

**RULES FOR THE EVALUATION OF NOISE  
AND VIBRATION COMFORT ON BOARD  
HIGH SPEED CRAFT EFFECTIVE  
FROM 1 JANUARY 2016**

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## GENERAL CONDITIONS

### Definitions:

“Administration” means the Government of the State whose flag the Ship is entitled to fly or under whose authority the Ship is authorised to operate in the specific case.

“IACS” means the International Association of Classification Societies.

“Interested Party” means the party, other than the Society, having an interest in or responsibility for the Ship, product, plant or system subject to classification or certification (such as the owner of the Ship and his representatives, the ship builder, the engine builder or the supplier of parts to be tested) who requests the Services or on whose behalf the Services are requested.

“Owner” means the registered owner, the ship owner, the manager or any other party with the responsibility, legally or contractually, to keep the ship seaworthy or in service, having particular regard to the provisions relating to the maintenance of class laid down in Part A, Chapter 2 of the Rules for the Classification of Ships or in the corresponding rules indicated in the specific Rules.

“Rules” in these General Conditions means the documents below issued by the Society:

- (i) Rules for the Classification of Ships or other special units;
- (ii) Complementary Rules containing the requirements for product, plant, system and other certification or containing the requirements for the assignment of additional class notations;
- (iii) Rules for the application of statutory rules, containing the rules to perform the duties delegated by Administrations;
- (iv) Guides to carry out particular activities connected with Services;
- (v) Any other technical document, as for example rule variations or interpretations.

“Services” means the activities described in Article 1 below, rendered by the Society upon request made by or on behalf of the Interested Party.

“Ship” means ships, boats, craft and other special units, as for example offshore structures, floating units and underwater craft.

“Society” or “TASNEEF” means Tasneef and/or all the companies in the Tasneef Group which provide the Services.

“Surveyor” means technical staff acting on behalf of the Society in performing the Services.

### Article 1

1.1. The purpose of the Society is, among others, the classification and certification of ships and the certification of their parts and components. In particular, the Society:

- (i) sets forth and develops Rules;
- (ii) publishes the Register of Ships;
- (iii) issues certificates, statements and reports based on its survey activities.

1.2. The Society also takes part in the implementation of national and international rules and standards as delegated by various Governments.

1.3. The Society carries out technical assistance activities on request and provides special services outside the scope of classification, which are regulated by these general conditions, unless expressly excluded in the particular contract.

### Article 2

2.1. The Rules developed by the Society reflect the level of its technical knowledge at the time they are published. Therefore, the Society, although committed also through its research and development services to continuous updating of the Rules, does not guarantee the Rules meet state-of-the-art science and technology at the time of publication or that they meet the Society's or others' subsequent technical developments.

2.2. The Interested Party is required to know the Rules on the basis of which the Services are provided. With particular reference to Classification Services, special attention is to be given to the Rules concerning class suspension, withdrawal and reinstatement. In case of doubt or inaccuracy, the Interested Party is to promptly contact the Society for clarification.

The Rules for Classification of Ships are published on the Society's website: [www.tasneef.ae](http://www.tasneef.ae).

2.3. The Society exercises due care and skill:

- (i) in the selection of its Surveyors
- (ii) in the performance of its Services, taking into account the level of its technical knowledge at the time the Services are performed.

2.4. Surveys conducted by the Society include, but are not limited to, visual inspection and non-destructive testing. Unless otherwise required, surveys are conducted through sampling techniques and do not consist of comprehensive verification or monitoring of the Ship or of the items subject to certification. The surveys and checks made by the Society on board ship do not necessarily require the constant and continuous presence of the Surveyor. The Society may also commission laboratory testing, underwater inspection and other checks carried out by and under the responsibility of qualified service suppliers. Survey practices and procedures are selected by the Society based on its experience and knowledge and according to generally accepted technical standards in the sector.

### Article 3

3.1. The class assigned to a Ship, like the reports, statements, certificates or any other document or information issued by the Society, reflects the opinion of the Society concerning compliance, at the time the Service is provided, of the Ship or product subject to certification, with the applicable Rules (given the intended use and within the relevant time frame).

The Society is under no obligation to make statements or provide information about elements or facts which are not part of the specific scope of the Service requested by the Interested Party or on its behalf.

3.2. No report, statement, notation on a plan, review, Certificate of Classification, document or information issued or given as part of the Services provided by the Society shall have any legal effect or implication other than a representation that, on the basis of the checks made by the Society, the Ship, structure, materials, equipment, machinery or any other item covered by such document or information meet the Rules. Any such document is issued solely for the use of the Society, its committees and clients or other duly authorised bodies and for no other purpose. Therefore, the Society cannot be held liable for any act made or document issued by other parties on the basis of the statements or information given by the Society. The validity, application, meaning and interpretation of a Certificate of Classification, or any other document or information issued by the Society in connection with its Services, is governed by the Rules of the Society, which is the sole subject entitled to make such interpretation. Any disagreement on technical matters between the Interested Party and the Surveyor in the carrying out of his functions shall be raised in writing as soon as possible with the Society, which will settle any divergence of opinion or dispute.

3.3. The classification of a Ship, or the issuance of a certificate or other document connected with classification or certification and in general with the performance of Services by the Society shall have the validity conferred upon it by the Rules of the Society at the time of the assignment of class or issuance of the certificate; in no case shall it amount to a statement or warranty of seaworthiness,

structural integrity, quality or fitness for a particular purpose or service of any Ship, structure, material, equipment or machinery inspected or tested by the Society.

**3.4.** Any document issued by the Society in relation to its activities reflects the condition of the Ship or the subject of certification or other activity at the time of the check.

**3.5.** The Rules, surveys and activities performed by the Society, reports, certificates and other documents issued by the Society are in no way intended to replace the duties and responsibilities of other parties such as Governments, designers, ship builders, manufacturers, repairers, suppliers, contractors or sub-contractors, Owners, operators, charterers, underwriters, sellers or intended buyers of a Ship or other product or system surveyed.

These documents and activities do not relieve such parties from any fulfilment, warranty, responsibility, duty or obligation (also of a contractual nature) expressed or implied or in any case incumbent on them, nor do they confer on such parties any right, claim or cause of action against the Society. With particular regard to the duties of the ship Owner, the Services undertaken by the Society do not relieve the Owner of his duty to ensure proper maintenance of the Ship and ensure seaworthiness at all times. Likewise, the Rules, surveys performed, reports, certificates and other documents issued by the Society are intended neither to guarantee the buyers of the Ship, its components or any other surveyed or certified item, nor to relieve the seller of the duties arising out of the law or the contract, regarding the quality, commercial value or characteristics of the item which is the subject of transaction.

In no case, therefore, shall the Society assume the obligations incumbent upon the above-mentioned parties, even when it is consulted in connection with matters not covered by its Rules or other documents.

In consideration of the above, the Interested Party undertakes to relieve and hold harmless the Society from any third party claim, as well as from any liability in relation to the latter concerning the Services rendered.

Insofar as they are not expressly provided for in these General Conditions, the duties and responsibilities of the Owner and Interested Parties with respect to the services rendered by the Society are described in the Rules applicable to the specific Service rendered.

#### **Article 4**

**4.1.** Any request for the Society's Services shall be submitted in writing and signed by or on behalf of the Interested Party. Such a request will be considered irrevocable as soon as received by the Society and shall entail acceptance by the applicant of all relevant requirements of the Rules, including these General Conditions. Upon acceptance of the written request by the Society, a contract between the Society and the Interested Party is entered into, which is regulated by the present General Conditions.

**4.2.** In consideration of the Services rendered by the Society, the Interested Party and the person requesting the service shall be jointly liable for the payment of the relevant fees, even if the service is not concluded for any cause not pertaining to the Society. In the latter case, the Society shall not be held liable for non-fulfilment or partial fulfilment of the Services requested. In the event of late payment, interest at the legal current rate increased by 1.5% may be demanded.

**4.3.** The contract for the classification of a Ship or for other Services may be terminated and any certificates revoked at the request of one of the parties, subject to at least 30 days' notice to be given in writing. Failure to pay, even in part, the fees due for Services carried out by the Society will entitle the Society to immediately terminate the contract and suspend the Services.

For every termination of the contract, the fees for the activities performed until the time of the termination shall be owed to the Society as well as the expenses incurred in view of activities already programmed; this is without prejudice to the right to compensation due to the Society as a consequence of the termination.

With particular reference to Ship classification and certification, unless decided otherwise by the Society, termination of the contract implies that the assignment of class to a Ship is withheld or, if already assigned, that it is suspended or withdrawn; any statutory certificates issued by the Society will be withdrawn in those cases where provided for by agreements between the Society and the flag State.

#### **Article 5**

**5.1.** In providing the Services, as well as other correlated information or advice, the Society, its Surveyors, servants or agents operate with due diligence for the proper execution of the activity. However, considering the nature of the activities performed (see art. 2.4), it is not possible to guarantee absolute accuracy, correctness and completeness of any information or advice supplied. Express and implied warranties are specifically disclaimed.

Therefore, except as provided for in paragraph 5.2 below, and also in the case of activities carried out by delegation of Governments, neither the Society nor any of its Surveyors will be liable for any loss, damage or expense of whatever nature sustained by any person, in tort or in contract, derived from carrying out the Services.

**5.2.** Notwithstanding the provisions in paragraph 5.1 above, should any user of the Society's Services prove that he has suffered a loss or damage due to any negligent act or omission of the Society, its Surveyors, servants or agents, then the Society will pay compensation to such person for his proved loss, up to, but not exceeding, five times the amount of the fees charged for the specific services, information or opinions from which the loss or damage derives or, if no fee has been charged, a maximum of AED5,000 (Arab Emirates Dirhams Five Thousand only). Where the fees charged are related to a number of Services, the amount of the fees will be apportioned for the purpose of the calculation of the maximum compensation, by reference to the estimated time involved in the performance of the Service from which the damage or loss derives. Any liability for indirect or consequential loss, damage or expense is specifically excluded. In any case, irrespective of the amount of the fees charged, the maximum damages payable by the Society will not be more than AED5,000,000 (Arab Emirates Dirhams Five Millions only). Payment of compensation under this paragraph will not entail any admission of responsibility and/or liability by the Society and will be made without prejudice to the disclaimer clause contained in paragraph 5.1 above.

**5.3.** Any claim for loss or damage of whatever nature by virtue of the provisions set forth herein shall be made to the Society in writing, within the shorter of the following periods: (i) THREE (3) MONTHS from the date on which the Services were performed, or (ii) THREE (3) MONTHS from the date on which the damage was discovered. Failure to comply with the above deadline will constitute an absolute bar to the pursuit of such a claim against the Society.

#### **Article 6**

**6.1.** These General Conditions shall be governed by and construed in accordance with United Arab Emirates (UAE) law, and any dispute arising from or in connection with the Rules or with the Services of the Society, including any issues concerning responsibility, liability or limitations of liability of the Society, shall be determined in accordance with UAE law. The courts of the Dubai International Financial Centre (DIFC) shall have exclusive jurisdiction in relation to any claim or dispute which may arise out of or in connection with the Rules or with the Services of the Society.

**6.2.** However,

- (i) In cases where neither the claim nor any counterclaim exceeds the sum of AED300,000 (Arab Emirates Dirhams Three Hundred Thousand) the dispute shall be referred to the jurisdiction of the DIFC Small Claims Tribunal; and
- (ii) for disputes concerning non-payment of the fees and/or expenses due to the Society for services, the Society shall have the

right to submit any claim to the jurisdiction of the Courts of the place where the registered or operating office of the Interested Party or of the applicant who requested the Service is located.

In the case of actions taken against the Society by a third party before a public Court, the Society shall also have the right to summon the Interested Party or the subject who requested the Service before that Court, in order to be relieved and held harmless according to art. 3.5 above.

**Article 7**

**7.1.** All plans, specifications, documents and information provided by, issued by, or made known to the Society, in connection with the performance of its Services, will be treated as confidential and will not be made available to any other party other than the Owner without authorisation of the Interested Party, except as provided for or required by any applicable international, European or domestic legislation, Charter or other IACS resolutions, or order from a competent authority. Information about the status and validity of class and statutory certificates, including transfers, changes, suspensions, withdrawals of class, recommendations/conditions of class, operating conditions or restrictions issued against classed ships and other related information, as may be required, may be published on the website or released by other means, without the prior consent of the Interested Party.

Information about the status and validity of other certificates and statements may also be published on the website or released by other means, without the prior consent of the Interested Party.

**7.2.** Notwithstanding the general duty of confidentiality owed by the Society to its clients in clause 7.1 above, the Society's clients hereby accept that the Society may participate in the IACS Early Warning System which requires each Classification Society to provide other involved Classification Societies with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and used to facilitate the proper working of the IACS Early Warning System. The Society will provide its clients with written details of such information sent to the involved Classification Societies.

**7.3.** In the event of transfer of class, addition of a second class or withdrawal from a double/dual class, the Interested Party undertakes to provide or to permit the Society to provide the other Classification Society with all building plans and drawings, certificates, documents and information relevant to the classed unit, including its history file, as the other Classification Society may require for the purpose of classification in compliance with the applicable legislation and relative IACS Procedure. It is the Owner's duty to ensure that, whenever required, the consent of the builder is obtained with regard to the provision of plans and drawings to the new Society, either by way of appropriate stipulation in the building contract or by other agreement.

In the event that the ownership of the ship, product or system subject to certification is transferred to a new subject, the latter shall have the right to access all pertinent drawings, specifications, documents or information issued by the Society or which has come to the knowledge of the Society while carrying out its Services, even if related to a period prior to transfer of ownership.

**Article 8**

**8.1.** Should any part of these General Conditions be declared invalid, this will not affect the validity of the remaining provisions.

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## 1 - GENERAL

### 1.1

The application of these Rules aims at the assessment and improvement of passenger and crew comfort on board high speed craft classed by RINA.

### 1.2

The criteria considered for the assessment of personal comfort are based on the evaluation of airborne noise and structural vibration levels during normal navigation. These rules do not consider the effects of craft motions.

### 1.3

These rules are based on the most recent international standards and requirements relevant to the measurement and control of noise and vibration issued by ISO and IMO, in particular IMO Resolution A.468 (XII).

### 1.4

Compliance with these rules is verified by means of measurements to be carried out on board in the conditions and locations indicated.

### 1.5

Measurements are to be carried out by either a RINA surveyor or by a technician from a company of capability recognised by RINA. In the latter case, measurements are to be carried out under surveillance of a RINA surveyor.

### 1.6

These rules define the limits and criteria of acceptability of noise and vibration levels on-board. They indicate the international reference standards, the procedure and the instrumentation necessary to carry out measurements.

## 2 - FIELD OF APPLICATION AND SPECIAL NOTATION

### 2.1 - Field of application

#### 2.1.1

These rules apply to the ships classed as high speed craft in compliance with RINA's "Rules for the construction and classification of high speed craft" (cf. "Rules for the construction and classification of ships", Section A, 2.4.1 hereinafter named "Rules").

#### 2.1.2

These rules apply to closed spaces in the passenger and crew living and transfer areas. They do not apply to machinery spaces.

### 2.2 - Special notation

#### 2.2.1

Upon request, craft complying with these rules are assigned the special notation High speed craft Noise and Vibration Comfort **HNVC** (X, Y) as per Section A, Chapter 2, Table 2.6 of the "Rules". This notation is marked on the Class Certificate and in the Register Book.

In the notation acronym, X and Y are respectively the noise and vibration parameters of merit. They are calculated, according to that specified in Chapter 4, on the basis of the averaged results of measurements in relation to the bounds given in Tables 1 and 2 respectively for noise and vibrations.

#### 2.2.2

The special notation is assigned if both of the parameters of merit are greater than 30.

#### 2.2.3

To maintain the special notation, whenever the craft is subject to repairs, modifications or refitting which, at the discretion of RINA, may affect her comfort characteristics, compliance with these rules is to be confirmed.

#### 2.2.4

On the occasion of Special Surveys, the maintenance of comfort characteristics may be subject to verification at the discretion of RINA.

## 3 - DEFINITIONS

### 3.1 - High speed craft

A craft capable of a maximum speed, in m/s, equal to or exceeding:

$$3.7 \nabla^{0.1667}$$

where:

$\nabla$  = displacement corresponding to the design waterline (m<sup>3</sup>).

### 3.2 - Public spaces

Spaces allocated for passengers and crew including bars, newspaper kiosks, smoking areas, main seating areas, lounges, dining rooms, recreation rooms, lobbies, lavatories and similar permanently enclosed spaces allocated to passengers.

### 3.3 - Operating compartment

The enclosed area from which navigation and control of the craft is exercised.

### 3.4 - Noise

Audible sound wave level, generally of a random nature, in the 20 to 18000 Hz frequency range.

### 3.5 - Noise level (or A weighted sound pressure level)

The quantity measured by a sound level meter in which the response in frequency is considered according to the A-weighting curve (cf. publication IEC 651).

### 3.6 - Sound pressure level

Measure of noise level L, in dB units, given by:

$$L = 20 \log_{10} \frac{p}{p_0}$$

where:

p = effective value (rms) of the measured sound pressure, in Pa,

p<sub>0</sub> = 20x10<sup>-6</sup> Pa (reference level).

### 3.7 - Vibration

Time variation of the value of a physical quantity described by either the motion or the position of a mechanical system when this value is alternatively larger or smaller than a mean reference value.

As far as these rules are concerned, the physical quantity for reference is the structural velocity, measured in mm/s, in the frequency range from 1 to 100 Hz.

### 3.8 - Maximum operational weight

The overall weight up to which operation in the intended mode is permitted by the Administration.

### 3.9 - Operational speed

90% of the speed achieved at maximum continuous propulsion power for which the craft is certified, at the maximum operational weight and in still water.

## 4 - CRITERIA

### 4.1 - Transit conditions

#### 4.1.1

Measurements shall be carried out with the craft at the maximum operational weight. Different conditions can be considered if accepted as equivalent for the purposes of these rules at the discretion of RINA.

#### 4.1.2

Measurements shall be carried out at the maximum operational speed of the craft with propulsion plants working at normal service speed.

#### 4.1.3

During measurements, all auxiliary systems, navigational equipment, radio system, radar etc. shall be operating in normal service conditions.

#### 4.1.4

Forced ventilation and air conditioning systems (HVAC plants) shall be operating in normal service conditions.

#### 4.1.5

Whenever possible, doors and windows shall be closed.

#### 4.1.6

Rooms and spaces shall be completely furnished and fitted.

#### 4.1.7

During noise measurements, only the personnel needed for the normal operation of the craft and those carrying out the measurements shall be present.

### 4.2 - Environmental conditions

#### 4.2.1

Water depth shall be sufficiently great that the measurements are not affected by reflections from the sea bed.

#### 4.2.2

In general, meteorological conditions shall be within the following limits:

- wind: not stronger than Beaufort 3 - strong breeze (speed 7 to 10 knots),
- waves: not stronger than force 3 - rough (significant wave height 0.5 to 1.25 m).

### 4.3 - Noise

#### 4.3.1 - Measurement positions

Measurements shall be carried out in all closed living or transit, passenger or crew spaces with the exception of machinery spaces. Measuring positions shall be uniformly distributed in these spaces. Measurements shall be carried out in at least 20% of seats in public spaces and in all seats in the operating compartment. At



the discretion of RINA, additional measurements shall be carried out in particular locations within the measurement area.

**4.3.2 - Limits**

Noise level shall be measured in dB units with A weighting filter, [dB(A)]. For each space typology, limits for the calculation of the noise merit parameter are given in Table 1.

**4.3.3 - Acceptance criteria**

In general, in each measurement point the noise level shall not exceed the upper limit,  $L_{max}$ , given in Table 1. At the discretion of RINA, higher values can be accepted provided they are localised and limited to no more than 5% of the total number of measuring positions.

**4.3.4 - Noise merit parameter**

For the purposes of these rules, the noise merit parameter, X defined in 2.2.1, is calculated by the following procedure:

- (1) for each measurement point, the noise merit coefficient,  $C_{mr}$ , is calculated by linear interpolation as follows:

$$C_{mr} = 0 \quad L_{mis} > L_{max}$$

$$C_{mr} = 1 - \frac{L_{mis} - L_{min}}{L_{max} - L_{min}} \quad L_{min} \leq L_{mis} \leq L_{max}$$

$$C_{mr} = 1 \quad L_{mis} < L_{min}$$

where:

$L_{mis}$  = measured noise level

$L_{min}$  = lower limit for noise level (Table 1)

$L_{max}$  = upper limit for noise level (Table 1)

- (2) the noise merit parameter, X, is the average value of the merit coefficients,  $C_{mr}$ , times 100.

TABLE 1

Spaces	$L_{min}$ [dB(A)]		$L_{max}$ [dB(A)]	
	≤60m	>60m	≤60m	>60m
Operating compartment	60	55	65	65
Public spaces (areas with seats)	65	60	75	70
Public spaces (other areas)	65	65	75	75

**4.4 - Vibrations**

**4.4.1 - Measurement positions**

Measurements shall be carried out in all closed living or transit, passenger or crew spaces with the exception of machinery spaces. Measuring positions shall be uniformly distributed in these spaces. Measurements shall be carried out in at least 10% of seats in public spaces and in all seats in the operating compartment. At the discretion of RINA, additional measurements shall be carried out in particular locations within the measurement area.

**4.4.2 - Limits**

The vibration level is equal to the peak structural velocity, measured in mm/s, recorded in the frequency range from 0 to 100 Hz, as per ISO 6954. For each space typology, limits for the calculation of the vibration merit parameter are given in Table 2.

TABLE 2

Spaces	$V_{min}$ [mm/s]	$V_{max}$ [mm/s]
Operating compartment	2.0	5.0
Public spaces (areas with seats)	2.0	5.0
Public spaces (other areas)	3.0	6.0

#### 4.4.3 - Acceptance criteria

In general, at each measurement point the vibration level shall not exceed the upper limit,  $V_{max}$ , given in Table 2. At the discretion of RINA, higher values can be accepted provided they are localised and limited to no more than 5% of the total number of measuring positions.

#### 4.4.4 - Vibration merit parameter

For the purposes of these rules, the noise merit parameter,  $Y$  defined in 2.2.1, is calculated by the following procedure:

- (1) for each measurement point, the vibration merit coefficient,  $C_{mv}$ , is calculated by linear interpolation as follows:

$$C_{mv} = 0 \quad V_{mis} > V_{max}$$

$$C_{mv} = 1 - \frac{V_{mis} - V_{min}}{V_{max} - V_{min}} \quad V_{min} \leq V_{mis} \leq V_{max}$$

$$C_{mv} = 1 \quad V_{mis} < V_{min}$$

where:

$V_{mis}$  = measured vibration level

$V_{min}$  = lower limit for vibration level (Table 2)

$V_{max}$  = upper limit for vibration level (Table 2)

- (2) the vibration merit parameter,  $Y$ , is the average value of the merit coefficients,  $C_{mv}$ , times 100.

## 5 - MEASUREMENT PROCEDURE

### 5.1 - Noise

#### 5.1.1 - Initial conditions

The following data and conditions shall be recorded and included in the report:

- craft loading condition;
- propulsion machinery, main auxiliaries, navigational aids, radio and radar sets;
- status of doors and windows (closed or open);
- water depth;
- environmental conditions (wind and waves);
- noise sources due to external factors such as presence of additional personnel, ongoing repairs or fitting work, etc.

#### 5.1.2 - Instrumentation

Noise level measurements shall be carried out by means of precision grade sound level meters. These sound level meters shall comply with either IEC 651 type 1 requirements or a standard accepted as equivalent by RINA.

A suitable acoustic calibrator, approved by the producer of the sound level meter shall be used.

When an octave band filter is used, jointly or separately from a sound level meter, it shall comply with either IEC 225 or a standard accepted as equivalent by RINA.

Microphones shall be of the random incidence type and shall comply with either IEC 179 class 1 or a standard accepted as equivalent by RINA.

Both the instrumentation for noise level measurement and the acoustic calibrator shall be properly calibrated according to a recognised standard.

#### 5.1.3 - Measurements

Noise level shall be measured in dB using the A weighting filter [dB(A)].

The sound level meter shall be set for slow response and calibrated with an acoustic calibrator before and after the measurements are taken.

Measurements shall be carried out keeping the microphone at approximately 1.5 m from the floor and at least 1.0 m from the walls or dividing bulkheads.

In the passenger seating zone located in public areas, measurements shall be in such a number as to uniformly cover all the seats (at least 2 measuring positions every 10 seats).

The distance between two measuring positions shall be within 3.0 and 6.0 m in general.

#### 5.1.4 - Reporting of results

Results shall be reported according to the format shown in Appendix 1.

A summary table showing the recorded noise levels and the corresponding noise merit coefficient  $C_{mr}$ , shall be enclosed with the report.

### 5.2 - Vibrations

#### 5.2.1 - Initial conditions

The following data and conditions shall be recorded and included in the report:

- craft loading condition;
- propulsion machinery, main auxiliaries, navigational aids, radio and radar sets;
- status of doors and windows (closed or open);
- water depth;
- environmental conditions (wind and waves);
- vibrations sources due to external factors such as ongoing repairs or fitting work.

#### 5.2.2 - Instrumentation

Vibration levels shall be recorded by means of a portable analyser (vibrometer).

Accelerometers shall be able to properly operate in the frequency range of investigations, namely 0 to 100 Hz., in accordance with ISO 6954.

A suitable calibrator, recommended by the producer of the vibrometer, shall be used.

Both the instruments for vibration recording and the calibrator shall be calibrated according to a recognised standard.

### 5.2.3 - Measurements

Vibration level measurements shall be carried out by recording the spectral peak of structural velocity, in mm/s, in the frequency range from 0 to 100 Hz, by means of a portable analyser connected to an accelerometer.

The accelerometer shall be in contact with the floor of the room and shall be in a vertical position. Contact with the floor is in general realised by means of a magnet to which the accelerometer is fixed. In the presence of carpets or other material which could damp vibrations, the accelerometer shall be fixed to a metallic plate placed above the measuring point.

In the passenger seating zone located in public areas, measurements shall be in such a number as to uniformly cover all the seats (at least 1 measuring point every 10 seats).

The distance between two measuring positions shall be within 3.0 and 6.0 m in general.

### 5.2.4 - Reporting of results

Results shall be reported according to the format shown in Appendix 1.

For each vibration measuring point, the spectrum of the structural velocity in the frequency range of investigation, as produced by the portable analyser, shall be included with the report together with an indication of the frequency and value of main peaks.

A summary table showing the recorded frequency and maximum spectral value (vibration level) at each measuring point and the corresponding vibration merit coefficient  $C_{mv}$ , shall be enclosed with the report.



**Appendix 1**

**CHARACTERISTICS OF THE CRAFT**

Name of the craft	
Register number - RI	
Flag	
Port of registry	
Name of the shipowner	
Name of the shipyard	
Place of build	
Construction number	
Gross tonnage	
Type of vessel	
Dimensions	
Length - Lpp	m
Breadth - B	m
Depth - D	m
Max. draught - T	m
Displacement at draught T	t
Date keel laid	
Date of delivery	

**CHARACTERISTICS OF THE MACHINERY**

Propulsion machinery	
Manufacturer	
Type	
Number of units	
Max. continuous power	kW
Shaft speed	rev./min
Normal operating power	
Auxiliary machinery	
Manufacturer	
Type	
Number of units	
Max. continuous power	kW
Shaft speed	rev./min
Principal reduction gear	
Manufacturer	
Type	
Reduction ratio	
Type of propeller	
Number of propellers	
Number of blades	
Shaft speed at the	rev./min
max. continuous power	

**MEASURING INSTRUMENTATION - SOUND**

Instrumentation / Manufacturer
Sound level meter
Microphone
Filter
Calibrator
Calibration of the sound level meter
Date in laboratory
Date prior to measuring

**Appendix 1**

**MEASURING INSTRUMENTATION - VIBRATION**

Instrumentation / Manufacturer	
Analyser	
Accelerometer	
Calibrator	
Calibration of the accelerometer	
Date in laboratory	
Date prior to measuring	
Calibration of the vibrometer	
Date in laboratory	
Date prior to measuring	

**CONDITIONS DURING MEASUREMENT**

Date	
Starting time	
Finishing time	
Position of the craft	
Type of voyage	
Conditions during measurements	
Draught forward	m
Draught aft	m
Depth of water under keel	m
Weather conditions	
Wind force / speed	Bf / m/s
Sea state / average wave height	SS / m
Speed of the craft	knots
Propeller shaft speed	rev./min
Propeller pitch	
Propulsion machinery speed	rev./min
Propulsion machinery power	kW
No. of propulsion machinery units operating	
No. of D/A engines operating	
No. of auxiliary machinery	

**MEASURING RESULTS - SOUND**

Enclose an outline of the general schemes in which the measurement positions of the sound level are indicated, marked by a number.

Position No.	Type of space C = Operating compartment L1 = Public space with seats L2 = Public space other areas	Level of noise measured [dB(A)]	Merit coefficient for sound (Cmr)
1			
2			
...			

**Appendix 1**

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**MEASURING RESULTS - VIBRATION**

Enclose an outline of the general schemes in which the measurement points of the vibration level are indicated, marked by a number.

Position No.	Type of space C = Operating compartment L1 = Public space with seats L2 = Public space other areas	Level of vibration measured (maximum velocity peak in the range 0 - 100 Hz) [mm/s]	Merit coefficient for vibration (Cmv)
1			
2			
...			

In addition, enclose for every measurement point the spectrum of the structural speed in the range of frequencies established, as determined by the portable analyser, with the indication of the value and frequency of the most important peaks.

