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Ships and marine technology — Large yachts — Measurement and assessment of the visual appearance of coatings

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11347 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 12, *Ships and marine technology — Large yachts*.

Introduction

This International Standard defines the exterior surface appearance and quality requirements for large yachts. The requirements are described in terms of appearance and colour attributes for above the waterline external areas. The purpose of this International Standard is to ensure that the level of exterior coating finish of the yachts will meet the customer's expectations in term of gloss, colour and appearance.

This International Standard specifically covers the visual characteristics of yacht coatings. It is not the purpose of this International Standard to cover any other aspects of the coating.

In particular, this International Standard does not address the degradation of an accepted coating over time or the assessment of the visual appearance of gelcoat.

NOTE Taking into account work environment conditions that are partially unprotected in which the coating activities occur, conditions that suffer sudden changes in weather and environment, repairs and adjustments are considered an integral part of the process before final acceptance. The partial accidental reinstatements will be regarded as part of the integration process as long as parameters of the project such as environmental conditions, stages and timing of activities, equipment, products, and application are all within the requirements of final acceptance.

The defect of "edge marking", swelling or sweated edges showing in the top coat around feather-edge sanded, old or previous paintwork, is therefore to be regarded as acceptable in its processing, provided that the defect is not greater than 5 % of the total external coated surface.

Ships and marine technology — Large yachts — Measurement and assessment of the visual appearance of coatings

1 Scope

This International Standard specifies technical requirements for the measurement and assessment of the visual appearance of the superficial coating of large yachts in terms of gloss, colour and any other superficial defects.

This International Standard is applicable to large yachts, of length, L_H, as defined in ISO 8666, higher than or equal to 24 m, and in use for sport or pleasure and commercial operations.

It describes the technical properties within which the final finish is to be evaluated before its acceptance.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85°*

ISO 7724-1, *Paints and varnishes — Colorimetry — Part 1: Principles*

ISO 7724-2, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*

ISO 7724-3, *Paints and varnishes — Colorimetry — Part 3: Calculation of colour differences*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
abrasion resistance
coating wear resistance property

3.2
blistering
convex deformation in a film, arising from local detachment of one or more of the constituent coats

[ISO 4618:2006, 2.28]

3.3
blooming
formation of a deposit on the surface of a film

NOTE A special form of blooming is an efflorescence.

[ISO 4618:2006, 2.30]

3.4
chalking
appearance of a fine, loosely adherent powder on the surface of a film arising from the degradation of one or more of its constituents

[ISO 4618:2006, 2.39]

3.5
chromatic coordinates
parameters identifying the position of a colour in a chromatic three-dimensional space

3.6
coating
continuous layer formed from a single or multiple application of a coating material to a substrate

[ISO 4618:2006, 2.49]

3.7
coating material
product, in liquid, paste or powder form, that, when applied to a substrate, forms a film possessing protective, decorative and/or other specific properties

[ISO 4618:2006, 2.50]

3.8
coating process
process of application of a coating material to a substrate, such as dipping, spraying, roller coating, and/or brushing

[ISO 4618:2006, 2.52]

3.9
coating system
combination of all coats of coating materials which are to be applied or which have been applied to a substrate

NOTE The actual system can be characterized by the number of coats involved.

[ISO 4618:2006, 2.53]

3.10
colorimetry
fundamental requirements necessary for determining the colour coordinates of paint films and related materials

3.11
colour
sensation resulting from the visual perception of radiation of a given spectral composition

[ISO 4618:2006, 2.57]

3.12
cracking
rupturing of a dry film

[ISO 4618:2006, 2.63]

3.13
cratering
formation in a film of small circular depressions that persist after drying

[ISO 4618:2006, 2.64]

3.14
deck house
superstructure on the upper deck of a yacht

3.15
dirt retention
tendency of a dry film to retain soiling material on its surface which cannot be removed by simple cleaning

3.16
drying
all the processes by which a film passes from the liquid to the solid state

[ISO 4618:2006, 2.84]

3.17
dry spraying
rough and uneven finish to the surface of the paint film where the particles are insufficiently fluid to flow together

3.18
fairness
particular range of wavelengths of defects from 300 mm to 1 000 mm

3.19
fingerprints
damages of wet film due to accidental contact by operators and/or objects

3.20
fish eyes
presence of craters in a coat each having a small particle of impurity in the centre

[ISO 4618:2006, 2.109]

3.21
flaking
detachment of small areas of the coating due to loss of adhesion

[ISO 4618:2006, 2.110]

3.22
flexibility
ability of a dry film to follow without damage the deformations of a substrate to which it is applied

[ISO 4618:2006, 2.116]

3.23
flow
property of a coating material that enables levelling

[ISO 4618:2006, 2.120]

3.24
gloss
optical property of a surface, characterized by its ability to reflect light specularly

[ISO 4618:2006, 2.128]

3.25
hardness
ability of a dry film to resist indentation or penetration by a solid object

[ISO 4618:2006, 2.133]

3.26
haze
milky opalescence in high-gloss or clear coating

[ISO 4618:2006, 2.134]

3.27
hiding power
ability of a coating material or a coating to obliterate the colour or the differences in colour of a substrate

[ISO 4618:2006, 2.135]

3.28
high-visibility areas
areas of coated surface that have the greatest impact on visual appearance, due to their location with respect to visibility by yacht users and external observers

EXAMPLE Coated surfaces facing living and entertainment areas of yacht owners and guests, and relevant passageways; stern; hull sides; vertical/slanted sides of superstructure.

NOTE Due to the possible differences in yachts' shape and size, it is recommended that high-visibility areas be clearly identified in the yacht supply contract.

3.29
hull
main body of a yacht which provides flotation

3.30
low-visibility areas
areas of coated surface that have a low impact on visual appearance due to their localization with respect to visibility by yacht users and external observers

EXAMPLE Vertical/slanted sides of superstructure; garage; technical spaces; masts.

NOTE Due to the possible differences in yachts' shape and size, it is recommended that low-visibility areas be clearly identified in the yacht supply contract.

3.31
orange peel
appearance of a film, resembling the texture of the surface of an orange

[ISO 4618:2006, 2.163]

3.32
overspray
that part of a sprayed coating material that does not reach the surface to be coated

[ISO 4618:2006, 2.166]

3.33
paint
pigmented or non-pigmented coating material which, when applied to a substrate, forms an opaque film having protective, decorative or specific technical properties

NOTE Adapted from ISO 4618:2006, 2.167.

3.34
peeling
detachment of large areas of the coating due to loss of adhesion

[ISO 4618:2006, 2.170]

3.35
pigment colouring material
colouring material, generally in the form of fine particles, which is practically insoluble in the medium and which is used because of its optical, protective and/or decorative properties

NOTE This material can also consist of metal or metallic alloy, shot effects, pearly metallized, or special effects finish colours.

3.36
pinholing
presence of small holes in the film resembling those made by a pin

[ISO 4618:2006, 2.177]

3.37
polishing marks
marks from top coat polishing, resulting in low gloss areas

3.38
ropiness
appearance characterized by pronounced brush marks that have not flowed out because of the poor levelling properties of the coating materials

[ISO 4618:2006, 2.196]

3.39
sags
local irregularities in the film thickness caused by the downward movement of a coating material during drying in a vertical or an inclined position

NOTE Small sags can be called runs, tears or droplets; large sags can be called curtains.

[ISO 4618:2006, 2.199]

3.40
sanding marks
raised or indented lines (curved or straight) visible in the top coat as a result of the sanding process under the top coat

3.41
substrate
surface to which a coating material is applied or is to be applied

[ISO 4618:2006, 2.219]

3.42
superstructure
structural part of a yacht above the main deck

3.43
top coat
final coat of a coating system

3.44
water marks
spots caused by water drops falling over a wet paint film

3.45
waviness
particular range of wavelengths of defects from 30 mm to 300 mm

3.46
wrinkling
development of ripples in a film of coating material during drying

[ISO 4618:2006, 2.252]

4 General

This International Standard specifies methods for evaluating the appearance of the external coating of large yachts.

Measurement relies on the following parameters, which, even if measured separately, converge to determine the overall assessment of visual appearance:

— gloss (ISO 2813),

— colour difference (ISO 7724-3),

— orange peel,

— fairness,

— sags,

— dirt retention,

— overspray,

— sanding marks,

— blistering,

— water marks,

— polishing marks,

— blooming.

For the above parameters, 5.1 to 5.12 provide descriptions, measurement and test methods.

Other defects, such as wrinkling, flaking, peeling, cracking, fish eyes, fingerprints, and lack of hiding power should not be present in the coated surfaces of large yachts.

5 Parameters, measurement and test methods

5.1 Gloss

5.1.1 Description

Gloss is a visual impression that is caused when the surface is evaluated. The factors involved in visual evaluation are the surface condition, the illumination and the observer. On a glossy surface, the incident light is directly reflected on the surface and only in the main direction of reflection. The angle of reflection is equal to the angle of incidence. The specular gloss, or specular reflection measurement, is a reading of the amount of reflected light intensity and is compared to the amount of reflected light from a black glass standard with a defined refractive index.

5.1.2 Test method

For the purposes of this International Standard, a 60° specular gloss-meter shall be used as defined in ISO 2813. The gloss-meter measures the specular reflection. The light intensity is registered over a small range of reflection angles.

Gloss measurement requirements shall be fulfilled by the test method outlined in Annex A. For aspects not addressed in Annex A, reference shall be made to the International Standards listed in Clause 2.

5.2 Colour difference

5.2.1 Description

Visual colour perception is influenced by varying colour sensitivity in each person and by varying environmental conditions such as lightness and colour. Colour perception mainly depends on three factors: light source, observer and surface condition [ISO 7724 (all parts)].

Light source and observer are defined by the CIE (Commission Internationale de l'Eclairage) and their spectral functions are stored in the spectrophotometers for colour measurement. Optical properties of a surface are then the only variables to be measured.

To maintain colour in a project, a standard reference needs to be established and the requirement is evaluated in terms of deviation from the standard and not in absolute value.

5.2.2 Test method

For the purposes of this International Standard, a spectrophotometer at d/8° geometry, specular included, shall be used unless otherwise specified by the builder or the paint manufacturer. The spectrophotometer measures the amount of light reflected by a coated surface along the wavelength spectrum of visible light, and the readings are taken from the spectrum data.

The colour difference measurement requirements shall be fulfilled by the test method outlined in Annex B. For aspects not addressed in Annex B, reference shall be made to the International Standards listed in Clause 2.

5.3 Orange peel

5.3.1 Description

Orange peel is a coating property resulting in a surface appearance characteristic of the skin of an orange. The coarseness of the resulting texture can vary and has a significant influence on the image-forming qualities of the finish. Extremes of gloss coating surface profile wavelengths are in the range of 0,1 mm to 30 mm. The closer the range between the surface and the observer, the greater the visual impact of orange peel.

5.3.2 Test method

For the purposes of this International Standard, a waviness measurement system shall be used.

Orange peel measurement requirements shall be fulfilled by the test method outlined in Annex C. For aspects not addressed in Annex C, reference shall be made to the International Standards listed in Clause 2.

5.4 Fairness

5.4.1 Description

Fairness is when irregularities in the surface prepared for painting or after painting result in a fairness especially visible under bright light conditions and glossy finishing. Extremes of gloss coating surface profile wavelengths are in the range of 300 mm to 1 000 mm. The closer the range between the surface and the observer, the greater the visual impact of fairness.

5.4.2 Test method

For the purposes of this International Standard, a measurement by linear bar and feeler gauge shall be performed.

Fairness measurement requirements shall be fulfilled by the test method outlined in Annex D. For aspects not addressed in Annex D, reference shall be made to the International Standards listed in Clause 2.

5.5 Sags

5.5.1 Description

Sags are when a number of factors influencing the flow of the wet coat film result in visible downward movements before paint curing.

Visibility of sags can vary according to the observation point with respect to the surface and the light conditions.

5.5.2 Test method

For the purposes of this International Standard, a measurement by straight ruler and feeler gauge shall be performed.

Sags measurement requirements shall be fulfilled by the test method outlined in Annex E. For aspects not addressed in Annex E, reference shall be made to the International Standards listed in Clause 2.

5.6 Dirt retention

5.6.1 Description

Dirt retention is when particles of dust, dirt or debris are embedded within the coating film during application or before complete curing.

Visibility of particles can vary according to the observation point with respect to the surface and the light conditions.

5.6.2 Test method

For the purposes of this International Standard, a measurement by a measuring magnifier shall be performed.

Particle number and size measurement requirements shall be fulfilled by the test method outlined in Annex F. For aspects not addressed in Annex F, reference shall be made to the International Standards listed in Clause 2.

5.7 Overspray

5.7.1 Description

Overspray is when particles of paint adhere to the coated surface or do not completely absorb into the paint, causing a reduction of gloss.

Reduction of gloss can vary according to the observation point with respect to the surface and the light conditions.

5.7.2 Test method

For the purposes of this International Standard, a measurement by a 60° specular gloss-meter shall be performed.

Lack of gloss requirements shall be fulfilled by the test method outlined in Annex G. For aspects not addressed in Annex G, reference shall be made to the International Standards listed in Clause 2.

5.8 Sanding marks

5.8.1 Description

Sanding marks are when scratches and lines originating from mechanical or manual sanding, performed as means of preparing the surface of the substrate or a previous paint layer, appear on the surface after the top coat has been applied.

Visibility of marks can vary according to the observation point with respect to the surface and the light conditions.

5.8.2 Test method

Measurement of sanding marks is performed indirectly by a localized measurement of gloss.

For the purposes of this International Standard, a measurement by a 60° specular gloss-meter shall be performed.

Lack of gloss requirements shall be fulfilled by the test method outlined in Annex H. For aspects not addressed in Annex H, reference shall be made to the International Standards listed in Clause 2.

5.9 Blistering

5.9.1 Description

Blisters appear as bubbles protruding from the coated surface, or as small holes and craters in the top coat, due to opening or release of bubbles.

Visibility of blisters can vary according to the observation point with respect to the surface and the light conditions.

5.9.2 Test method

For the purposes of this International Standard, counting and sizing by a measuring magnifier shall be performed.

Blisters' number and size measurement requirements shall be fulfilled by the test method outlined in Annex I. For aspects not addressed in Annex I, reference shall be made to the International Standards listed in Clause 2.

5.10 Water marks

5.10.1 Description

Water marks are when water stains appear on the coated surface, usually circular, white- or light-coloured, caused by mineral salts resulting from water evaporation.

Visibility of stains can vary according to the observation point with respect to the surface and the light conditions.

5.10.2 Test method

For the purposes of this International Standard, a measurement by a measuring magnifier shall be performed.

Stains' number and size measurement requirements shall be fulfilled by the test method outlined in Annex J. For aspects not addressed in Annex J, reference shall be made to the International Standards listed in Clause 2.

5.11 Polishing marks

5.11.1 Description

Polishing marks are when scratches and marks on polished areas give the polished surface lower gloss and greyish colour.

Visibility of marks can vary according to the observation point with respect to the surface and the light conditions.

5.11.2 Test method

Measurement of polishing marks is performed indirectly, by a localized measurement of gloss.

For the purposes of this International Standard, a measurement by a 60° specular gloss-meter shall be performed.

Lack of gloss requirements shall be fulfilled by the test method outlined in Annex K. For aspects not addressed in Annex K, reference shall be made to the International Standards listed in Clause 2.

5.12 Blooming

5.12.1 Description

Blooming is a pearly white veil or a tarnish defect that forms on the surface of the paint film.

Visibility of blooming can vary according to the observation point with respect to the surface and the light conditions.

5.12.2 Test method

Measurement of blooming is performed indirectly, by a localized measurement of gloss.

For the purposes of this International Standard, a measurement by a 60° specular gloss-meter shall be performed.

Lack of gloss requirements shall be fulfilled by the test method outlined in Annex L. For aspects not addressed in Annex L, reference shall be made to the International Standards listed in Clause 2.

Annex A
(normative)

Test method for gloss measurement of coatings

A.1 Scope

The aim is to provide a method for proof testing the specular gloss of the external surface coatings as specified in ISO 2813.

A.2 Measuring instrument

For the purposes of this International Standard, a 60° specular gloss-meter shall be used. Resolution shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The apparatus is calibrated by reading the gloss of high- and semi-gloss standard plates. If the difference between the reading and its reference value is greater than ±1,0 unit, adjustment of the apparatus shall be made.

The instrument aperture is then placed over the coated area and its gloss reading noted.

A.3 Test method

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the specular gloss shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

The readings shall be equally spaced according to the following criteria:

— For yachts with hull length between 24 m and 30 m, the prescribed measuring points shall be every 4 m^2 of area.

— For yachts with hull length between 30 m and 90 m, the prescribed measuring points shall be every 6 m^2 of area.

— For yachts with a hull length from 90 m, the prescribed measuring points shall be every 10 m^2 of area.

If measurement points resulting from the readings grid fall on a piece that is not significant with regard to painting quality, due to its finish, material or shape, i.e. portholes, windows, fairleads and similar, the measurement point shall be relocated to the nearest significant surrounding area. If the new point falls within a 1 m distance of the next measurement point resulting from the reading grid, the relocated measurement point shall be omitted.

Hull/superstructure: the readings shall be taken in the entire area above the waterline in accordance with the above spacing criteria.

Deck house: the readings shall be taken on a vertical, horizontal and sloping area in accordance with the above spacing criteria.

A.4 Acceptance criteria and report

All readings shall be in gloss units (GU).

The value required in terms of gloss shall be specified.

All the readings shall be recorded in a file by the yacht builder and the acceptance value shall be an average value of all readings for each area, which shall be reported as a general value for the whole acceptance of the coating.

A.5 Limitation

This method is valid for gloss and semi-gloss surfaces and for solid, effect and metallic colours.

If the area is too small or unsuitable for readings, the gloss shall be compared visually with a reference area already tested.

Since measurements can be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex B
(normative)

Test method for colour difference measurement of coatings

B.1 Scope

The aim is to establish a method for proof-testing the colour difference of the external coated surfaces.

B.2 Measuring instrument

For the purposes of this International Standard, a spectrophotometer at d/8° geometry shall be used as defined in ISO 7724 (all parts).

The recommended illuminant is D 65. Accuracy shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The circular measuring aperture should have a minimum diameter of 11 mm.

The instrument shall include the specular reflectance.

B.3 Test method

Before beginning the coating activities, the colour chosen shall be measured and a reference recorded as a standard to maintain the colour in the project.

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the colour difference shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

The readings shall be equally spaced according to the following criteria:

— For yachts with hull length between 24 m and 30 m, the prescribed measuring points shall be every 4 m^2 of area;

— For yachts with hull length between 30 m and 90 m, the prescribed measuring points shall be every 6 m^2 of area;

— For yachts with a hull length from 90 m, the prescribed measuring points shall be every 10 m^2 of area.

If measurement points resulting from the readings grid fall on a piece that is not significant with regard to painting quality, due to its finish, material or shape, i.e. portholes, windows, fairleads and similar, the measurement point shall be relocated to the nearest significant surrounding area. If the new point falls within a 1 m distance of the next measurement point resulting from the reading grid, the relocated measurement point shall be omitted.

Hull/superstructure: the readings shall be taken in the entire area above the waterline in accordance with the above spacing criteria.

Deck house: the readings shall be taken on a vertical, horizontal and sloping area in accordance with the above spacing criteria.

B.4 Acceptance criteria and report

The colour difference, if any, between the acceptance value and the standard reference shall be specified.

All the readings shall be recorded in a file by the yacht builder and the acceptance value shall be an average value of all readings for each area, which shall be reported as a general value for the whole acceptance of the coating.

B.5 Limitation

This method is valid only for gloss and semi-gloss surfaces and for solid colour. It is not valid for metallic and effect colours.

Since measurements can be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex C
(normative)

Test method for measurement of orange peel of coatings

C.1 Scope

The aim is to establish a method for proof-testing the appearance of the external coated surfaces.

C.2 Measuring instrument

For the purposes of this International Standard, a 60° angle wave-scan shall be used. Its measurement range shall be within 0 to 100 and the structure spectrum between 0,1 mm and 30 mm. The scan length shall be 50/100/200 mm. Resolution shall be to at least 1 decimal place (0,1).

The wave-scan simulates visual perception similar to that of the human eye. The instrument optically scans the waves reflected from the wavy light/dark pattern of a coating film. The contemporary survey of the large waves (“orange peel”) and the small waves (“image-forming quality/dullness) representing the reflected beam simulates the visual assessment.

A laser point light source illuminates the surface at a 60° angle and a detector measures the reflected light intensity at the equal but opposite angle. The wave-scan analyses the surface structure according to size in order to simulate the resolution of the human eye. The measurement is divided into several ranges using mathematical filter functions.

Conduct necessary referencing as recommended by the manufacturer of the instrument.

C.3 Test method

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer’s technical data.

Each reading shall be taken at three different points within a square decimetre and the orange peel value shall be reported as the average of these readings. In the event that any single reading is anomalous, i.e. lower than the minimum value reported under C.4, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

The readings shall be equally spaced according to the following criteria:

— For yachts with hull length between 24 m and 30 m, the prescribed measuring points shall be every 4 m^2 of area;

— For yachts with hull length between 30 m and 90 m, the prescribed measuring points shall be every 6 m^2 of area;

— For yachts with hull length from 90 m, the prescribed measuring points shall be every 10 m^2 of area.

If measurement points resulting from the readings grid fall on a piece that is not significant with regard to painting quality, due to its finish, material or shape, i.e., portholes, windows, fairleads and similar, the measurement point shall be relocated to the nearest significant surrounding area. If the new point falls within a 1 m distance of the next measurement point resulting from the reading grid, the relocated measurement point shall be omitted.

Hull/superstructure: the readings shall be taken in the entire area above the waterline in accordance with the above spacing criteria.

Deck house: the readings shall be taken on a vertical, horizontal and sloping area in accordance with the above spacing criteria.

C.4 Acceptance criteria and report

The value required in terms of orange peel for the SW (short waves) and for the LW (long waves) shall be specified.

All the readings shall be recorded in a file by the yacht builder and the acceptance value shall be an average value of all readings for each area, which shall be reported as a general value for the whole acceptance of the coating.

C.5 Limitation

This method is valid for solid, effect, and metallic colour.

To be valid this test shall be conducted on gloss surfaces ≥ 70 GU at 60°.

Since measurements can be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex D
(normative)

Test method for measurement of fairness of coatings

D.1 Scope

The aim is to establish an experimental method for proof-testing the fairness of the external surfaces.

D.2 Measuring instrument

Measurement shall be taken by means of a flexible bar and a feeler gauge, with feelers from 0,1 to 1,0 mm.

According to the surface extension and shape, bars from 2 m to 6 m long may be used.

The construction material of the bar and its cross-section shape may differ, provided that physical properties allow measurements within tolerance.

As a reference, a hollow flat aluminium bar 20 mm × 100 mm × 3 mm thick may prove suitable.

The bar shall be linear in order to obtain correct measurements.

D.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of wavy depressions.

The measurement shall be made by placing one of the bar edges against the surface.

The bar shall be brought into contact with the surface by hand pressure, and the clearance between surface and bar shall be measured along the full bar length by the feeler gauge.

Identification of clearance areas is made easy by the use of a portable light placed at the opposite side of the bar, with respect to the observation side.

D.4 Acceptance criteria and report

All readings are in absolute value.

A limit clearance value for fairness acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

D.5 Limitation

None.

Annex E
(normative)

Test method for measurement of sags of coatings

E.1 Scope

The aim is to establish an experimental method for proof-testing any coating sags on the external coated surfaces.

E.2 Measuring instrument

Measurement is taken by means of a straight ruler and feeler gauge, with feelers from 10 µm to 100 µm.

As a reference, a ruler 2 mm × 15 mm × 100 mm may prove suitable.

E.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of sags.

The measurement shall be made by placing the 2-mm-thick edge against the surface.

The ruler shall be placed on the surface, vertically across the sag edge, and put into contact with the sag edge, while the upper part of the ruler shall touch the coated surface.

The ruler shall protrude not more than 20 mm below the sag edge.

The clearance between ruler and coated surface shall be measured by means of the feeler gauge, immediately downwards of the sag edge.

E.4 Acceptance criteria and report

A limit clearance for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

E.5 Limitation

None.

Annex F
(normative)

Test method for measurement of dirt retention of coatings

F.1 Scope

The aim is to establish an experimental method for proof-testing dirt retention on the external coated surfaces.

F.2 Measuring instrument

Measurement is taken by counting particles using a measuring magnifier with an enlargement ratio of 5 to 10 times and scale divisions of 0,1 mm.

F.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of dirt.

Squares of 100 mm × 100 mm of free surface shall be marked.

Number and size of particles are subject to visual counting.

F.4 Acceptance criteria and report

The value required for acceptance of high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

F.5 Limitation

None.

Annex G
(normative)

Test method for measurement of overspray of coatings

G.1 Scope

The aim is to establish an experimental method for proof-testing the lack of gloss due to the presence of overspray on the external coated surfaces.

G.2 Measuring instrument

For the purposes of this International Standard, a 60° specular gloss-meter shall be used. Resolution shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The apparatus is calibrated by reading the gloss of high- and semi-gloss plates. If the difference between the reading and its reference value is greater than ±1,0 unit, adjustment of the apparatus shall be made.

G.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of overspray.

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the specular gloss shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at a 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

G.4 Acceptance criteria and report

All readings shall be in gloss units (GU).

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

G.5 Limitation

This method is valid for gloss and semi-gloss surfaces and for solid, pearlescent and metallic colours.

If the area is too small or unsuitable for the readings, the gloss shall be compared visually with a reference area already tested.

Since measurements may be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex H
(normative)

Test method for measurement of sanding marks of coatings

H.1 Scope

The aim is to establish an experimental method for proof-testing the lack of gloss due to the presence of sanding marks on the external coated surfaces.

H.2 Measuring instrument

For the purposes of this International Standard, a 60° specular gloss-meter shall be used. Resolution shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The apparatus is calibrated by reading the gloss of high- and semi-gloss plates. If the difference between the reading and its reference value is greater than ±1,0 units, adjustment of the apparatus shall be made.

H.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of sanding marks.

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the specular gloss shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

H.4 Acceptance criteria and report

All readings shall be in gloss units (GU).

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

H.5 Limitation

This method is valid for gloss and semi-gloss surfaces and for solid, pearlescent and metallic colours.

If the area is too small or unsuitable for the readings, the gloss shall be compared visually with a reference area already tested.

Since measurements may be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex I
(normative)

Test method for measurement of blistering of coatings

I.1 Scope

The aim is to establish an experimental method for proof-testing any blistering on the external coated surfaces.

I.2 Measuring instrument

Visual assessment is taken by counting blisters using a measuring magnifier with enlargement ratio 5 to 10 times and scale divisions of 0,1 mm.

I.3 Test method

The assessment shall be performed on areas where visual observation has given an indication of the presence of blistering.

Squares of 100 mm × 100 mm of free surface shall be marked.

Number and size of blisters shall be subject to visual counting.

I.4 Acceptance criteria and report

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

I.5 Limitation

None.

Annex J
(normative)

Test method for measurement of water marks of coatings

J.1 Scope

The aim is to establish an experimental method for proof-testing any water mark on the external coated surfaces.

J.2 Measuring instrument

Visual assessment is taken by counting blisters using a measuring magnifier with enlargement ratio 5 to 10 times and scale divisions of 0,1 mm.

J.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of water marks.

Squares of 100 mm × 100 mm free surface shall be marked.

Number and size of marks shall be subject to visual counting.

J.4 Acceptance criteria and report

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

J.5 Limitation

None.

Annex K
(normative)

Test method for measurement of polishing marks of coatings

K.1 Scope

The aim is to establish an experimental method for proof-testing the lack of gloss due to the presence of polishing marks on the external coated surfaces.

K.2 Measuring instrument

For the scope of this International Standard, a 60° specular gloss-meter shall be used. Resolution shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The apparatus is calibrated by reading the gloss of high- and semi-gloss plates. If the difference between the reading and its reference value is greater than ±1,0 units, adjustment of the apparatus shall be made.

K.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of polishing marks.

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the specular gloss shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

K.4 Acceptance criteria and report

All readings shall be in gloss units (GU).

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

K.5 Limitation

This method is valid for gloss and semi-gloss surfaces and for solid, pearlescent and metallic colours.

If the area is too small or unsuitable for the readings, the gloss shall be compared visually with a reference area already tested.

Since measurements may be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Annex L
(normative)

Test method for measurement of blooming of coatings

L.1 Scope

To establish an experimental method for proof testing the lack of gloss due to blooming presence on the external coated surfaces.

L.2 Measuring instrument

For the scope of this International Standard, a 60° specular gloss-meter shall be used. Resolution shall be to at least 1 decimal place (0,1).

Calibration shall be conducted as recommended by the manufacturer of the instrument.

The apparatus is calibrated by reading the gloss of high- and semi-gloss plates. If the difference between the reading and its the reference value is greater than ±1,0 units, adjustment of the apparatus shall be made.

L.3 Test method

The measurement shall be performed on areas where visual observation has given an indication of the presence of blooming.

The readings shall be taken following complete cure of the entire coating and in accordance with the coating manufacturer's technical data.

Each reading shall be taken at three different points within a square decimetre and the specular gloss shall be reported as the average of these readings. In the event that any single reading is anomalous, an additional three readings shall be taken around the same point in the same area at 10 cm distance. The average of these three readings shall be reported as the average value for that measurement point.

L.4 Acceptance criteria and report

All readings shall be in gloss units (GU).

The value required for acceptance on high-visibility areas shall be specified.

All the readings shall be recorded in a file by the test executor, together with the corresponding measurement-point locations.

L.5 Limitation

This method is valid for gloss surfaces and for solid, pearlescent and metallic colours.

If the area is too small or unsuitable for the readings, the gloss shall be compared visually with a reference area already tested.

Since measurements may be influenced by surface curvature, the maximum curvature where readings may be performed shall be recommended by the manufacturer of the instrument used, shall be such as not to influence the reading and shall exceed 10 times the diameter of the measuring aperture.

Bibliography

[1] ISO 1513, *Paints and varnishes — Examination and preparation of test samples*

[2] ISO 4618:2006, *Paints and varnishes — Terms and definitions*

[3] ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

[4] ISO 8502-3, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)*

[5] ISO 8666, *Small craft — Principal data*

[6] ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

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