Guidance for Inclining Test

Object of Amendment

Rules for the Survey and Construction of Steel Ships Part B

Reason for Amendment

In order to obtain highly accurate inclining test results, standard test methods are specified in Annex 2.3.2, Part B of the Rules for the Survey and Construction of Steel Ships.

In addition, IACS has issued IACS Recommendation No. 31 which shows recommended procedures for inclining test, and it is considered to be an international guideline for such tests.

Accordingly, relevant requirements related to inclining test conditions and measurement methods are amended in reference to IACS Recommendation No. 31 (Rev.3), the latest version of the recommendation.

Outline of the Amendmenthe main amendments are as follows.

(1) Adds a standard condition stating that the excess weight of a vessel during testing is to be less than 4 %, excluding the weight of the liquid ballast.
(2) Specifies the lengths and arrangements for pendulums and U-tubes.
(3) Specifies that minimum metacentric height is to be 0.20 m or more, and excessive trimming is to be avoided during testing.
(4) Modify the wording, expressions, structure of text, etc. to be in accordance with IACS Recommendation No. 31.

Effective Date and application

Effective date of this amendment is 1 July 2026.

ID:DH25-09

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS	**RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**	
Part B CLASS SURVEYS	**Part B CLASS SURVEYS**	
Annex 2.3.2 GUIDANCE FOR INCLINING TEST	**Annex 2.3.2 GUIDANCE FOR INCLINING TEST**	
An1.1 General	**An1.1 General**	
An1.1.1 General This annex shows the standard method for the inclining test stipulated in **2.1.7-8, Part B of the Rules**. Other alternative methods are not limited.	**An1.1.1 General** This annex shows the standard method for the inclining test stipulated in **2.1.7-8, Part B of the Rules**.	
An1.2 Preparation for the Test	**An1.2 Preparation for the Test**	
An1.2.1 Data to be Submitted	**An1.2.1 Data to be Submitted**	
1 The Instructions containing the information regarding the date and location of the test, the responsible person, stability, inclining weight, schemes of inclining weight positions, etc. are to be presented to the Society before the inclining test.	(Newly added)	IACS Rec.31 2.1
2 The following plans are to be available at the time of the test as necessary. (1) General arrangement drawing (2) Tank capacity plan (3) Hydrostatic curves	The following plans are to be available at the time of the test as necessary. (1) General arrangement drawing (2) Tank capacity plan (3) Hydrostatic curves	IACS Rec.31 2.1

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
(4) Draft marks locations	(4) Draft marks locations	
An1.2.2 Inclining Test Conditions	**An1.2.2 Inclining Test Conditions**	
1 The ship is to be as near to completion as possible. Equipment used by the yard on board is to be removed as much as is possible.	**1** The ship is to be as near to completion in lightweight condition as possible. Equipment used by the yard on board is to be removed as much as is possible.	IACS Rec.31 2.2.1
2 (Omitted)	**2** (Omitted)	
3 The total value of missing weights is not to exceed 2 % of the lightship displacement. The total value of surplus weights is not to exceed either **(1)** or **(2)** below. For smaller ships, a greater deviation may be allowed.	**3** The weight of the ship at testing is not to be below 98 percent of the lightweight condition. However, it is not to be in excess of 102 percent excluding the weight of surplus weights, liquid ballast, fuel oil, diesel oil and fresh water. For smaller ships, a greater deviation may be allowed.	(1)IACS Rec.31 2.2.1 (2)NK Original
(1) 4 % of the lightship displacement, excluding liquid ballast		
(2) 2 % of the lightship displacement, excluding liquid ballast, fuel oil, diesel oil and fresh water		
4 All objects are to be secured in their regular positions. All weights which may swing or shift are to be secured in their known position. If more than one sea stowage position is possible, the actual stowage position used during the test is to be recorded.	**4** All objects are to be secured in their regular positions. All weights which may swing or shift are to be secured in their sea stowage position. If more than one sea stowage position is possible, the actual stowage position used during the test is to be recorded.	IACS Rec.31 2.2.2
5 (Omitted)	**5** (Omitted)	
6 All bilge water and other extraneous standing liquids are to be removed. When draining individual tanks is impracticable, allowances for such liquids are to be at the discretion of the Society.	**6** Bilge water and liquids accumulated on deck are to be removed in order to exclude an influence on measurements.	IACS Rec.31 2.2.4
7 All service tanks and machinery plant piping are to be filled as for the working condition. Where the liquid concerned is not actually filled, the quantity required for the working condition is considered as present, and its weight and centre of gravity is to be taken into account by the calculation.	(Newly added)	IACS Rec.31 2.2.5 Considerations by calculation is NK original.
8 (Omitted)	**7** (Omitted)	
9 All spaces are to be safe for inspection.	(Newly added)	IACS Rec.31 2.2.7

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
An1.2.3 Tank Contents	**An1.2.3 Tank Contents**	
1 Preferably, all tanks are to be either full or empty. The number of tanks containing liquids is to be kept to a minimum.	**1** As a rule, all tanks are to be either full or empty. The number of tanks containing liquids is to be kept to a minimum.	IACS Rec.31 2.3.1
2 Soundings and density of liquids are to be measured in tanks. Shapes of tanks which are partly filled is to be known in order to determine the free liquid surface effect.	**2** Soundings and density of liquids are to be measured in tanks containing liquids. Where tanks are partly filled, free surface effect which has an influence on the result of the test is to be estimated from the shape of the tanks.	IACS Rec.31 2.3.2
3 Adequate measures are to be taken to preclude air pockets in completely full tanks.	**3** Where tanks are intended to be filled completely, attention is to be paid to the removal of air pockets. All empty tanks are to be adequately dried.	IACS Rec.31 2.3.3
4 All connections between tanks are to be closed and all empty tanks are to be adequately dried.	**4** All connections between tanks are to be closed.	IACS Rec.31 2.3.3
An1.2.4 Mooring Arrangements and Environmental Conditions	**An1.2.4 Mooring Arrangements and Environmental Conditions**	
1 (Omitted)	**1** (Omitted)	
2 The depth of water is to be checked prior to the test, and the ship is to be moored at a place of sufficient depth so that its hull does not touch the sea bottom during the test, taking into account the tides.	**2** The depth of water under the hull is to be sufficient to ensure that the hull will be entirely free of the bottom even if the ship is inclined, taking into account tide differences, if applicable.	IACS Rec.31 2.4.2
3 The following mooring arrangements are to be referred to as the standard. Moreover, other mooring arrangements may be approved at the discretion of the Society.	**3** The following mooring arrangements are to be referred to as the standard. Moreover, other mooring arrangements may be approved at the discretion of the Society.	Wording correction
(1) A ship is moored by bow and stern lines on both sides of the ship attached at or near the centreline. Longitudinal mooring lines are to be as long as practicable.	(1) A ship is moored by bow and stern lines on both sides of the ship attached at or near the centre-line. Longitudinal mooring lines are to be as long as practicable.	
(2) A ship is moored by bow and stern lines on one side only and supplemented by spring lines.	(2) A ship is moored by bow and stern lines on one side only and supplemented by spring lines.	
4 Where a single bow or stern line is used, it is to be confirmed that the ship's freedom of movement is not	**4** Where only a single bow or stern line is used, it is to be confirmed that the ship's freedom of movement is not	IACS Rec.31 2.4.3

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
adversely affecting the results of the experiment. **5** When tidal currents are present, the experiment is to be conducted at or around slack tide. **6** (Omitted) **7** The test is not to be conducted under adverse wind, wave and current conditions where the accuracy of the results cannot be assured. **An1.2.5 Inclining Weights** **1** For inclining tests, solid inclining weights are to be used. Use of water ballast transfer to incline the ship may be permitted only in cases where it is impracticable to incline the ship using solid weights. If the transfer of water ballast is to be used, a detailed procedure and including calculation procedure are to be submitted to the Society for approval prior to the experiment. **2** The total weight used is to be sufficient to provide a minimum inclination of one degree and a maximum of four degrees of heel to each side of the initial position. However, in those cases where it is impractical to reach a minimum angle of one degree by use of solid weights or water ballast, a lesser inclination angle may be accepted provided that the requirements related to pendulum deflection or U-tube difference in height in **An1.2.6-2** are complied with. **3** It is recommended that no fewer than four weights (or sets of weights) be used, each approximately equal in mass, and that the inclining weights (or sets of weights) be positioned as symmetrically as possible and parallel to the centreline in places convenient for the shifting of weights and measurement of the arms. **4** Each weight is to be compact, impervious to water and shaped such that its centre of gravity is to be accurately determined.	adversely affecting the results of the experiment. **5** When tidal currents are present, the experiment is to be conducted at or around slack tide as is possible. **6** (Omitted) **7** To carry out the inclining test under the influence of wind and currents may be permitted, provided the accuracy of the test is assured. **An1.2.5 Inclining Weights** **1** As a rule, not less than four solid weights are to be used for the inclining test. Use of water ballast transfer to incline the ship may be permitted only in cases where it is impracticable to incline the ship using solid weights. However, the procedure is to be submitted to the Society for approval prior to commencement. **1** Positioning of inclining weights which gives a maximum heeling moment is to result in a minimum heel angle of 1° up to a maximum 4° from upright, depending upon ship type and size. Where it is impracticable to incline the ship above 1° because of factors such as the GoM being too large, the precision of the measurements is to be enhanced taking account of the characteristic and conditions of the ship and the conditions of the test. **2** The solid weights are to be heavy enough to comply with the requirements in **An 1.3.3-1**. Each solid weight is to be almost equal in mass. **3** Each weight is to be compact, impervious to water. Its centre of gravity is to be accurately determined.	IACS Rec.31 2.4.5 IACS Rec.31 2.4.7 IACS Rec.31 2.5.1 & 2.5.2 IACS Rec.31 2.5.3 Moved from An1.3.3-1 IACS Rec.31 2.5.4 IACS Rec.31 2.5.4

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
5 Each inclining weight is to be marked with an identification number. The inclining weights are to be weighted with a calibrated instrument. In such cases, a report including the identification number, weight, weight measuring date, an instrument and calibration date is to be prepared to show to the Surveyor at the time of the survey.	**4** Each inclining weight is to be marked with an identification number. The inclining weights are to be weighted with a calibrated instrument. In such cases, a report including the identification number, weight, weight measuring date, a instrument and calibration date is to be prepared to show to the Surveyor at the time of the survey.	IACS Rec.31 2.5.5 Preparation of documents is NK original.
An1.2.6 Measuring Devices	**An1.2.6 Measuring Devices**	
1 The use of three measuring devices is recommended to determine the vessel's inclination after each weight shift, however, a minimum of two devices are to be used, one of which is to be a pendulum or U-tube arrangement.	**1** In general, not less than two measuring devices, one of which is to be a pendulum or a U-tube, are to be used to determine the ship's inclination.	IACS Rec.31 2.6.1
2 The lengths and arrangements of pendulums and U-tubes are to be such as to ensure the accuracy of the readings of deflection and difference. The minimum deflection and difference to each side of the initial position corresponding to the total weight shift is, in principle, to be 15 *cm*.	**2** Where pendulums are used, the pendulums are normally to be long enough to give a measured deflection, to each side of upright, of at least 100 *mm*, and be suspended at sheltered locations to be protected from the wind.	IACS Rec.31 2.6.2
3 Where stabilographs are used, the calibration of the instruments is to be verified to the Surveyor's satisfaction prior to the experiment. A trace of the recorded heel pattern is to be included in the test report.	**4** Where stabilographs are used, the calibration of the instruments is to be verified to the Surveyor's satisfaction prior to the experiment.	IACS Rec.31 2.6.2
(Deleted)	**3** Where U-tubes are used, the arrangement of the U-tube length is to be such as to ensure the accuracy of its readings.	
An1.2.7 Initial Condition and Stability	**An1.2.7 Initial Condition and Stability**	
1 The ship is to be preferably upright prior to inclining. However, an initial list of the ship not exceeding 0.5 degree is permissible.	**1** The ship is to be preferably upright prior to inclining. However, an initial list of the ship not exceeding 0.5° is permissible.	IACS Rec.31 2.7.1
2 Excessive trim is to be avoided for certain hull forms where changes in waterplane shape would occur in the region of the waterline when the ship is heeled. Such features are taken into account to select a suitable draught and trim for	**2** Initial trim of the ship is not to exceed 1% of the ship's length.	IACS Rec.31 2.7.2

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
the test.		
3 The persons conducting the test are to be satisfied that the ship has adequate, positive stability and acceptable allowance of the stress levels during the test. The estimated initial metacentric height is to be at least 0.20 *m*.	**3** The persons conducting the test are to be satisfied that the ship has adequate, positive stability and acceptable allowance of the stress levels during the test.	IACS Rec.31 2.7.3
An1.3 Inclining Test and Record of Data	**An1.3 Inclining Test and Record of Data**	
An1.3.1 Accuracy of Data (Omitted)	**An1.3.1 Accuracy of Data** (Omitted)	
An1.3.2 Draught and Water Density Measurements	**An1.3.2 Draught and Water Density Measurements**	
1 Draught is to be measured at fore, aft and midship draught marks on both sides immediately before the test and verified after the test to ensure that no significant changes in vessel's condition have occurred during the test.	**1** Draught is to be measured at fore, aft and midship draught marks on both sides immediately before the test.	IACS Rec.31 3.3.1 & 3.3.2
2 (Omitted)	**2** (Omitted)	
3 A suitable boat with low freeboard is to be available for the draught measurements.	**3** It is to be ensured that no significant changes have occurred to the load condition of the ship during the test.	IACS Rec.31 3.3.3
4 (Omitted)	**4** (Omitted)	
5 Sufficient water samples are to be taken at suitable locations and depths to enable an accurate assessment of water density to be made.	**5** Water samples are to be taken at a suitable depth away from surface water which could contain rainwater.	IACS Rec.31 3.3.5
An1.3.3 Weight Shifts	**An1.3.3 Weight Shifts**	
1 (Omitted)	**2** (Omitted)	IACS Rec.31 3.4.1
2 (Omitted)	**4** (Omitted)	IACS Rec.31 3.4.2
3 The transverse shift distance is to be as great as practicable, and appreciable changes in longitudinal or vertical position when moving port to starboard and vice versa are to be avoided.	**3** The transverse shift distance is to be as great as practicable. The inclining weights are to be positioned symmetrically to the centre line in order to measure the transverse shift distance easily.	IACS Rec.31 3.4.2

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

Amended	Original	Remarks
An1.3.4 Measurement of Heel Angle **1** Pendulum or U-tube readings are to be taken on the recording batten or scale by either of the following ways: (1) On the final stable position of the pendulum or liquid column after stopping of ship motions due to shifting of the inclining weight. (2) By marking the centre of residual motion about the mean position.	**An1.3.4 Measurement of Heel Angle** **1** Pendulum or U-tube readings are to be taken on the recording batten or scale by either of the following ways: (1) On the final stable position of the pendulum or liquid column after stopping of ship motions due to shifting of the inclining weight; (2) By marking the centre of residual motion about the mean position.	Wording correction
2 When using other devices, angles of inclination are to be recorded according to instructions supplied with each device.	**2** When using other devices, angles of inclination are to be recorded according to instructions supplied for each device.	IACS Rec.31 3.4.5
3 Checks are to be made during the inclining test process for each measuring device, which is to be a progressive plot of angles of heel against heeling moments that gives a series of points lying about a straight line passing through (or close to) the origin. If there is a deviation of points, either between the points for a particular weight movement or from the straight line, the deflections and moments are to be checked and corrected prior to the next weight movement.	**3** Whenever the inclining weights are shifted, the plot of heel angle against heeling moment is to be made. If there is a deviation of points from the straight line passing through the initial position, the deflections and moments are to be checked and corrected prior to the next weight movement.	IACS Rec.31 3.4.6
4 Personnel are to be instructed to remain at their assigned positions while inclination readings are being taken and a check is to be made that all mooring and other lines remain slack following each weight shift until all deflections have been taken and recorded.	**4** It is to be checked that weights remain on assigned positions and all lines connected to shore remain slack during measurement.	IACS Rec.31 3.4.7
An1.3.5 Other Relevant Data **1** In the case where the inclinations are carried out by means of transfer of water, it is to be possible to evaluate accurately the weight and the centre of the shifted liquid in relation to the ship's heel and trim.	**An1.3.5 Other Relevant Data** **1** Where the inclining test is carried out by means of transfer of water, it has to be possible to evaluate accurately the weight and the centre of the shifted liquid in relation to the ship's heel and trim.	IACS Rec.31 3.5.1
2 (Omitted)	**2** (Omitted)	

Amended-Original Requirements Comparison Table (Guidance for Inclining Test)

<table>
<tr><th>Amended</th><th>Original</th><th>Remarks</th></tr>
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An1.4 Postponement of the Test

If during the course of an inclining test circumstances arise such that the recommendations in this Annex are not complied with, the Surveyor may advise the person in charge to postpone the test.

An1.5 Inclining Test Report

1 (Omitted)
2 (Omitted)

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An1.4 Postponement of the Test

If during the course of the inclining test circumstances arise such that the requirements in this chapter are not complied with, the Surveyor may advise the person in charge to postpone the test.

An1.5 Inclining Test Report

1 (Omitted)
2 (Omitted)

</td><td>IACS Rec.31 4</td></tr>
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Table An 1.3.3

	Four		Six	
	Port side	Starboard side	Port side	Starboard side
No.0	2, 4	1, 3	2, 4, 6	1, 3, 5
No.1	4	1, 2, 3	4, 6	1, 2, 3, 5
No.2		1, 2, 3, 4		1, 2, 3, 4, 5, 6
No.3	1	2, 3, 4	6	1, 2, 3, 4, 5
No.4	1, 3	2, 4	2, 4, 6	1, 3, 5
No.5	1, 2, 3	4	1, 2, 3, 4, 6	5
No.6	1, 2, 3, 4		1, 2, 3, 4, 5, 6	
No.7	2, 3, 4	1	1, 2, 4, 6	3, 5
No.8	2, 4	1, 3	2, 4, 6	1 ,3, 5

Notes:
(1) The numbers shown in this table show identification number of the weights.
(2) The underlined numbers indicate the last weights or weight groups shifted.

</td><td></td><td>IACS Rec.31 Table 1 Wording correction for Notes</td></tr>
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EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2026.

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