Directive 2003/25/EC of the European Parliament and of the Council of 14 April 2003 on specific stability requirements for ro-ro passenger ships (Text with EEA relevance)

ANNEX I

SPECIFIC STABILITY REQUIREMENTS FOR RO-RO PASSENGER SHIPS
as referred to in Article 6

Directive 2003/25/EC of the European Parliament and of the Council of 14 April...
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[^{F1}Appendix

Model test method

1.   Objectives

This revised model test method is a revision of the method contained in the Appendix to the Annex to resolution 14 of the 1995 SOLAS Conference. Since the entry into force of the Stockholm Agreement a number of model tests has been carried out in accordance with the test method previously in force. During these tests a number of refinements in the procedures have been identified. This new model test method aims to include these refinements and, together with the appended Guidance Notes, provide a more robust procedure for the assessment of survivability of a damaged ro-ro passenger ship in a seaway. In the tests provided for in paragraph 1.4 of the stability requirements included in Annex I, the ship should be capable of withstanding a seaway as defined in paragraph 4 hereunder in the worst-damage-case scenario.

2.   Definitions

L_{BP}	is the length between perpendiculars
H_S	is the significant wave height
B	is the moulded breadth of the ship
T_P	is the peak period
T_Z	is the zero crossing period

3.   Ship model

3.1.   The model should copy the actual ship for both outer configuration and internal arrangement, in particular all damaged spaces having an effect on the process of flooding and shipping of water. Intact draught, trim, heel and limiting operational KG corresponding to the worst damage case should be used. Furthermore, the test case(s) to be considered should represent the worst damage case(s) defined in accordance with SOLAS regulation II-1/8.2.3.2 (SOLAS 90) with regard to the total area under the positive GZ curve and the centreline of the damage opening should be located within the following range:

3.1.1. ± 35 % L_{BP} from midship;

3.1.2. an additional test will be required for the worst damage within ± 10 % L_{BP} from midship if the damage case referred to in .1 is outside of ± 10 % L_{BP} from midship.

3.2.   The model should comply with the following:

3.2.1. length between perpendiculars (L_{BP}) is to be at least 3 m or a length corresponding to a model scale of 1:40, whichever is greater, and the vertical extent up to at least three superstructure standard heights above the bulkhead (freeboard) deck;

3.2.2. hull thickness of flooded spaces should not exceed 4 mm;

3.2.3. in both intact and damaged conditions, the model should satisfy the correct displacement and draught marks (T_A, T_M, T_F, port and starboard) with a maximum tolerance in any one draught mark of + 2 mm. Draught marks forward and aft should be located as near FP and AP as practicable;

3.2.4.   all damaged compartments and ro-ro spaces should be modelled with the correct surface and volume permeabilities (actual values and distributions) ensuring that floodwater mass and mass distribution are correctly represented;

3.2.5.   the characteristics of motion of the actual ship should be modelled properly, paying particular attention to the intact GM tolerance and radii of gyration in roll and pitch motion. Both radii should be measured in air and be in the range of 0,35B to 0,4B for roll motion, and 0,2LOA to 0,25LOA for pitch motion;

3.2.6.   main design features such as watertight bulkheads, air escapes, etc., above and below the bulkhead deck that can result in asymmetric flooding should be modelled properly as far as practicable to represent the real situation; Ventilating and cross-flooding arrangements should be constructed to a minimum cross section of 500 mm^2;

3.2.7.   the shape of the damage opening should be as follows:

1.   trapezoidal profile with side at 15o slope to the vertical and the width at the design waterline defined according to SOLAS regulation II-1/8.4.1;

2.   isosceles triangular profile in the horizontal plane with the height equal to B/5 according to SOLAS regulation II-1/8.4.2. If side casings are fitted within B/5, the damaged length in way of the side casings should not be less than 25 mm;

3.   notwithstanding the provisions of subparagraphs 3.2.7.1 and 3.2.7.2 above, all compartments taken as damaged in calculating the worst damage case(s) referred to in paragraph 3.1 should be flooded in the model tests;

3.3.   The model in the flooded equilibrium condition should be heeled by an additional angle corresponding to that induced by the heeling moment $M_h = \max (M_{pass}; M_{launch})$-$M_{wind}$, but in no case should the final heel be less than 1o towards damage. M_{pass}, M_{launch} and M_{wind} are as specified in SOLAS regulation II-1/8.2.3.4. For existing ships this angle may be taken as 1o.

4.   Procedure for experiments

4.1.   The model should be tested in a long-crested irregular seaway defined by the JONSWAP spectrum with significant wave height HS, a peak enhancement factor γ = 3,3 and a peak period

$$T_P = 4\sqrt{H_S} \; (T_Z = T_P / 1{,}285)$$

. H$_S$ is the significant wave height for the area of operation, which is not exceeded by a probability of more than 10 % on a yearly basis, but limited to a maximum of 4 m.

Furthermore,

4.1.1.   the basin width should be sufficient to avoid contact or other interaction with the sides of the basin and is recommended not to be less than L$_{BP}$ + 2 m;

4.1.2.   the basin depth should be sufficient for proper wave modelling but should not be less than 1 m;

4.1.3.   for a representative wave realisation to be used, measurements should be performed prior to the test at three different locations within the drift range;

4.1.4.   the wave probe closer to the wave maker should be located at the position where the model is placed when the test starts;

4.1.5.   variation in H_S and T_P should be within $\pm$ 5 % for the three locations; and

4.1.6.   during the tests, for approval purposes, a tolerance of + 2,5 % in H_S, $\pm$ 2,5 % in T_P and $\pm$ 5 % in T_Z should be allowed with reference to the probe closer to the wave maker.

4.2.   The model should be free to drift and placed in beam seas (90*o* heading) with the damage hole facing the oncoming waves, with no mooring system permanently attached to the model used. To maintain a beam sea heading of approximately 90*o* during the model test the following requirements should be satisfied:

4.2.1.   heading control lines, intended for minor adjustment, should be located at the centre line of the stem and stern, in a symmetrical fashion and at a level between the position of KG and the damaged waterline; and

4.2.2.   the carriage speed should be equal to the actual drift speed of the model with speed adjustment made when necessary.

4.3.   At least 10 experiments should be carried out. The test period for each experiment should be of a duration such that a stationary state is reached, but not less than 30 min in full-scale. A different wave realisation train should be used for each experiment.

5.   Survival criteria

The model should be considered as surviving if a stationary state is reached for the successive test runs as required in paragraph 4.3. The model should be considered as capsized if angles of roll of more than 30*o* to the vertical axis or steady (average) heel greater than 20*o* for a period longer than three minutes full-scale occur, even if a stationary state is reached.

6.   Test documentation

6.1.   The model test programme should be approved by the Administration in advance.

6.2.   Tests should be documented by means of a report and a video or other visual records containing all relevant information on the model and the test results, which are to be approved by the Administration. These should include, as a minimum, the theoretical and measured wave spectra and statistics (H_S, T_P, T_Z) of the wave elevation at the three different locations in the basin for a representative realisation, and for the tests with the model, the time series of main statistics of the measured wave elevation close to the wave maker and records of model roll, heave and pitch motions, and of the drift speed.**]**