No. 111 PASSENGER SHIPS – Guidelines for preparation of Hull Structural Surveys

(Feb 2010)
(Rev.1 June 2018)

Contents

1 Introduction

2 Preparations for Survey

2.1 General
2.2 Conditions for survey
2.3 Access to structures
2.4 Survey planning meeting
2.5 Documentation on Board

3 Accessibility to ship structure

3.1 General accessibility
3.2 Access and inspection planning
3.3 Longitudinal bulkheads
3.4 Downflooding ducts
3.5 Ventilation ducts
3.6 Air Pipes
3.7 Grey and black water tanks, including biological treatment system tanks
3.8 Stabiliser housings
3.9 Structures adjacent to refrigerated rooms
3.10 Permanent ballast

4 Tank corrosion

4.1 General
4.2 Tanks with constant water levels

No. 111 (cont)

1 Introduction

The International Association of Classification Societies (IACS) has produced a series of manuals to share the knowledge accumulated by its members with the maritime industry.

This publication provides guidelines for preparation of hull structural surveys on passenger ships, with focus on areas with accessibility problems.

Within the scope of ship's classification, the periodical surveys are of prime importance as far as structural assessment of the ship is concerned.

The purpose of hull classification periodical surveys is to confirm that the hull and equipment comply with the applicable Classification requirements and will remain in satisfactory condition, based on the understanding that ships are to be maintained and operated at all times at the diligence of the Owners in proper condition complying with the relevant requirements and regulations.

These Guidelines include a review of survey preparation guidelines which cover the safety aspects related to the performance of the survey, the necessary access facilities, and the preparation necessary before the surveys can be carried out.

An important feature of this guideline is the section on accessibility to different parts of the ship structures for passenger ships due to the wide variety of configurations and possible limited access.

These Guidelines have been developed using the best information currently available. It is intended only as guidance in support of the sound judgment of owners, and is to be used at the owners' discretion, except for 2.2 and 2.3, which are extracts from IACS UR Z7 and, as such, are mandatory requirements. Should there be any doubt with regard to interpretation or validity in connection with particular applications, clarification should be obtained from the Classification Society concerned.

No. 111 (cont)

2 Preparations for Survey

2.1 General

The owner's representative should be aware of the scope of the coming survey and instruct those who are responsible, such as the Master or the Superintendent, to prepare the necessary arrangements. Execution will naturally be heavily influenced by the type and scope of the survey to be carried out. If there is any doubt, the Classification Society concerned should be consulted.

Parts 2.2 and 2.3 below are extracts from IACS Unified Requirements, UR Z7, and are mandatory requirements that have to be fulfilled.

2.2 Conditions for survey

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

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

2.2.3 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.

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

2.2.5 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.

2.3 Access to structures

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

2.3.2 For survey in cargo holds and water ballast tanks, 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 and passages through structures;
- lifts and movable platforms;
- boats or rafts;
- other equivalent means.

2.4 Survey planning meeting

The survey planning meeting is a requirement in UR Z7 for intermediate and special surveys. It is however good practice to hold such a meeting also before commencing annual survey and any other periodical and non-periodical survey.

No. 111 (cont)

During this meeting, issues described in 2.2 and 2.3 above and in 4.2 should be addressed accordingly, in particular access to the areas mentioned in 3.3 - 3.10, using the accessibility document described in 3.2.

Also refer to IACS Recommendation 44, “Survey Guidelines for tanks in which soft coatings have been applied”.

2.5 Documentation on Board

The following documentation should be readily available when planning the survey.

(a) structural plans of the areas to be surveyed;

(b) accessibility document as detailed in 3.2 below.

Prior to survey, it is recommended that the documents on board the ship be reviewed as a basis for the current survey.

No. 111 (cont)

3 Accessibility to ship structure

3.1 General accessibility

The areas relevant for structural surveys depend on the design and there are large differences between different ship configurations. The structural survey of a passenger ship may involve a large variety of differing access problems due to the complexity of the structure.

Surveyable items are not specifically confined to tank examination, but will involve access to various other parts of the internal structure and the shell plating.

3.2 Access and inspection planning

It is recommended that an accessibility document is developed for each ship or class of ship containing the relevant information for accessing the structures indicated in 3.3 to 3.10 below.

The document should be retained onboard for use by owner's representatives and surveyors intending to examine the relevant spaces, structure and items.

This document should also be referred to in the owners planned maintenance scheme.

The accessibility document should refer to the operator's Safety Management System and should include the following as applicable:

- discontinuities and/or openings in continuous longitudinal bulkheads
- manhole/inspection opening arrangement and location(s)
- ladders and hand-holds
- specific safety issues for the individual item where extra precaution or procedures for access is required
- damage stability subdivision zones/boundaries
- location of and means for inspection of ventilation duct valves and fire flaps with controls

3.3 Longitudinal bulkheads

The continuous longitudinal bulkheads are, together with the ship sides, the webs of the hull girder, carrying the shear loads created by the differences in buoyancy and weight distribution along the ship as well as those created by sea loads. The longitudinal bulkheads also contribute to resisting the longitudinal bending, particularly near the upper decks and the bottom structure.

Wherever there are discontinuities/openings in the longitudinal bulkheads the stresses from the loads above will have to flow "around" these discontinuities resulting in stress concentrations at the corners. It should be noted that fractures may be observed, particularly at the upper and lower zones of the bulkheads.
Examples of discontinuities include fire-screen door openings, cable and pipe penetrations, elevator access arrangements and ventilation duct openings. (An example of such fractures is shown in Fig.1).

Access to these areas may be required in connection with Class Special or Continuous Surveys, or more often where considered necessary.

No. 111 (cont)

Figure 1: Openings in longitudinal bulkhead – a fracture in way of a door frame

3.4 Downflooding ducts

Downflooding ducts are fitted in order to meet the SOLAS damage stability criteria. Their purpose is to transfer water to a lower compartment in case of water ingress and thereby improve stability in the damaged condition.

Downflooding ducts are normally found on the ship sides, integrated into the structure by using the side shell plating as one of their boundaries.

Under certain conditions accelerated corrosion can take place to the internal structure and associated shell plating in way of these ducts. Maintenance and regular inspection is of vital importance to ensure the watertight integrity of the ship.

3.5 Ventilation ducts

The ventilation ducts may in general be categorized in two groups, structural and non-structural.

- **Structural** ventilation ducts are stiffened in such a way that the boundaries can withstand loads other than just the loads from air pressure and may be integrated with the ship structure or self supporting. These ducts are used in cases where a ventilation duct is crossing a watertight bulkhead, or in spaces that may be filled in case of damages according to the damage scenarios calculated for the ship.

No. 111 (cont)

- **Non-structural** ventilation ducts are “thin” compared to the structural ducts and are normally only designed to withstand the air pressure. They are thus only used within one vertical division and for areas above the waterline where water filling is not likely to occur in case of damages.

Of the two types of ventilation ducts, access to and inspection of the structural ventilation ducts is considered particularly important as a potential transfer of water along a ventilation duct from one compartment to another may have severe consequences for the ship.

The condition of the ventilation ducts using the ship’s side shell plating as one of the duct boundaries, both structural and non-structural (layout is shown in Fig. 2), is particularly important for both maintenance and regular inspection.

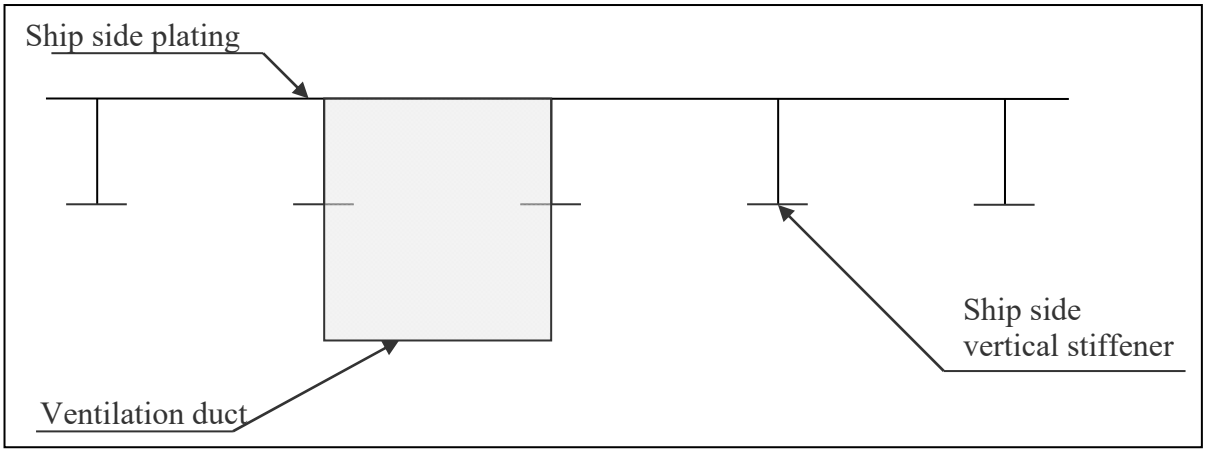

Figure 2: Plan view of ventilation duct using ship side shell as one of the boundaries

3.6 Air Pipes

All internal tanks will have air pipes to prevent overpressure or vacuum in case of filling or discharging. Air pipes may end in the engine room for smaller tanks, but are normally extended to higher external decks or led directly overboard above the waterline.

Where extended to higher decks or led overboard, the air pipes may be crossing other compartments and will, in service or accommodation decks, often be hidden behind panels. Some of the air pipes will be subject to a corrosive environment adversely affecting the pipe itself and also the vent heads.

3.7 Grey and black water tanks, including biological treatment system tanks

The main challenges with these tanks are the corrosive environment, the lack of access and time window for routine internal inspection and maintenance whilst the ship is in service.

If the internal structures are kept unprotected, the corrosive environment may cause leaks and water ingress/egress, giving rise to a risk of pollution or a reduced tank capacity as a result.

Surveys of these tanks are recommended to be planned well in advance to coincide with planned dockings. Some biological treatment systems may require a lead time to re-establish operational capability.

No. 111 (cont)

3.8 Stabiliser housings

Due to the limited access opportunities for inspection, it is recommended that during dry docking survey, the fin housings and in particular the welds in the fin/hull connection, with the fin extended, should be surveyed.

3.9 Structures adjacent to refrigerated rooms

Structures adjacent to refrigerated rooms may have an increased risk of condensation leading to deterioration of the structures. In particular, the structures below the refrigerated rooms may be subject to deterioration.

In cases where refrigerated stores are located adjacent to the side shell, there may be an increased risk of condensation leading to deterioration of the side shell structure.

As the access to the side shell structure in these areas will be restricted, it is recommended that, in addition to the deck below, the surrounding structure also be examined as far as practicable, in particular the connection to the ship side structure below the refrigerated store.

3.10 Permanent ballast

In some ships, permanent or fixed ballast may be fitted in some of the ballast tanks. Such ballast may be of a corrosive or non-corrosive type. When corrosive ballast is used, it should be protected from the main factors causing corrosion and kept under observation.

For a type of ballast that needs to be kept under observation, a manual describing these procedures should be retained onboard.

In cases of liquid permanent ballast, a material test piece may be fitted to the access cover of the tank, hanging into the liquid for monitoring of the corrosion activities in the tank. In addition, a chemical test of the ballast fluid from mid-depth should be done to confirm that the inhibitors are still effective.

In cases of non-liquid ballast, sample areas may be required to be cleared to enable access for survey and ballast material should be visually examined for shifting or settling and excessive moisture.

No. 111 (cont)

4 Tank corrosion

4.1 General

In tanks with a corrosive environment, the corrosion of the structure may be accelerated where the tank is not coated or where the protective coating has not been properly maintained, and can lead to fractures of the internal structures and the tank boundaries. When corrosion occurs, it may be accelerated by factors like higher temperatures, humidity, salinity and presence of oxygen.

In water ballast tanks, wastage of the internal structure can be a major problem, in particular on older ships.

Whilst corrosion may be found in all parts of a tank, the ullage space of tanks with a corrosive environment is known to be prone to accelerated rates of corrosion.

4.2 Tanks with constant water levels

In order to ensure a proper survey onboard, it is important to take into account operational information such as constant water levels of certain ballast tanks.

For tanks with a “typical” or stable filling level, and in particular those with a corrosive environment, e.g. water ballast tanks, high corrosion rates may normally be found in the splash zone right above the filling level. (see Fig. 3)

At the survey planning meeting, it should be established if any of the tanks to be surveyed have a normal/stable working level of liquid content, and the surveyor is to be made aware of this level.

The surveyor is further to be made aware of any previous problems associated with the tanks to be examined.

No. 111
(cont)

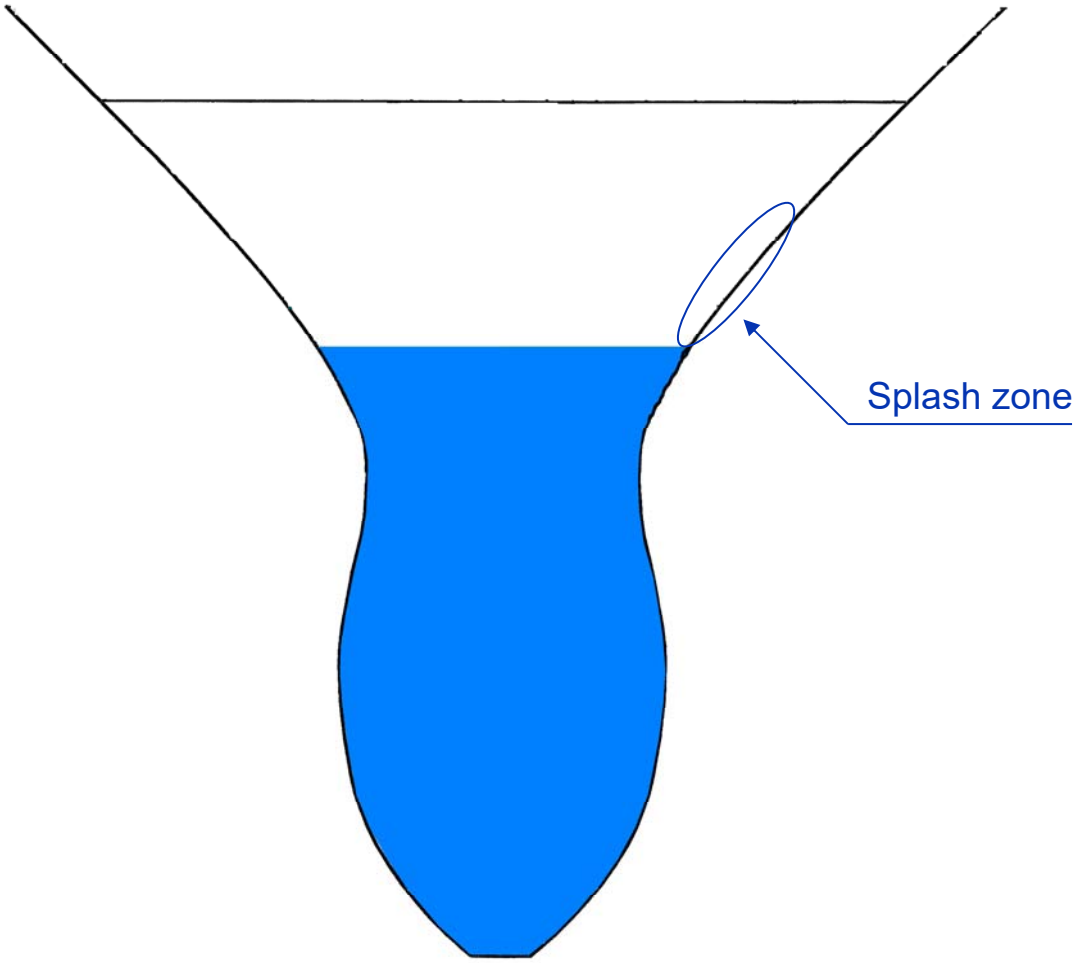

Figure 3: Fore peak tank with "typical" filling level

End of Document