Comfort and Health on-board Offshore Units

December 2016

Rule Note
NR 636 DT R00 E

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BUREAU VERITAS

MARINE & OFFSHORE DIVISION

GENERAL CONDITIONS

ARTICLE 1

1.1. - BUREAU VERITAS is a Society the purpose of whose Marine & Offshore Division (the "Society") is the classification (" Classification ") of any ship or vessel or offshore unit or structure of any type or part of it or system therein collectively hereinafter referred to as a "Unit" whether linked to shore, river bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

The Society:

- "prepares and publishes Rules for classification, Guidance Notes and other documents (" Rules ");
- "issues Certificates, Attestations and Reports following its interventions (" Certificates ");
- "publishes Registers.

1.2. - The Society also participates in the application of National and International Regulations or Standards, in particular by delegation from different Governments. Those activities are hereafter collectively referred to as " Certification ".

1.3. - The Society can also provide services related to Classification and Certification such as ship and company safety management certification; ship and port security certification, training activities; all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.

1.4. - The interventions mentioned in 1.1., 1.2. and 1.3. are referred to as " Services ". The party and/or its representative requesting the services is hereinafter referred to as the " Client ". **The Services are prepared and carried out on the assumption that the Clients are aware of the International Maritime and/or Offshore Industry (the "Industry") practices.**

1.5. - The Society is neither and may not be considered as an Underwriter, Broker in ship's sale or chartering, Expert in Unit's valuation, Consulting Engineer, Controller, Naval Architect, Manufacturer, Shipbuilder, Repair yard, Charterer or Shipowner who are not relieved of any of their expressed or implied obligations by the interventions of the Society.

ARTICLE 2

2.1. - Classification is the appraisement given by the Society for its Client, at a certain date, following surveys by its Surveyors along the lines specified in Articles 3 and 4 hereafter on the level of compliance of a Unit to its Rules or part of them. This appraisement is represented by a class entered on the Certificates and periodically transcribed in the Society's Register.

2.2. - Certification is carried out by the Society along the same lines as set out in Articles 3 and 4 hereafter and with reference to the applicable National and International Regulations or Standards.

2.3. - **It is incumbent upon the Client to maintain the condition of the Unit after surveys, to present the Unit for surveys and to inform the Society without delay of circumstances which may affect the given appraisement or cause to modify its scope.**

2.4. - The Client is to give to the Society all access and information necessary for the safe and efficient performance of the requested Services. The Client is the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out.

ARTICLE 3

3.1. - **The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical knowledge of the Industry. They are a collection of minimum requirements but not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and carefully followed at all times by the Client.**

Committees consisting of personalities from the Industry contribute to the development of those documents.

3.2. - **The Society only is qualified to apply its Rules and to interpret them. Any reference to them has no effect unless it involves the Society's intervention.**

3.3. - The Services of the Society are carried out by professional Surveyors according to the applicable Rules and to the Code of Ethics of the Society. Surveyors have authority to decide locally on matters related to classification and certification of the Units, unless the Rules provide otherwise.

3.4. - **The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not in any circumstances involve monitoring or exhaustive verification.**

ARTICLE 4

4.1. - The Society, acting by reference to its Rules:

- "reviews the construction arrangements of the Units as shown on the documents presented by the Client;
- "conducts surveys at the place of their construction;
- "classes Units and enters their class in its Register;
- "surveys periodically the Units in service to note that the requirements for the maintenance of class are met.

The Client is to inform the Society without delay of circumstances which may cause the date or the extent of the surveys to be changed.

ARTICLE 5

5.1. - **The Society acts as a provider of services. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty.**

5.2. - **The certificates issued by the Society pursuant to 5.1. here above are a statement on the level of compliance of the Unit to its Rules or to the documents of reference for the Services provided for.**

In particular, the Society does not engage in any work relating to the design, building, production or repair checks, neither in the operation of the Units or in their trade, neither in any advisory services, and cannot be held liable on those accounts. Its certificates cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.

5.3. - **The Society does not declare the acceptance or commissioning of a Unit, nor of its construction in conformity with its design, that being the exclusive responsibility of its owner or builder.**

5.4. - The Services of the Society cannot create any obligation bearing on the Society or constitute any warranty of proper operation, beyond any representation set forth in the Rules, of any Unit, equipment or machinery, computer software of any sort or other comparable concepts that has been subject to any survey by the Society.

ARTICLE 6

6.1. - The Society accepts no responsibility for the use of information related to its Services which was not provided for the purpose by the Society or with its assistance.

6.2. - **If the Services of the Society or their omission cause to the Client a damage which is proved to be the direct and reasonably foreseeable consequence of an error or omission of the Society, its liability towards the Client is limited to ten times the amount of fee paid for the Service having caused the damage, provided however that this limit shall be subject to a minimum of eight thousand (8,000) Euro, and to a maximum which is the greater of eight hundred thousand (800,000) Euro and one and a half times the above mentioned fee. These limits apply regardless of fault including breach of contract, breach of warranty, tort, strict liability, breach of statute, etc.**

The Society bears no liability for indirect or consequential loss whether arising naturally or not as a consequence of the Services or their omission such as loss of revenue, loss of profit, loss of production, loss relative to other contracts and indemnities for termination of other agreements.

6.3. - All claims are to be presented to the Society in writing within three months of the date when the Services were supplied or (if later) the date when the events which are relied on of were first known to the Client, and any claim which is not so presented shall be deemed waived and absolutely barred. Time is to be interrupted thereafter with the same periodicity.

ARTICLE 7

7.1. - Requests for Services are to be in writing.

7.2. - **Either the Client or the Society can terminate as of right the requested Services after giving the other party thirty days' written notice, for convenience, and without prejudice to the provisions in Article 8 hereunder.**

7.3. - The class granted to the concerned Units and the previously issued certificates remain valid until the date of effect of the notice issued according to 7.2. here above subject to compliance with 2.3. here above and Article 8 hereunder.

7.4. - The contract for classification and/or certification of a Unit cannot be transferred neither assigned.

ARTICLE 8

8.1. - The Services of the Society, whether completed or not, involve, for the part carried out, the payment of fee upon receipt of the invoice and the reimbursement of the expenses incurred.

8.2. - **Overdue amounts are increased as of right by interest in accordance with the applicable legislation.**

8.3. - **The class of a Unit may be suspended in the event of non-payment of fee after a first unfruitful notification to pay.**

ARTICLE 9

9.1. - The documents and data provided to or prepared by the Society for its Services, and the information available to the Society, are treated as confidential. However:

- "Clients have access to the data they have provided to the Society and, during the period of classification of the Unit for them, to the **classification file** consisting of survey reports and certificates which have been prepared at any time by the Society for the classification of the Unit ;
- "copy of the documents made available for the classification of the Unit and of available survey reports can be handed over to another Classification Society, where appropriate, in case of the Unit's transfer of class;
- "the data relative to the evolution of the Register, to the class suspension and to the survey status of the Units, as well as general technical information related to hull and equipment damages, may be passed on to IACS (International Association of Classification Societies) according to the association working rules;
- "the certificates, documents and information relative to the Units classed with the Society may be reviewed during certificating bodies audits and are disclosed upon order of the concerned governmental or inter-governmental authorities or of a Court having jurisdiction.

The documents and data are subject to a file management plan.

ARTICLE 10

10.1. - Any delay or shortcoming in the performance of its Services by the Society arising from an event not reasonably foreseeable by or beyond the control of the Society shall be deemed not to be a breach of contract.

ARTICLE 11

11.1. - In case of diverging opinions during surveys between the Client and the Society's surveyor, the Society may designate another of its surveyors at the request of the Client.

11.2. - Disagreements of a technical nature between the Client and the Society can be submitted by the Society to the advice of its Marine Advisory Committee.

ARTICLE 12

12.1. - Disputes over the Services carried out by delegation of Governments are assessed within the framework of the applicable agreements with the States, international Conventions and national rules.

12.2. - Disputes arising out of the payment of the Society's invoices by the Client are submitted to the Court of Nanterre, France, or to another Court as deemed fit by the Society.

12.3. - **Other disputes over the present General Conditions or over the Services of the Society are exclusively submitted to arbitration, by three arbitrators, in London according to the Arbitration Act 1996 or any statutory modification or re-enactment thereof. The contract between the Society and the Client shall be governed by English law.**

ARTICLE 13

13.1. - **These General Conditions constitute the sole contractual obligations binding together the Society and the Client, to the exclusion of all other representation, statements, terms, conditions whether express or implied. They may be varied in writing by mutual agreement. They are not varied by any purchase order or other document of the Client serving similar purpose.**

13.2. - The invalidity of one or more stipulations of the present General Conditions does not affect the validity of the remaining provisions.

13.3. - The definitions herein take precedence over any definitions serving the same purpose which may appear in other documents issued by the Society.

BV Mod. Ad. ME 545 L - 7 January 2013

RULE NOTE NR 636

NR 636
Comfort and Health on-board Offshore Units

December 2016

Section 1 General Requirements

Section 2 Additional Requirements for Notation COMF HEALTH-NOISE

Section 3 Additional Requirements for Notation COMF HEALTH-VIB

SECTION 1 GENERAL REQUIREMENTS

1 General

1.1 Application

1.1.1 This Rule Note provides procedural and technical requirements for the assignment of the following additional class notations:

- **COMF HEALTH-NOISE- g** with regard to noise criteria
- **COMF HEALTH-VIB- g** with regard to vibration criteria

with g = **1** or **2** (**1** corresponding to the best level)

Each class notations may be assigned separately.

The requirements corresponding to those additional class notations are given in Sec 2 and Sec 3 respectively.

1.1.2 The additional class notations **COMF HEALTH-NOISE** and **COMF HEALTH-VIB** may be assigned to all offshore units in accordance with Part A of NR445 Rules for the Classification of Offshore Units.

1.2 Basic principles

1.2.1 This Rule Note deals with the habitability of offshore units with regard to for noise and vibrations.

The assessment is based on two different requirements:

- comfort requirements applicable for accommodation, service, navigation and control spaces
- health requirements so as to protect workers from risk arising from physical agent (noise and vibration levels are given for working spaces).

1.2.2 The assigned grade is made on the basis of measurements performed by, or under supervision of an acoustic and vibration specialist from the Society during building stage, sea trials or in service. However, measurements may be performed by another acoustic and vibration specialist from external company provided that this specialist has duly obtained the relevant delegation from the Society.

1.3 Regulations - Standards

1.3.1 This Rule Note take into account various international standards and are deemed to preserve their general principles.

1.3.2 This Rule Note refer to the following standards applicable to noise:

- ISO 31/VII, "Quantities and units of acoustics"
- IEC Publication 61672, "Electroacoustics-Sound level meters"
- IEC Publication 61260, "Octave, half-octave and third octave band filters"
- IEC Publication 60942, "Electroacoustics - Sound calibrators"
- IMO Resolution MSC.337(91), "Adoption of the Code on noise level on-board ships)"
- ISO 717, "Acoustics - Rating of sound insulation in buildings and of building elements", namely:
  - Part 1, "Airborne sound insulation in buildings and interior elements"
- ISO 9612, "Acoustics – Guidelines for measurement and assessment of exposure to noise in a working environment"
- ISO 1996, "Acoustics - Description, measurement and assessment of environmental noise", namely:
  - Part 1, "Basic quantities and assessment procedure"
  - Part 2, "Determination of environmental noise levels"
- ISO 1999, "Acoustics - Determination of occupational noise exposure and estimation of noise-induced hearing impairment"
- ISO 3382, "Acoustics - Measurement of the reverberation time of rooms with reference to other acoustical parameters", namely:
  - Part 1, "Performance spaces"
  - Part 2, "Reverberation time in ordinary rooms"
- ISO 4869, "Acoustics - Hearing protectors", namely:
  - Part 2, "Estimation of effective A-weighted sound pressure levels when hearing protectors are worn".
- ISO 16283-1, "Acoustics - Field measurement of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation"

1.3.3 This Rule Note refer to the following standards applicable to vibration:

- ISO 2041, "Vibration and shock - Vocabulary"
- ISO 6954, "Mechanical vibration and shock - Guidelines for the overall evaluation of vibration in merchant ships"
- ISO 2631-1 "Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration – Part 1 General Requirements"
- ISO 8041, "Human response to vibration – Measuring instrumentation".

1.4 Documentation to be submitted

1.4.1 Documents to be submitted are listed in Tab 1.

Table 1 : Documents to be submitted

No	A/I	Document
1	I	List of working areas, where individual hearing protectors are required
2	I	Hearing protectors technical data sheets including attenuation data
3	I	General arrangements
4	A	Measurement program: • loading conditions • equipment / machinery operating conditions • weather conditions
Note 1: A = to be submitted for approval I = to be submitted for information.		

2 Conditions of attribution

2.1 Measurements

2.1.1 Measurements to be taken during the survey are to be performed under the conditions specified in [3].

2.1.2 Measurement and calibration equipment are to meet the requirements of ISO 2923, IEC 61672-1, IEC 61260 and IEC 60942 for noise, and ISO 2631, ISO 6954 and ISO 8041 for vibration.

Sound insulation measurements are to be carried out according to ISO 16283-1.

The reverberation time measurements are to be carried out according to ISO 3382.

Noise and vibration calibrators are to be verified at least every year. Measuring equipment are to be verified at least every two years. This verification shall be done by a national standard laboratory or a competent laboratory accredited according to ISO 17025 (2005) as corrected by (Cor 1:2006).

2.2 Determination of habitability rating number

2.2.1 The notation is completed by a grade "g" equal to **1** or **2** which represents the merit level achieved for the assignment of the notation, the grade **1** corresponding to the best level.

2.2.2 When it is not possible for the Society to follow or to do all the required measurements, spot-check is to be performed by the Society. This spot-check consists of a cross-comparison between:

- a sample of at least 10% of the measurements provided by the shipyard/external specialist (see Note 1),
- and the corresponding readings obtained during the spot-check measurements.

This procedure enables the validation of the entire set of measurements provided by the shipyard/external specialist.

Note 1: The maximum deviations allowed during the cross-comparison are 2 dB(A) for noise measurements and 0,05 m/s² for vibration measurements for both single amplitude peak acceleration and overall frequency weighted RMS readings.

2.2.3 Levels are measured in several locations of each space of the offshore unit and are to be lower or equal to the requirements given in Sec 2 and Sec 3.

a) for accommodations, service, navigation and control spaces:
   - a tolerance on noise levels may be accepted but shall not exceed the following maximum values:
     - 3 dB(A) for 18% of all measured cabins and 5 dB(A) for 2% of all measured cabins (with a minimum of 1 cabin)
     - 3 dB(A) for 25% of other measuring points and 5 dB(A) for 5% of other measuring points
     - 1 dB for 20% of apparent weighted sound reduction indexes R'w and 2 dB for 10% of apparent weighted sound reduction indexes (with a minimum of 1 partition or floor)
     - 0,05 s for 20% of measured reverberation times (with a minimum of 1 space)
   - a tolerance on vibration levels may be accepted but shall not exceed the following maximum value:
     - 0,05 m/s² for 20% of all measuring points

b) for working spaces:
   - No tolerance admitted.

2.3 Measuring locations

2.3.1 The list of measuring points is to be prepared prior to the tests by the Society or the external company (see [1.2.2]. This list may be adjusted during the tests and covers:

- noise level
- vibration level
- insulation measurements
- reverberation time measurements

2.3.2 Measurements are to be taken in all locations corresponding to "accommodation spaces", "service spaces", "navigation spaces", "control spaces" and "working spaces" according to the measurement program.

The measurement locations are to be chosen to assure a good representation of the overall noise and vibration environment on board the offshore unit.

Note 1: The number of measuring points should not exceed 250.

2.3.3 Measurement in accommodation, service, navigation and control spaces

In cabins, the measurements are to be carried out at the centre of the room. For large public rooms, such as lounges, restaurants, etc., measurements are to be carried out in different locations, each measuring points covering less than 30 m².

2.3.4 Measurement in working spaces

In order to assess the exposure of personnel to noise and whole-body vibration at working environment, measurements are to be carried out in all working spaces.

Special attention should be paid to working spaces located close to identified sources of noise and vibration.

3 Testing conditions

3.1 General

3.1.1 This Article gives the conditions to be fulfilled during measurements. Additional details of these conditions may be taken from International Standards, namely:

- IMO Resolution MSC.337(91) and ISO 2923 for noise
- ISO 2631-1 and ISO 6954 for vibrations.

3.1.2 Prior to the tests, possible divergence on the required conditions may be accepted by the Society. If any, it is to be clearly mentioned in the report.

3.1.3 During the tests, some additional measurements may be decided upon request of the Society.

3.1.4 During measurements, especially for noise, rooms are to be preferably fully completed (outfitting, furniture, covering,...). Measurements performed in an unfinished state can be accepted if compliant.

3.2 Harbour test conditions

3.2.1 Part of noise measurement tests is to be conducted at quay (determination of insulation indexes between rooms, reverberation time measurements). For these specific tests, measurements should preferably be performed without machinery, ventilation or air conditioning running.

3.3 Offshore trial conditions

3.3.1 Noise and vibration measurements are to be carried out in normal operation condition of the offshore unit. Measurements are to be conducted with concurrent operation of any equipment needed for the production, and the normal power production required for accommodation and working areas. The list of machines and equipment to be run during the tests is, at least, to include the following (if present):

- propulsion engines for mobile units in normal running conditions
- HVAC
- wash water pump
- SRU pump
- water injection pump
- HHP compressor
- HP compressor
- LLP compressor
- offloading pump
- turbine/diesel generator
- LP-MP compressor
- SWLP
- laundry with the entire equipment running.

3.3.2 Any other frequently used equipment (more than 1/3 of the time at sea) is to be run at its normal operating condition (if practicable).

3.3.3 Heating, ventilation and air conditioning units are to be running in normal condition, corresponding to the rated airflow.

3.3.4 Tests have to be conducted in sea and weather condition 3 or less. Measurements carried out with worst weather conditions may be accepted at the sight of the results.

SECTION 2 ADDITIONAL REQUIREMENTS FOR NOTATION COMF HEALTH-NOISE

1 General

1.1 Application

1.1.1 The requirements of this Section are applicable when the additional class notation **COMF HEALTH-NOISE** is assigned. They are additional to the applicable requirements of Sec 1.

2 Measurement procedure

2.1 Instrumentation

2.1.1 The instrumentation is to be calibrated in situ, before and after the tests, and is to include one third octave band filter (see Sec 1, [2.1.2]). The instrument is to be able to give L_{Aeq} measurements and peak hold measurements.

2.2 Data processing - Analysis

2.2.1 Measurements in accommodation, service, navigation and control spaces

a) To evaluate the nominal noise level inside accommodation, service, navigation and control spaces, $L_{Aeq,T}$ value is used.

$L_{Aeq,T}$ (dB(A) re. 20 µPa) is the equivalent continuous A weighted sound pressure level, where T is greater than 20 seconds.

Results are to be given on a table in global values (dB(A)) calculated in third octave bands from 20 Hz to 20 kHz.

Upon request of the Society or its representative, they may have to be presented in a table giving the third octave band analysis.

b) To evaluate the required privacy inside accommodations, the apparent weighted sound reduction index R'w is to be calculated.

R'w (dB) is a field measure of airborne sound insulation between rooms. This index is to be determined in accordance with ISO 717-1 and ISO 16283-1.

c) To evaluate the speech-blurring effect of reverberation in large spaces such as mess rooms and recreation rooms, the reverberation time RT60 is to be calculated. RT60 (seconds) represents the amount of time required for sound to decrease by 60 dB.

For each room tested, the RT60 is to be evaluated from T20 which represents the arithmetic mean of all measurements for the octave bands 500 Hz, 1000 Hz and 2000 Hz.

$$T_{20} = \frac{\left[\sum_{1}^{n} T_{20}(500Hz) + \sum_{1}^{n} T_{20}(1000Hz) + \sum_{1}^{n} T_{20}(2000Hz)\right]}{3n}$$

where:

T20 : The reverberation time, in seconds, based on a 20 dB evaluation range

n : Number of measuring positions (see [2.4.4]).

2.2.2 Measurements in working spaces

To evaluate the maximal noise exposure of workers during a normal working day, $L_{Aeq,T}$ and L_{Cpeak} values are used.

$L_{Aeq,T}$ (dB(A) re. 20 µPa) is the equivalent continuous A weighted sound pressure level, where T is greater than 60 seconds.

Results are to be given on a table in global values (dB (A)) calculated in third octave bands from 20 Hz to 20 kHz.

L_{Cpeak} (dB(C) re. 20 µPa) is the instantaneous C weighted peak hold noise level.

2.3 Measuring condition

2.3.1 Tests are to be conducted in the conditions described in Sec 1, [3]. Air conditioning is to be in normal operation. Doors and windows are to be closed, unless they are kept open in normal use.

2.4 Measuring positions

2.4.1 Measurements are to be taken at a height between 1,2 m and 1,6 m from the deck and at a distance above 1,0 m from any boundary surface of the room. In cabins and offices, one measurement will be performed in the middle of the space.

The measurement is to be taken at 2,0 m at least from the existing noise sources (e.g. inlet/outlet of air conditioning openings).

The selection of noise level measuring locations is indicated in Sec 1, [2.3].

2.4.2 The maximum noise exposure level is evaluated at each working space identified and submitted (see Sec 1, [1.4].

2.4.3 The selection of insulation measuring locations is to be representative of the different types of insulation provided in Tab 3 (a minimum of two measurements of each insulation type is required).

2.4.4 For each space, reverberation time measurements points are to be selected such as to be representative of the acoustic environment, each measuring point covering less than 30 m^2.

3 Requirements

3.1 Noise measurements in accommodations, service, navigation and control spaces

3.1.1 Noise levels in accommodations, service, navigation and control spaces corresponding to the noise grade "g" are provided in Tab 1 and Tab 2.

Tab 1 gives requirements for accommodation platforms.

Tab 2 gives requirement for living quarter included on production platforms.

For mobile offshore installations, the noise requirements during transit is 5 dB(A) higher than the one given in Tab 1 and Tab 2.

3.1.2 Noise emergence

When the noise level contains audible annoying tonal components, an objective assessment should be carried out as described in ISO 1996-2:2007 Annex D.

A prominent tone in one-third-octave band is established when its level exceeds the time-average sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The constant level difference varies with the frequency as follows:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz)
- 8 dB in middle-frequency bands (160 Hz to 400 Hz)
- 5 dB in high-frequency bands (500 Hz to 10 000 Hz).

In case that emergence is verified at one measuring point, a constant value of 5 dB(A) is to be added to the $L_{Aeq,T}$ measured at that point before to be compared to the requirements provided in Tab 1 and Tab 2.

3.1.3 Sound insulation measurement

Between two adjacent accommodation spaces, acoustic insulation is to be higher than the requirements given in Tab 3. Measurements are to be performed in situ.

Table 1 : Noise level requirements for accommodation units

Space	$L_{Aeq,T}$ (dB(A))	
	grade g = 1	grade g = 2
• Cabins	43	46
• Hospital - Medical facilities	43	46
• Mess rooms – Recreation spaces	52	55
• Gymnasiums	52	57
• Quiet recreation room	50	55
• Passageways in the accommodations	55	60
• Open recreation areas	65	70
• Galleys	70	75
• Laundries	70	75
• Control room	50	55
• Electrical/telecom control room (with office desk)	55	60
• Office	48	53

Table 2 : Noise level requirements for living quarter on production units

Space	$L_{Aeq,T}$ (dB(A))	
	grade g = 1	grade g = 2
• Cabins	45	50
• Hospital - Medical facilities	45	50
• Mess rooms – Recreation spaces	55	60
• Gymnasiums	55	62
• Quiet recreation room	50	55
• Passageways in the accommodations	60	65
• Open recreation areas	70	75
• Galleys	70	75
• Laundries	70	75
• Wheelhouse, bridge	55	60
• Control room	50	55
• Electrical/telecom control room (with office desk)	55	60
• Office	50	55
• Laboratory	60	65

Table 3 : Apparent weighted sound reduction indexes R'w

Space	R'w (dB) grade g = 1 & 2
Cabin to cabin	40
Cabin to cabin with communicating door	35
Corridor to cabin	35
Cabin to recreation spaces/ Mess room/gymnasium	55
Staircase to cabin	40

3.1.4 Reverberation time

The maximum reverberation time is to be lower than the requirements given in Tab 4 for the recreation rooms and mess rooms.

3.2 Noise measurements in working spaces

3.2.1 Noise levels in working areas corresponding to the noise grade "g" are provided in Tab 5.

Table 4 : Reverberation time RT60

Space	RT60 (sec) grade g =1 & 2
Recreation rooms	0,5
Mess rooms	0,6

Table 5 : Noise level exposure requirements

Space	$L_{Aeq,T}$ (dB(A))		L_{Cpeak} (dB(C))	
	grade g=1	grade g=2	grade g=1	grade g=2
Working spaces	83 **(1) (2)**	85 **(1) (2)**	137	140

(1) Determination of the worker's maximum exposure is to take into account the attenuation provided by individual hearing protectors worn by the worker. Hearing protectors' attenuation should be calculated in accordance to the HML-method described in ISO 4869-2:1994.

(2) Hearing protectors' characteristics provided by the owner should be used for the determination of the effective maximum exposure.

SECTION 3 ADDITIONAL REQUIREMENTS FOR NOTATION COMF HEALTH-VIB

1 General

1.1 Application

1.1.1 The requirements of this Section are applicable when the additional class notation **COMF HEALTH-VIB** is assigned. They are additional to the applicable requirements of Sec 1.

2 Measurement procedure

2.1 Instrumentation

2.1.1 The instrumentation has to include at least a transducer (accelerometer or velocity transducer) with an appropriate amplifier, and a FFT analyser.

The instrumentation has to be calibrated in situ, before and after the tests. Should the vibration measurements be performed on a soft floor, the use of a rigid plate with the person standing on the plate or a tripod and the accelerometer rigidly fixed on is recommended.

2.2 Data processing, presentation of results and analysis

2.2.1 Measurements in accommodation, service, navigation and control spaces

The criteria of vibration level are expressed in terms of:

a) Overall frequency-weighted r.m.s. acceleration a_v(m/s^2) in range 1 to 80 Hz as defined by ISO 2631-1

The acceleration criterion value a_v is given by the following formula:

$$a_v = \sqrt{k_x^2 a_{wx}^2 + k_y^2 a_{wy}^2 + k_z^2 a_{wz}^2}$$

where:

a_{wx}, a_{wy}, a_{wz}: Frequency W_d or W_k weighted r.m.s. acceleration in each orthogonal direction x, y and z

k_x, k_y, k_z: Frequency weighting factors used for the calculation of the acceleration value

a_v : Calculated during a minimum time of 20 seconds. According to ISO 2631-1, the frequency weighting factors used for the calculation of the acceleration value a_v are:

- x axis: W_d, k_x = 1,0
- y axis: W_d, k_y = 1,0
- z axis: W_k, k_z = 1,0

b) Single frequency r.m.s. acceleration (m/s^2) limit curves for horizontal and vertical axis (see Fig 1 and Fig 2).

2.2.2 Measurements in working spaces

The criteria of vibration level are expressed in terms of:

a) Overall frequency-weighted r.m.s. acceleration a_{wmax} (m/s^2) in range 1 to 80 Hz as defined by ISO 2631-1

The exposure acceleration criteria value a_{wmax} is the highest r.m.s. value determined on the three orthogonal axes for standing position person.

The exposure acceleration criteria value a_{wmax} is given by the following formula:

$$a_{wmax} = \max (k_x a_{wx}, k_y a_{wy}, k_z a_{wz})$$

where:

a_{wx}, a_{wy}, a_{wz}: Frequency W_d or W_k weighted r.m.s. acceleration in each orthogonal direction x, y and z

k_x, k_y, k_z: Frequency weighting factors used for the calculation of the acceleration value

a_{wmax} : Calculated during a minimum time of 60 seconds. According to ISO 2631-1, the frequency weighting factors used for the calculation of the acceleration value a_{wmax} are:

- x axis: W_d, k_x = 1,4
- y axis: W_d, k_y = 1,4
- z axis: W_k, k_z = 1,0

b) Single frequency r.m.s. acceleration (m/s^2) limit curves for horizontal and vertical axis (see Fig 1 and Fig 2).

2.3 Measuring conditions

2.3.1 Tests are to be conducted in the conditions described in Sec 1, [3].

2.4 Measuring positions

2.4.1 The location of the measuring positions is selected in accordance with Sec 1, [2.3]. Measurements are to be taken in the vertical, transversal and longitudinal directions at the feet interface with the floor in cabins, offices or other small size rooms. Measurements are to be taken in the centre of the room or at worker position. For larger rooms, several measuring points may be required and are to be chosen according to the local structure.

2.4.2 The maximum whole body vibration exposure level is evaluated at each working space identified and submitted (see Sec 1, [1.4.1]).

3 Requirements

3.1 Vibration measurements in accommodations, service, navigation and control spaces

3.1.1 Vibration levels in accommodations, service, navigation and control spaces corresponding to the vibration grade “g” are provided in Tab 1 and Tab 2 for the accommodation units and in Tab 3 and Tab 4 for living quarters on production units.

For mobile offshore installations, the vibration requirements during transit is 0,15 m/s^2 higher than indicated in Tab 1 and Tab 2.

3.2 Vibration measurements in working spaces

3.2.1 Vibration levels in working spaces corresponding to the vibration grade "g" are provided in Tab 5 and Tab 6.

Table 1 : Overall acceleration level requirements a_v for accommodation units

Space	a_v (m/s^2)	
	grade g = 1	grade g = 2
Cabins Hospital - Medical facilities	0,075	0,12
Mess rooms – Recreation spaces Gymnasiums Passageways in the accommodations	0,12	0,15
Open recreation areas Galleys - Laundries	0,20	0,40
Office	0,12	0,15

Table 2 : Single frequency acceleration limit curves for accommodation units

Space	Single frequency acceleration limit curves **(1)**	
	grade g = 1	grade g = 2
Cabins Hospital - Medical facilities	IV	IV
Mess rooms – Recreation spaces Gymnasiums Passageways in the accommodations	IV	IV
Open recreation areas Galleys - Laundries	III	III
Office	III	III

(1) Refer to the limit curves requirements in Fig 1 for the horizontal axis and in Fig 2 for the vertical axis.

Table 3 : Overall acceleration level requirements a_v for living quarters on production units

Space	a_v (m/s^2)	
	grade g = 1	grade g = 2
Cabins Hospital - Medical facilities	0,10	0,15
Mess room - Recreation space Gymnasium Passageways in the accommodations	0,15	0,20
Open recreation areas Galleys - Laundries	0,25	0,50
Wheelhouse, bridge Control room	0,17	0,22
Office	0,17	0,22
Laboratory	0,20	0,40

Table 4 : Single frequency acceleration limit curves for living quarters on production units

Space	Single frequency acceleration limit curves **(1)**	
	grade g = 1	grade g = 2
Cabins Hospital - Medical facilities	IV	IV
Mess room - Recreation space Gymnasium Passageways in the accommodations	IV	IV
Open recreation areas Galleys - Laundries	III	III
Wheelhouse, bridge Control room	III	III
Office	III	III
Laboratory	III	III

(1) Refer to the limit curves requirements in Fig 1 for the horizontal axis and in Fig 2 for the vertical axis.

Table 5 : Overall acceleration exposure requirements a_{wmax}

Space	a_{wmax} (m/s^2)	
	grade g = 1	grade g = 2
Working spaces	0,40	0,90

Table 6 : Single frequency acceleration limit curves for working spaces

Space	Single frequency acceleration limit curves **(1)**	
	grade g = 1	grade g = 2
Working spaces	II	I

(1) Refer to the limit curves requirements in Fig 1 for the horizontal axis and in Fig 2 for the vertical axis.

Figure 1 : Single frequency r.m.s. acceleration limit curves for horizontal axis

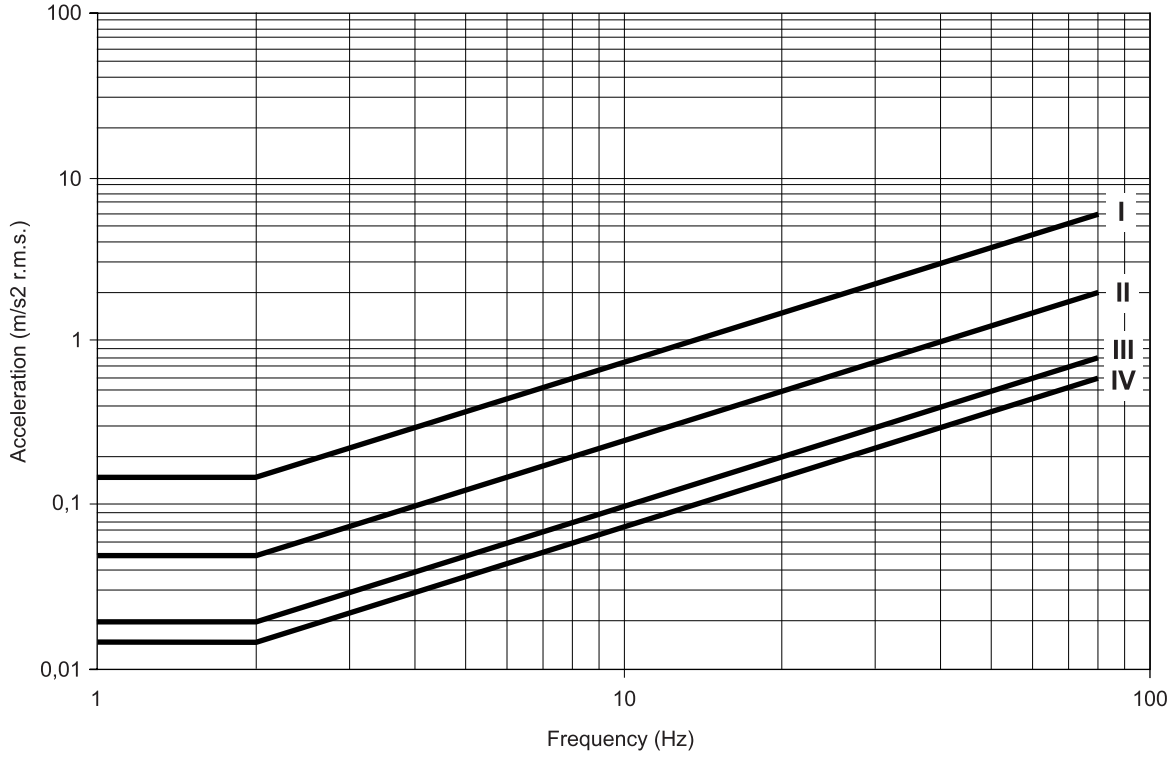

Figure 2 : Single frequency r.m.s. acceleration limit curves for vertical axis