covered by UR Z16, are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

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\* Some member Societies use the term "Special Periodical Survey" others use the term "Class Renewal Survey" instead of the term "Special Survey".

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2.2.1.4 The survey extent of ballast tanks converted to void spaces is to be specially considered in relation to the requirements for ballast tanks.

Note: For survey of automatic air pipes refer to 2.2.13 of UR Z7.

### 2.2.2 Dry Dock Survey

2.2.2.1 A survey in dry dock is to be a part of the Special Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the ballast tanks are to be carried out in accordance with the applicable requirements for special surveys, if not already performed.

Note: Lower portions of the ballast tanks are considered to be the parts below light ballast water line.

### 2.2.3 Tank Protection

2.2.3.1 Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. For tanks used for water ballast, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor.

When such breakdown of hard protective coating is found in water ballast double bottom tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

2.2.3.2 Where the hard protective coating in ballast tanks is found to be in a GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

## 2.3 Extent of Overall and Close-up Survey

2.3.1 An Overall Survey of all tanks and spaces, excluding fuel oil, lube oil and fresh water tanks, is to be carried out at each Special Survey.

Note: For fuel oil, lube oil and fresh water tanks, reference is to be made to UR Z7, Table 3.

2.3.2 The minimum requirements for close-up surveys at special survey are given in Table I.

2.3.3 The Surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and where tanks have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

2.3.4 For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to Table I may be specially considered.

Note: For examination of automatic air pipe heads, reference is to be made to UR Z7, Table 4.

**Z7.2**  
(cont)**2.4 Extent of Thickness Measurement**

2.4.1 The minimum requirements for thickness measurements at Special Survey are given in Table II.

2.4.2 The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table V may be used as guidance for these additional thickness measurements.

2.4.3 For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurement according to Table II may be specially considered.

2.4.4 Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

**2.5 Extent of Tank Testing**

2.5.1 All boundaries of water ballast tanks and deep tanks used for water ballast within the cargo area are to be pressure tested. For fuel oil tanks, the representative tanks are to be pressure tested.

2.5.2 The Surveyor may extend the tank testing as deemed necessary.

2.5.3 Tank testing of fuel oil tanks is to be carried out with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries, and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

**Z7.2**  
(cont)**3. ANNUAL SURVEY****3.1 Schedule**

3.1.1 Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Special Survey.

**3.2 Scope**

## 3.2.1 General

3.2.1.1 The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

## 3.2.2 Examination of the hull

3.2.2.1 Examination of the hull plating and its closing appliances as far as can be seen.

3.2.2.2 Examination of watertight penetrations as far as practicable.

3.2.3 Examination of weather decks.

3.2.3.1 Examination of flame screens on vents to all bunker tanks.

3.2.3.2 Examination of bunker and vent piping systems.

3.2.4 Examination of cargo pump rooms and compressor rooms and, as far as practicable, pipe tunnels if fitted.

3.2.4.1 Examination of all pump room and compressor room bulkheads for signs of leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room and compressor room bulkheads.

3.2.4.2 Examination of the condition of all piping systems, except those covered by UR Z16.

Note: For survey of air pipes, flame screens on vents and ventilators refer to 3.2.3.5 to 3.2.3.8 of UR Z7.

## 3.2.5 Suspect Areas

Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table V may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

## 3.2.6 Examination of ballast tanks

3.2.6.1 Examination of ballast tanks when required as a consequence of the results of the Special Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements are to be increased to determine the

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extent of areas of substantial corrosion. Table V may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

**Z7.2**  
(cont)**4. INTERMEDIATE SURVEY****4.1 Schedule**

4.1.1 The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

4.1.2 Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2nd and 3rd Annual Survey.

4.1.3 A survey planning meeting is to be held prior to the commencement of the survey.

4.1.4 Concurrent crediting to both Intermediate Survey (IS) and Special Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

**4.2 Scope**

4.2.1 The scope of the second or third annual survey is to be extended to include the following:

**4.2.2 Ballast tanks**

4.2.2.1 For ships between 5 and 10 years of age, an overall survey of representative ballast tanks is to be carried out. If there is no hard protective coating, soft or semi-hard coating or POOR coating condition, the examination is to be extended to other ballast tanks of the same type.

4.2.2.2 For ships over 10 years of age, an overall survey of all ballast tanks is to be carried out.

4.2.2.3 If such examinations reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.

4.2.2.4 For ballast tanks, excluding double bottom tanks, if there is no hard protective coating, soft or semi-hard coating, or POOR coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals.

4.2.2.5 When such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.

4.2.2.6 The minimum requirements for close-up surveys at intermediate survey are given in Table III.

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(cont)**5. PREPARATION FOR SURVEY****5.1 Conditions of Survey**

5.1.1 The Owner is to provide the necessary facilities for a safe execution of the survey.

5.1.2 Tanks and Spaces are to be safe for access, i.e. gas freed, ventilated and illuminated.

5.1.3 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.1.4 Sufficient illumination is to be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.

5.1.5 Where soft or semi-hard coatings have been applied, safe access is to be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

**5.2 Access to Structures**

5.2.1 For Overall Survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.

5.2.2 For Close-up Surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- permanent staging and passages through structures;
- temporary staging, e.g. ladders, and passages through structures;
- other equivalent means.

**5.3 Equipment for Survey**

5.3.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

5.3.2 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- radiographic equipment
- ultrasonic equipment
- magnetic particle equipment
- dye penetrant

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**5.4 Survey at Sea or at Anchorage**

5.4.1 Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey are to be in accordance with 5.1, 5.2, and 5.3.

5.4.2 A communication system is to be arranged between the survey party in the tank and the responsible officer on deck.

**Z7.2**  
(cont)**6. PROCEDURES FOR THICKNESS MEASUREMENTS****6.1 General**

6.1.1 The required thickness measurements, if not carried out by the Society itself, are to be witnessed by a Surveyor of the Society. The Surveyor is to be on board to the extent necessary to control the process.

6.1.2 The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

6.1.3 Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

**6.2 Certification of Thickness Measurement Company**

6.2.1 The thickness measurements are to be carried out by a company certified by the Classification Society according to principles stated in Table IV.

**6.3 Reporting**

6.3.1 A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator.

6.3.2 The Surveyor is to review the final thickness measurement report and countersign the cover page.

## Z7.2

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TABLE I

**TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL  
SPECIAL SURVEYS OF LIQUEFIED GAS CARRIERS**

Special Survey No.1 (age ≤ 5)	Special Survey No.2 (5 < age ≤ 10)	Special Survey No.3 and subsequent (age > 10)
<p>One web frame in a representative ballast tank of the topside, hopper side and double hull side type (1)</p> <p>One transverse bulkhead in a ballast tank (3)</p>	<p>All web frames in a ballast tank, which is to be a double hull side tank or a topside tank. If such tanks are not fitted, another ballast tank is to be selected (1)</p> <p>One web frame in each remaining ballast tank (1)</p> <p>One transverse bulkhead in each ballast tank (2)</p>	<p>All web frames in all ballast tanks (1)</p> <p>All transverse bulkheads in all ballast tanks (2)</p>
<p>(1) Complete transverse web frame including adjacent structural members.            (2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.            (3) Transverse bulkhead lower part including girder system and adjacent structural members.</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of close-up surveys may be specially considered by the Classification Society.</p> <p>Note 3: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by the Classification Society.</p> <p>Note 4: The Surveyor may extend the close-up survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> <li>- in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information;</li> <li>- in tanks having structures approved with reduced scantlings.</li> </ul>		

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TABLE II

### TABLE OF MINIMUM REQUIREMENTS FOR THE THICKNESS MEASUREMENT AT HULL SPECIAL SURVEY OF LIQUEFIED GAS CARRIERS

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
One section of deck plating for the full beam of the ship within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: - each deck plate  - one transverse section within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: - each deck plate  - two transverse sections (1)  - all wind and water strakes	Within the cargo area: - each deck plate  - three transverse sections (1)  - each bottom plate  - duct keel plating and internals
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I
Suspect areas	Suspect areas	Suspect areas	Suspect areas
<p>(1) at least one section is to include a ballast tank within 0,5L amidships, if any</p> <p>Note 1: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of thickness measurements may be increased to include the tank top plating at the discretion of the Surveyor.</p> <p>Note 2: For areas in spaces where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of thickness measurements may be specially considered by the Classification Society.</p> <p>Note 3: The Surveyor may extend the thickness measurements as deemed necessary. Where substantial corrosion, as defined in 1.2.8, is found, the extent of thickness measurements is to be increased to the satisfaction of the Surveyor.</p>			

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TABLE III

## TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL INTERMEDIATE SURVEYS OF LIQUEFIED GAS CARRIERS

10 < age ≤ 15	age > 15
<p>Close-up survey of:</p> <ul style="list-style-type: none"> <li>- all web frames and both transverse bulkheads in a representative ballast tank (1) and (2)</li> <li>- the upper part of one web frame in another representative ballast tank</li> <li>- one transverse bulkhead in another representative ballast tank (2)</li> </ul>	<p>Close-up survey of:</p> <ul style="list-style-type: none"> <li>-all web frames and both transverse bulkheads in two representative ballast tanks (1) and (2)</li> </ul>
<p>(1) Complete transverse web frame including adjacent structural members</p> <p>(2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where protective coating is found to be in GOOD condition, the extent of close-up survey may be specially considered by the Classification Society.</p> <p>Note 3: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by the Classification Society.</p> <p>Note 4: The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> <li>- in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information;</li> <li>- in tanks having structures approved with reduced scantlings.</li> </ul>	

TABLE IV

**PROCEDURES FOR CERTIFICATION OF FIRMS ENGAGED IN THICKNESS  
MEASUREMENT OF HULL STRUCTURES**

**1. Application**

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels. UR Z17 also applies.

**2. Procedures for Certification**

(1) Submission of Documents: Following documents are to be submitted to the Society for approval:

- a) Outline of firm, e.g. organization and management structure.
- b) Experience of the firm on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators, are to be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.

(2) Auditing of the firms:

Upon reviewing the documents submitted with satisfactory results, the firm is audited in order to ascertain that the firm is duly organised and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull construction of the ships.

(3) Certification is conditional on an onboard demonstration at thickness measurements as well as satisfactory reporting.

**3. Certification**

(1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, the Society will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by the Society.

(2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

**Z7.2**  
(cont)**4. Information of any alteration to the Certified Thickness Measurement Operation System**

In case where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration is to be immediately informed to the Society. Re-audit is made where deemed necessary by the Society.

**5. Cancellation of Approval**

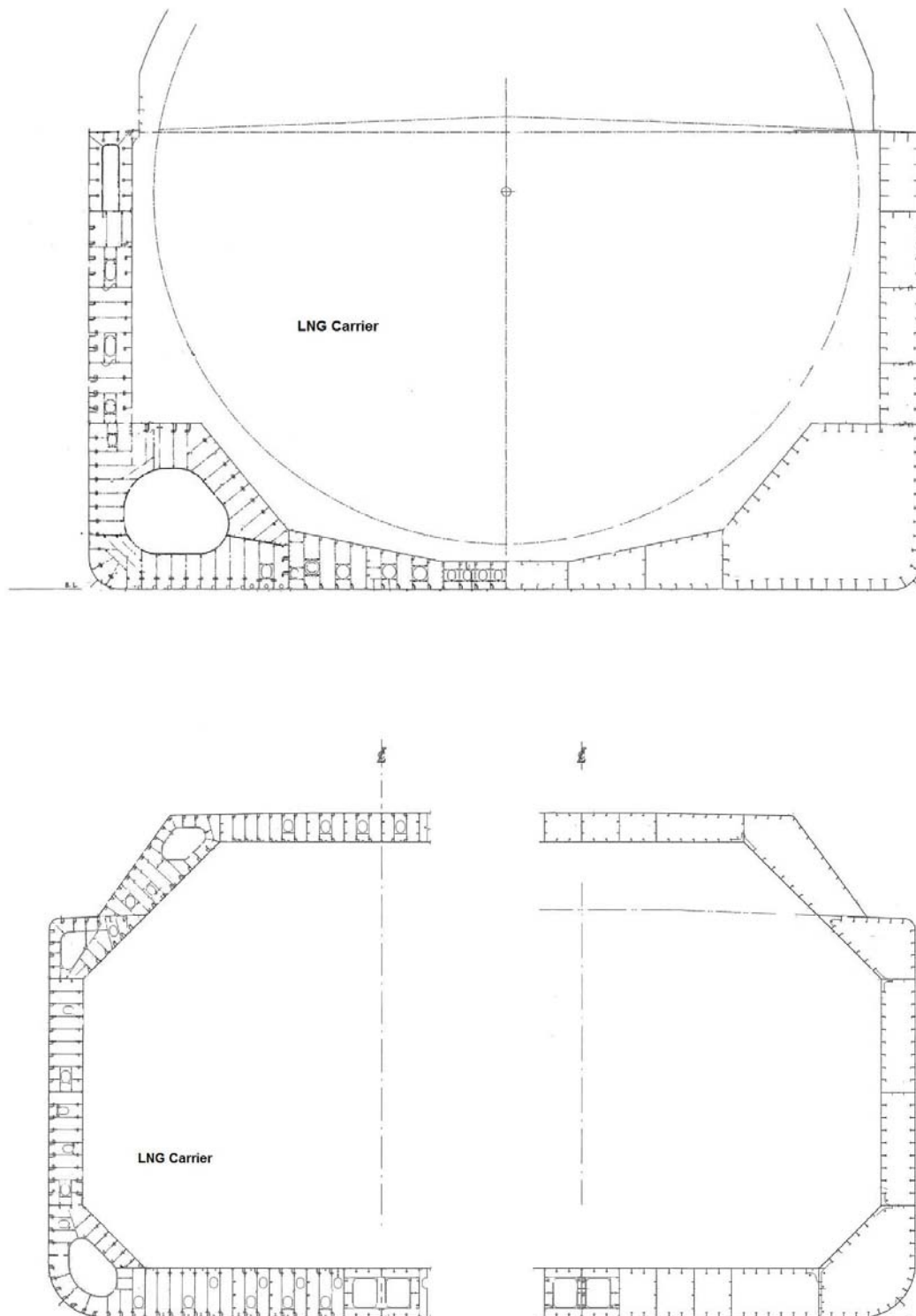
Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Society's surveyor found any deficiencies in the approved thickness measurement operation system of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to the Society.

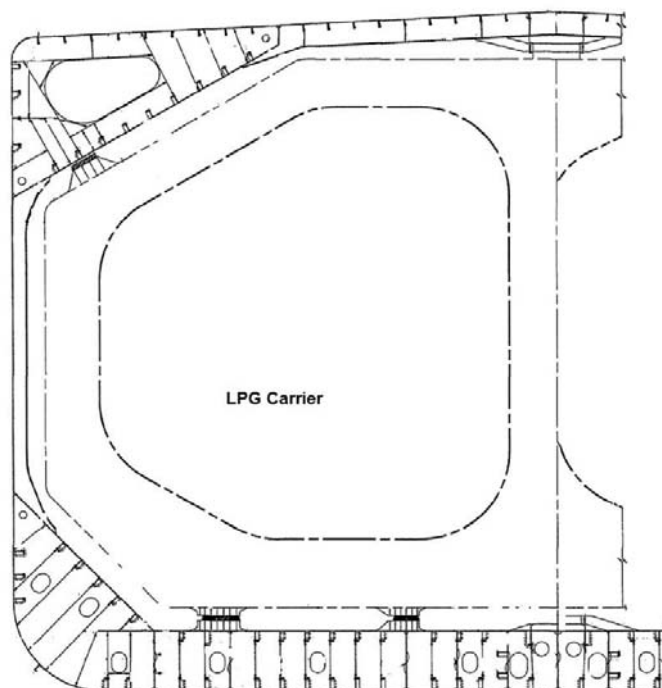
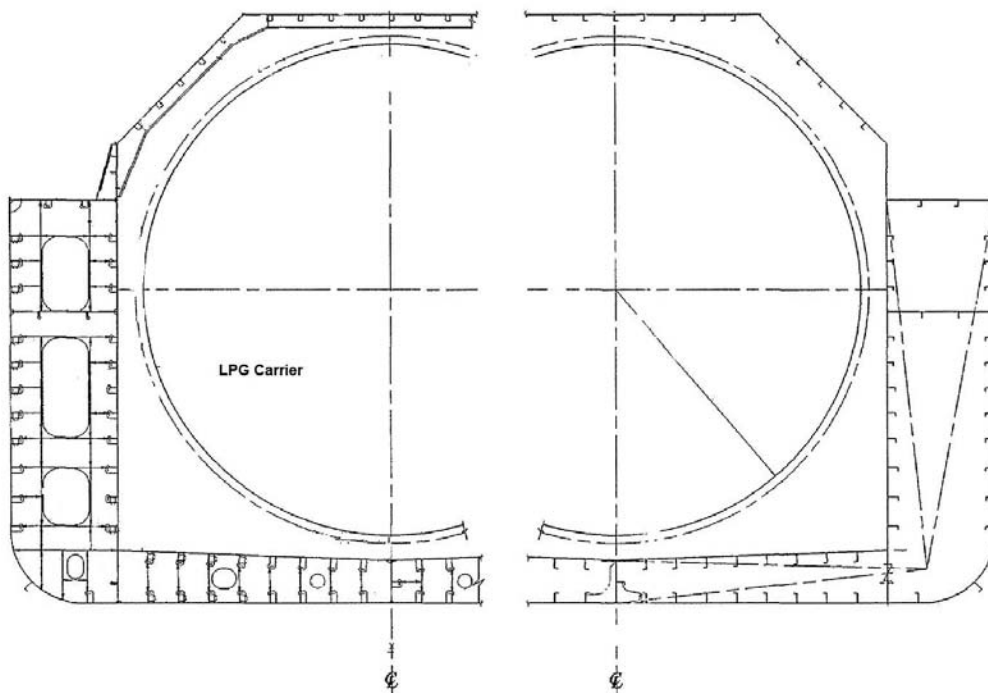
**Z7.2**  
(cont)

**TABLE V**  
**GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF**  
**SUBSTANTIAL CORROSION**

<b>Structural member</b>	<b>Extent of Measurement</b>	<b>Pattern of Measurement</b>
Plating	Suspect area and adjacent plates	5 point pattern over 1 square metre
Stiffeners	Suspect area	3 measurements each in line across web and flange

**Z7.2**  
(cont)**FIGURE 1**  
**TYPICAL MIDSHIP SECTIONS OF LIQUEFIED GAS CARRIERS**

**Z7.2**  
(cont)



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