

Rules for Classification and Construction

I Ship Technology

1 Seagoing Ships



24 Guidelines for Compliance with MLC 2006 Noise and Vibration Requirements

The following Guidelines come into force on 1 November 2013.

Germanischer Lloyd SE

Head Office

Brooktorkai 18, 20457 Hamburg, Germany

Phone: +49 40 36149-0

Fax: +49 40 36149-200

headoffice@gl-group.com

www.gl-group.com

"General Terms and Conditions" of the respective latest edition will be applicable
(see Rules for Classification and Construction, I - Ship Technology, Part 0 - Classification and Surveys).

Reproduction by printing or photostatic means is only permissible with the consent of
Germanischer Lloyd SE.

Published by: Germanischer Lloyd SE, Hamburg

Table of Contents

Section 1 General

A	ILO MLC 2006.....	1-1
B	Objective of the Guidelines.....	1-1
C	Application of the Guidelines.....	1-2
D	MLC Certification Process.....	1-2
E	Definitions.....	1-5

Section 2 Noise

A	General.....	2-1
B	MLC 2006 Noise Requirements.....	2-1
C	Noise Protection Requirements.....	2-2
D	Noise Measurements.....	2-5

Section 3 Vibration

A	General.....	3-1
B	MLC 2006 Vibration Requirements.....	3-1
C	Required Vibration Limits.....	3-2
D	Vibration Measurements.....	3-3

Section 4 Approval of Service Suppliers

A	General.....	4-1
B	Objective.....	4-1
C	Application.....	4-1
D	Procedure for Approval.....	4-1
E	Certificate of Approval.....	4-3
F	Information of Alterations to the Certified Service Operation System.....	4-3
G	Cancellation of Approval.....	4-3
H	Special Requirements for Various Categories of Service Suppliers.....	4-4

Annex 2a References

Annex 2b Definitions and Terminology

Annex 2c Determination of Noise Exposure (simplified procedure based on ISO 9612:2009)

Annex 2d Guidance on the Inclusion of Noise Issues in Safety or Occupational Health and Risk Management Systems

Annex 2e Noise Measurement Report

Annex 3 Vibration Measurement Report

Annex 4 Application Form for Approval

Section 1 General

A	ILO MLC 2006.....	1-1
B	Objective of the Guidelines.....	1-1
C	Application of the Guidelines.....	1-2
D	MLC Certification Process.....	1-2
E	Definitions.....	1-5

A ILO MLC 2006

The Maritime Labour Convention, 2006 (MLC 2006) was adopted on 23 February 2006 and will come into effect as binding international law on 20 August 2013. It is the obligation of the ratifying Member State to ensure implementation of the provisions into its national law.

The MLC 2006 regulates Seafarers' onboard working and living conditions, such as a safe and secure workplace; fair terms of employment; decent living and working conditions; and social protection such as access to medical care, health protection and welfare.

The Convention comprises three different but related parts: Articles, Regulations and the Code. The Articles and Regulations deal with the core rights and principles and the basic obligations of countries that have ratified the Convention. The Code, describing how the requirements are to be implemented, consists of two parts:

Part A contains mandatory standards whereas Part B consists of non-mandatory guidelines that can be helpful and sometimes essential for a proper understanding of the regulations and the mandatory standards in Part A.

The Regulations and the Code are structured into five Titles:

Title 1 Minimum Requirements for Seafarers to Work on a Ship

Title 2 Conditions of Employment

Title 3 Accommodation, Recreational Facilities, Food and Catering

3.1 Accommodation and recreational facilities

Title 4 Health Protection, Medical Care, Welfare and Social Security Protection

Title 5 Compliance and Enforcement

B Objective of the Guidelines

B.1 Title 3.1 of the MLC 2006, "Accommodation, recreational facilities" addresses issues related to quality of life at sea, including the physical design of seafarer accommodations and the characteristics of the ambient environment which seafarers are exposed to.

B.2 The individual implementation of MLC 2006 by the Competent Authorities depends on the conversion of the MLC 2006 requirements into national law. Flexibility provided for in the MLC 2006 might, therefore, result in different requirements by the Competent Authorities. It is also possible that some Competent Authorities will not determine the qualitative ambient related requirements of MLC 2006.

The Guidelines document GL's interpretation on how to comply with the MLC 2006 noise and vibration related requirements. National mandatory requirements have to be fulfilled independently of these Guidelines.

B.3 The Guidelines address requirements related to whole-body vibration and noise. Compliance with the other constructional requirements e.g. Lighting and Ventilation, according to Regulation 3.1, 3.2, 4.1 and 4.3 of MLC 2006 is certified by GL with a separate Statement of Compliance.

B.4 For ships fulfilling these Guidelines a corresponding Certificate of Compliance can be issued on request.

B.5 The objective of these Guidelines is

- to provide an alternative basis for demonstrating compliance if a Competent Authority does not specify the requirements relating to noise and vibration
- to ensure clearness regarding the compliance with the convention by defining quantitative assessment criteria and standardized measurement methodologies
- to define unified requirements and the related approval process for Service Suppliers performing noise and vibration measurements within the framework of MLC 2006.

C Application of the Guidelines

C.1 The MLC 2006 is mandatory for all ships engaged in commercial activities (except fishing vessels, ships of traditional build and warships or naval auxiliaries).

C.2 The Title 3.1 requirements of the Convention apply only to ships constructed on or after 20 August 2013. For ships constructed before that date, the previous requirements shall continue to apply to the extent that they were applicable prior to that date and under the law or practice of the Competent Authority concerned. A ship shall be deemed to have been constructed on the date when its keel is laid or when it is at a similar stage of construction.

C.3 These Guidelines will be applied by GL on request for voluntary MLC 2006 compliance certification for ships flying a flag that has no mandatory requirements relating to noise and vibration defined according to its current regulations.

In case of port state controls or a later transfer of the ship to a flag with mandatory noise and vibration requirements the respective Certificate of Compliance may be used as proof for MLC 2006 compliance in the terms of these Guidelines.

C.4 Upon agreement of a Competent Authority that has no requirements relating to noise and vibration these Guidelines will be applied by GL in the course of crew complaints to ships flying the Authority's flag.

C.5 Upon the agreement of a Competent Authority that has mandatory requirements regarding noise and vibration these Guidelines will be applied to ships flying the Authority's flag whenever the national requirements are unspecific or do not cover the topic in question. In case of conflicting requirements the Competent Authority's requirements take precedence.

C.6 The Guidelines will be applied to ships flying a flag that has authorized GL to apply these Guidelines or parts of it.

D MLC Certification Process

D.1 General

Each vessel of 500 GT and above is required to carry a Maritime Labour Certificate (MLC) and a Declaration of Maritime Labour Compliance (DMLC).

Compliance with MLC 2006 will be verified onboard either by the ship's Flag Administration or on behalf of the Flag Administration by a Recognised Organisation.

D.1.1 DMLC

The DMLC consist of two parts: Part I is about the implementation of national requirements to the provisions of the MLC 2006. Part II is drawn up by the ship owner and reflects the measures adapted to ensure ongoing compliance with the national law.

Subject to GL's authorization by the flag State, the ship owner is to submit to GL a complete DMLC (Part I + II) for each ship for which inspection and certification, as applicable, is requested.

The DMLC (Part II) is to be reviewed by GL to verify that the measures adopted by the ship owner ensure ongoing compliance with the national requirements as stipulated in the DMLC (Part I).

After the document review, a full inspection by the Maritime Labour Inspector nominated by GL must be completed. In subsequent inspections, the review with respect to the DMLC, Part II will concentrate on whether or not the measures set out in Part II are being properly implemented.

D.1.2 MLC

A MLC will be issued by GL, on completion of a satisfactory verification of compliance with the requirements of national laws or regulations or other measures implementing the Convention for the 14 areas listed in Title 5, Appendix A5-I. A DMLC must be attached for it to be valid.

A MLC has a maximum validity of five years, including an intermediate inspection between the 2nd and 3rd anniversary date.

The issue of a MLC is conditional upon the existence of a certified valid DMLC for the ship subject to certification.

D.1.3 Interim MLC

An interim MLC may be issued valid for no more than 6 months to enable a ship to operate and accumulate objective evidence of the effective implementation of the measures adopted by the ship owner to ensure ongoing compliance with the national requirements implementing the requirements of the Convention between inspections and the measures proposed to ensure ongoing compliance.

An interim MLC may be issued:

- to new ships on delivery;
- when a ship changes flag; or
- when a ship owner assumes responsibility for the operation of a ship which is new to that ship owner

An inspection for the issuance of an interim MLC (interim inspection) is to be conducted before the issuance of an interim MLC.

A full inspection shall be carried out prior to expiry of the interim MLC to enable issue of the full-term MLC. No further interim MLC may be issued following the initial six months. A DMLC (Part II) need not be available for the period of validity of the interim MLC.

D.1.4 MLC with limited validity

On satisfactory completion of an initial / renewal inspection, a Maritime Labour Certificate with limited validity (also referred to as 'short term MLC') with a validity not exceeding 5 months from the day of the inspection may be issued by the Maritime Labour Inspector to facilitate the evaluation of the inspection report and to cover the period until a full term certificate is issued. The MLC with limited validity may be issued provided:

- no significant deficiency remains
- the vessel's flag Administration has no objections
- the Maritime Labour Inspector formally recommends certification of the ship on the inspection report.

D.2 Inspection and certification of items related to construction and equipment

D.2.1 General

Ship's classification and the MLC certification may be handled by different parties.

GL offers to certify the compliance with the construction and equipment related MLC 2006 requirements by plan approval in the course of the classification process and is safeguarding with checklists that the requirements of the MLC 2006 and national requirements of the flag state are observed.

GL certifies compliance by issuing the following Statement of Compliance (SoC) and Certificate of Compliance (CoC) respectively.

- SoC CONCERNING SHIP CONSTRUCTIONS AND EQUIPMENT ACCORDING TO REGULATION 3.1, 3.2, 4.1 AND 4.4
- CoC ACCORDING GL GUIDELINES FOR COMPLIANCE WITH MLC 2006 NOISE AND VIBRATION REQUIREMENTS

D.2.2 SoC concerning ship construction and equipment

The verification of compliance with the ships structural part of the MLC 2006 is divided into three parts:

- a questionnaire which shall be filled in by the shipyard (or ship owner)
- plan approval
- onboard inspection by a GL surveyor

The result of all three verifications will be combined in the SoC.

D.2.3 CoC concerning noise and vibration

D.2.3.1 General

For ships fulfilling the requirements of these Guidelines with respect to the noise and vibration measurement methodologies and acceptable noise and vibration levels a Certificate of Compliance will be issued on request.

In case a Competent Authority has national mandatory noise and vibration requirements according to its current regulations and provided GL is authorized accordingly, GL will issue a Statement of Compliance to certify the compliance with these national requirements.

In both cases the verification of compliance will be based on the review of the submitted noise and vibration measurement reports. The measurements have to be conducted by Service Suppliers approved according to these Guidelines.

D.2.3.2 Procedure in case of non-compliance

In case the measured noise or vibration levels exceed the limits as defined in these Guidelines, one of the following procedures can be applied to achieve compliance none-the-less:

1. If the exceedances are limited to spaces that are dispensable for the ship's operation and the crew's accommodation and recreation, the access to those spaces can be restricted. The restricted spaces will be listed in the CoC.
2. In some cases the noise or vibration exceedances may be rectified e.g. by structural modifications, vibration compensators, silencers etc. In such a case GL would recommend to issue an interim MLC or a MLC with limited validity until the remedial measures are in place and it has been demonstrated by repeated measurements that the levels are within the limits.
3. In case the measurements were not conducted at a loading or operating condition being representative for the ship's operational profile, the measurements can be repeated under representative conditions. In such a case GL would recommend to issue an interim MLC or a MLC with limited validity until the measurements have been repeated and it was demonstrated that the levels are below the limits.

In case of exceeded noise or vibration limits as defined by national requirements the due course of action has to be accepted by the Competent Authority.

In case a seafarer complains about undue noise or vibration the applicable complaint management procedures have to be applied.

E Definitions

E.1 Seafarer

Seafarer means any person who is employed or engaged or works in any capacity on board a ship to which this Convention applies.

E.2 Ship owner

Ship owner means the owner of the ship or another organization or person, such as the manager, agent or bareboat charterer, who has assumed the responsibility for the operation of the ship from the owner and who, on assuming such responsibility, has agreed to take over the duties and responsibilities imposed on ship owners in accordance with this Convention, regardless of whether any other organization or persons fulfil certain of the duties or responsibilities on behalf of the ship owner.

E.3 Competent Authority

Competent Authority means the minister, government department or other authority with power to issue and enforce regulations, orders or other instructions that have the force of law with respect to the subject matter of the provision concerned.

E.4 Service Suppliers

Service Suppliers are firms engaged in measuring

- sound pressure levels
- whole body vibration

Section 2 Noise

A	General	2-1
B	MLC 2006 Noise Requirements.....	2-1
C	Noise Protection Requirements	2-2
D	Noise Measurements	2-5

A General

A.1 Primary purpose of this Section is

- to define quantitative noise acceptance criteria that fulfil the qualitative MLC 2006 requirements
- to define methods of quantifying noise in relation to these criteria
- to provide the owner and/or operator of the ship as employer necessary instruments to carry out a successful risk-assessment in the field of occupational health and safety with view to noise

A.2 These Guidelines are based on international standards, in particular on IMO Res. MSC.337(91), CODE ON NOISE ON BOARD SHIPS. Most of the following requirements are taken from this regulation.

IMO MSC.337(91) is a regulation based on emission and design criteria considering different ship types. The MLC 2006 requires acceptable noise immission for seafarers on board irrespective of the ship type. Consequently no distinction will be made for different ship types in these Guidelines.

Note

The noise limits according to MSC.337(91) e.g. cabin noise limit of 55 dB(A) for ships larger than 10.000 GT have to be observed irrespectively of these Guidelines.

The procedures were adapted to recognized standards of good practice and rules of occupational health and safety where applicable. The recommendations in these Guidelines shall be applied as far as reasonable and to the satisfaction of the administration. References to relevant standards are made as listed in *Annex 2A*.

A.3 Important definitions for expressions and terms used in these Guidelines are given in Annex 2B.

A.4 Individual requirements according to current regulations of the responsible Flag State regarding acceptable noise levels, measurement requirements etc. have to be fulfilled independently of these Guidelines.

A.5 For reference a guidance on the inclusion of noise Issues in Safety or Occupational Health and Risk Management Systems is given in Annex 2D.

B MLC 2006 Noise Requirements

B.1 The following paragraphs are original extracts from the MLC 2006 and represent the most relevant requirements with respect to noise exposure:

Guideline B3.1.12 – Prevention of noise and vibration

“

1. *Accommodation and recreational and catering facilities should be located as far as practicable from the engines, steering gear rooms, deck winches, ventilation, heating and air-conditioning equipment and other noisy machinery and apparatus.*
2. *Acoustic insulation or other appropriate sound-absorbing materials should be used in the construction and finishing of bulkheads, deckheads and decks within the sound-producing spaces as well as self-closing noise-isolating doors for machinery spaces.*
3. *Engine rooms and other machinery spaces should be provided, wherever practicable, with sound-proof centralized control rooms for engine-room personnel. Working spaces, such as the machine shop, should be insulated, as far as practicable, from the general engine-room noise and measures should be taken to reduce noise in the operation of machinery.*
4. *The limits for noise levels for working and living spaces should be in conformity with the ILO international guidelines on exposure levels, including those in the ILO code of practice entitled Ambient factors in the workplace, 2001, and, where applicable, the specific protection recommended by the International Maritime Organization, and with any subsequent amending and supplementary instruments for acceptable noise levels on board ships. A copy of the applicable instruments in English or the working language of the ship should be carried on board and should be accessible to seafarers.*

.....“

Regulation 4.3 1.

“ Each Member shall ensure that seafarers on ships that fly its flag are provided with occupational health protection and live, work and train on board ship in a safe and hygienic environment”

Standard A3.1.6. (h)

“Accommodation and recreational and catering facilities shall meet the requirements in Regulation 4.3, and the related provisions in the Code, on health and safety protection and accident prevention, with respect to preventing the risk of exposure to hazardous levels ...of noise ... and to provide an acceptable occupational and on-board living environment for seafarers.”

Standard A4.3.4

“Compliance with the requirements of applicable international instruments on the acceptable levels of exposure to workplace hazards on board ships and on the development and implementation of ships’ occupational safety and health policies and programmes shall be considered as meeting the requirements of this Convention.”

C Noise Protection Requirements

C.1 Preface

To fulfil the MLC 2006 noise requirements the following topics are considered in these Guidelines:

- .1 Limits on acceptable maximum noise levels for all spaces to which seafarers normally have access
- .2 Minimum standards for acoustic insulation between accommodation spaces;
- .3 Protection of the seafarer from the risk of noise-induced hearing loss by personnel hearing protection in spaces with excessive noise levels;
- .4 Standardised procedures for noise level measurements and determination of noise exposure;

C.2 Noise Criteria

In the following the three different noise criteria and procedures for their verification are defined:

- Maximum sound pressure levels in living and working spaces
- Room to room insulation with regard to Acoustic Privacy
- Noise Exposure Limits

Section 2 Noise

C.2.1 Maximum A-weighted sound pressure level

The noise level limits as defined in Table 2.1 were stipulated in such a way that seafarers will not be exposed to an $L_{ex,24h}$ exceeding 80 dB(A) under the assumption of a maximum working shift of 8 hours within a day or a 24 hour period. They are applicable for normal seagoing operation as set out in D.2.1.

For newbuildings the compliance with the sound pressure level limits has to be demonstrated during sea trials by measurements according to the procedures described in D.

Table 2.1 Maximum Acceptable Sound Pressure Levels given in dB(A)
 (to be compared with measured values of $L_{Aeq}(T)$ – see D.1.3)

No.	Designation of rooms and spaces	Noise Limit [dB(A)]
1.	Work spaces	
.1	Machinery spaces	110
.2	Machinery control rooms	75
.3	Workshops	85
.4	Non-specified work spaces	85
2.	Accommodation spaces	
.1	Cabins ¹ and hospitals ²	60
.2	Mess rooms	65
.3	Recreation rooms/day rooms	65
.4	Offices/ treatment rooms	65
.5	Open recreation spaces	75
3.	Navigation spaces	
.1	Navigation bridge and chartrooms	65
.2	Listening/look-out posts, including navigation bridge wings	70
.3	Separated radio rooms (with radio equipment operating but not producing audio signals)	60
.4	Radar rooms	65
4.	Service spaces	
.1	Galleys, without food processing equipment operating	75
.2	Serveries and pantries	75
5.	Normally unoccupied spaces	
.1	Spaces not specified	90
.2	Suez crew room	65

¹ Used as a bedroom

² Hospitals: Treatment rooms with bed, which are used for recovery.

Note

Apart from above mentioned noise limits in Table 1 with respect to health protection the requirements of the LSA-CODE, chapter 7.2 and the recommendations of IMO A.343(IX) apply even though not covered by these Guidelines.

In spaces with sound pressure levels exceeding 85 dB(A), suitable hearing protection shall be used, or to apply time limits for exposure to ensure that an equivalent level of protection is maintained. These areas shall be marked with warning signs according to D.3.4.2.

The maximum continuous noise level at workers ear when using hearing protection shall not exceed 85 dB(A).

No crew member shall be exposed to sound pressure level peak values exceeding 135 dB(C).

In accommodation spaces where intermittent noise or single tones have been detected the measured noise level shall be adjusted according to the procedure described in D.2.6.4 before comparing with the limits in Table 2.1.

C.2.2 Acoustic Insulation (Privacy)

Consideration shall be given to the acoustic insulation between accommodation spaces in order to make rest and recreation possible even if activities are going on in adjacent spaces, e.g. music, talking, toilet flushing.

The airborne sound insulation properties for bulkheads and decks within the accommodation shall be determined by laboratory tests in accordance with ISO 10140-2:2010 and comply at least with the following weighted sound reduction index R_w :

Table 2.2 Sound insulation index

Cabin to cabin	$R_w \geq 35$
Mess rooms, recreation rooms, public spaces and entertainments areas to cabins and hospitals	$R_w \geq 45$
Corridor to cabin	$R_w \geq 30$
Cabin to cabin <u>with</u> communicating door	$R_w \geq 30$

Care should be taken in the erection of materials and the construction of accommodation spaces.

During sea trial testing, if the erection of materials is in doubt measurements should be taken onboard the ship for a representative selection of each type of partition, floors and doors as requested in Table 2.2. The apparent sound reduction index R'_w shall comply with the requirements of Table 2.2 with a tolerance of up to 3 dB.

Note

Field measurements should be performed according to ISO 140-4:1998. When the area of the materials tested is < 10 m², a minimum value of 10 m² shall be considered for the calculation of the R'_w index.

C.2.3 Noise Exposure Limits

In some cases because of specific flag state requirements or crew complaints the determination of noise exposure levels might become necessary.

In general the Noise Exposure Limit $L_{ex,24h}$ is 80 dB(A).

The compliance with this criterion should be verified by calculation of the expected noise exposure of each job category of crew members in accordance with the method proposed in Annex 2C.

C.2.4 Hearing Protection and Warning Information

C.2.4.1 Hearing Protection

When the application of means for controlling sound at source does not reduce the noise level in any space to that specified in Table 2.1, seafarers who are required to enter such spaces shall be supplied with effective hearing protection on an individual basis.

The provision of hearing protectors shall not be considered to be a substitute for effective noise control. The individual hearing protectors shall be so selected as to eliminate the risk of hearing impairment or to reduce the risk to an acceptable level as specified in Table 2.1. The hearing protectors shall be in accordance with the HML-method described in ISO 4869-2:1994.

The ship operator shall make every effort to ensure the wearing hearing protectors and shall be responsible for checking the effectiveness of measures taken in compliance of this guide.

C.2.4.2 Warning information

Where the noise levels in machinery spaces (or other spaces) are greater or expected to be greater than 85 dB(A), entrances to such spaces shall carry a warning notice comprising symbol and supplementary sign in the working language of the ship as prescribed by the Administration.

Table 2.3 Signs at the entrance to noisy rooms (example in English)

80 – 85 dB(A)	High-noise level – use hearing protectors
85 – 100 dB(A)	Dangerous noise – use of hearing protectors mandatory
110 – 115 dB(A)	Caution: Dangerous noise – use of hearing protectors mandatory – short stay only
> 115 dB(A)	Caution: Excessively high-noise level – use of hearing protectors mandatory – no stay longer than 10 minutes

D Noise Measurements

D.1 General

D.1.1 Measurements shall be conducted for each ship of a series.

D.1.2 A test programme including measurement locations and operating conditions shall be provided prior to the noise test.

D.1.3 Measurements of the A-weighted equivalent continuous sound pressure level, $L_{Aeq}(T)$ shall be taken.

D.1.4 Measurements of the C-weighted equivalent continuous sound pressure level $L_{Ceq}(T)$ and the C-weighted peak sound pressure level L_{Cpeak} shall be taken in spaces where $L_{Aeq}(T)$ exceeds 85 dB(A) for the purpose of determining appropriate hearing protection according to Standard ISO 4869-2:1994.

D.2 Measurement Conditions and Procedures

D.2.1 Operating conditions at sea

D.2.1.1 Measurements shall be taken with the ship in design draught condition. The course of the vessel shall be as straight as possible. The actual conditions during the measurements shall be recorded in the survey report.

D.2.1.2 Propulsion machinery shall produce the necessary power to reach the ship's normal service speed (design speed). The power shall be not less than 80 % of the maximum continuous rating (MCR).³

Engines driving generators for propulsion (gen-sets) shall be running at rated speed with a constant governor setting under conditions of 100 % power (rated propulsion power).

D.2.1.3 For ships which shall normally be operated with Dynamic Positioning (DP) systems for longer periods than 1 hour per day additional measurements are to be performed in DP mode. The DP system shall produce the power necessary to keep the ship's position at sea state 3.

D.2.1.4 All machinery (e.g. auxiliary engines, stabilizers), navigation instruments, radio and radar sets, etc., normally in use at normal seagoing condition and levels.

D.2.1.5 The total diesel generator output shall not be less than 60% of the total design power. In case this output can not be reached during sea trial, further measurements are to be carried out in port condition. These measurements shall be carried out in spaces adjacent to the diesel generators, their funnel and at the bridge wings at about 25 % of total design power with the main engine not running. If the audible noise is obviously caused by the diesel generators the readings shall be increased by 5 dB before being compared to the limits to account for the low power during measurements.

D.2.1.6 Engine room and cargo hold ventilation shall be operated at the highest design revolution rate.

D.2.1.7 Air-conditioning equipment and water chiller shall be operated at normal operating condition.

D.2.1.8 Doors and windows shall be closed.

D.2.1.9 Spaces should be fully furnished. Measurements in spaces without soft furnishings may be taken but no allowance is made for their absence. Rechecks or follow-up readings may be taken with soft furnishings included.

D.2.2 Operating conditions in port or others than seagoing condition

D.2.2.1 In general the measurements as specified below are required in case of crew complaints only.

D.2.2.2 When the noise from e.g. the ship's cargo handling equipment, reefer units, and during maintenance or overhaul is suspected to lead to noise levels above the limits, measurements shall be taken during these operations.

Whereas for stationary noise the limits according C.3.1 and for non-stationary the limits according C.3.3 are applicable.

Noise originating from sources external to the ship should be discounted as indicated in C.2.3.3.

D.2.3 Environmental conditions

D.2.3.1 The minimum water depth during measurements shall be at least five times the aft draught. For ships normally operating in shallow waters, corresponding conditions have to be chosen for measurements.

D.2.3.2 Sea state 3 and a wind force of 4 Beaufort shall not be exceeded. For more severe weather conditions, the acceptance of measurements will be decided by GL on a case-by-case basis.

D.2.3.3 Care shall be taken to see that noise from extraneous sound sources, such as people, entertainment, construction and repair work, does not influence the noise level on board the ship at the positions of measurement. If necessary, measured values may be corrected for steady state background noise according to the energy summation principle.

³ In case of measurements during sea trial for cargo ships equipped with fixed pitch propellers it might not always be possible to fulfil both requirements at the same time. In such a case the measurements shall be taken at rated engine speed. Please note that this is in contradiction to the requirement of minimum 80 % propulsion power of MSC.337(91); However, this is considered acceptable for sea trial measurements as long as it is ensured that in case of crew complaints during ship service repetitive measurements will be performed at a minimum of 80 % of propulsion power.

D.2.4 Personnel requirements

Noise measurements and their evaluation shall be carried out by experienced technicians employed by a service supplier approved by GL according to the requirements as defined in Section 4. If desired, GL will conduct measurements with own experts.

D.2.5 Measurement equipment

D.2.5.1 Sound level meters

Integrating sound level meters according Publication IEC 61672-1(2002-05) type/class 1 standard shall be used.

D.2.5.2 Octave filter set

An octave filter set shall conform to IEC Publication 1260 (1995), if applicable.

D.2.5.3 Calibration

Sound calibrators shall comply with the standard IEC 60942 (2003-01) and are to be approved by the manufacturer of the sound level meter used.

D.2.5.4 Check of measuring instrument and calibrator

Calibrator and sound level meter shall be verified at least every two years by a national standard laboratory or a competent laboratory accredited according to ISO 17025 (2005) as corrected by (Cor 1:2006).

D.2.5.5 Microphone wind screen

A microphone wind screen shall be used when taking readings outside, e.g. on navigating bridge wings or on deck, and below deck where there is any substantial air movement. The wind screen should not affect the measurement level of similar sounds by more than 0.5 dB(A) in "no wind" conditions.

D.2.6 Measurement procedure

D.2.6.1 During noise level measurement, only seafarers necessary for the operation of the ship and persons taking the measurements shall be present in the space concerned.

D.2.6.2 Sound pressure level readings shall be taken in decibels using an A-weighting (dB(A)) filter and in non-weighted octave bands between 31.5 and 8,000 Hz.

D.2.6.3 In machinery spaces or wherever hazardous sound pressure levels are expected readings shall be taken in decibels using a C-weighting (dB(C)) filter. The reading shall be compared to the limit of 135 dB(C) (see C.2.2).

D.2.6.4 The measurements shall be made using spatial averaging (as described in D.2.13.1) and over a time period until stable readings are found or at least 15 seconds in order to represent the average value from variations due to irregular operation or variations in the sound field. Readings shall be made only to the nearest decibel. If first decimal of the dB reading is 5 or higher, the reading shall be made to nearest higher integer.

D.2.6.5 Intermittent noise and single tones are to be reported if subjectively audible.

D.2.7 Determination of noise exposure

In addition to the continuous sound level measurements, the noise exposure of seafarers (see C.3.3) shall be determined based upon ISO 9612:2009. A simplified procedure based on ISO 9612 and an example for a work place related noise exposure is given in Annex 2C.

D.2.8 Calibration

The sound level meter shall be calibrated with the calibrator referred to D.2.5.3 before and after measurements are taken.

D.2.9 Measurement locations

D.2.9.1 If not otherwise stated, measurements shall be taken with the microphone at a height of between 1.2 m (seated person) and 1.6 m (standing person) from the deck. The distance between two measurement points should be at least 2 m.

In large spaces not containing machinery measurements should be taken at intervals not greater than 10 m throughout the space including positions of maximum noise level. In no case shall measurements be taken closer than 0.5 m from the boundaries of a space.

D.2.9.2 Work spaces

The noise level shall be measured at all points where work is carried out, including communication stations. Working spaces are areas normally occupied for a longer period of time (20 min or longer). Holds, stores, passage ways and similar are not classified as working spaces.

D.2.9.3 Intake and exhaust openings

When measuring noise levels, the microphone should, where possible, not be placed within a 30° angle away from the direction of the gas stream and not less than a distance of 1 m from the edge of the intake or exhaust opening of engines, ventilation, air-conditioning and cooler systems, and as far as possible from reflecting surfaces.

D.2.10 Measurements in machinery spaces

D.2.10.1 Measurements shall be taken at the principal working and control stations of the seafarers in the machinery spaces and in the adjacent control rooms, if any, special attention being paid to telephone locations and to positions where voice communication and audible signals are important.

D.2.10.2 Readings should not normally be taken closer than 1 m from operating machinery, or from decks, bulkheads or other large surfaces, or from air inlets. Where this is not possible, measurement shall be taken at a position midway between the machinery and adjacent reflecting surface.

D.2.10.3 Measurements from machinery which constitutes a sound source should be taken at 1 m from the machinery. Measurement should be made at a height of between 1.2 m to 1.6 m above the deck, platform or walkway as follows:

- .1 at a distance of 1 m from, and at intervals abt. 3 m, all sources such as:
 - main turbines or engines at each platform level
 - main gear
 - turbo charger
 - purifiers
 - electrical alternators and generators
 - boiler firing platform
 - compressors
 - cargo pumps (including their driving motors or turbines)
- .2 at local control stations, e.g., the main maneuvering or emergency maneuvering stand on the main engine, the machinery control rooms and steering gear room;
- .3 at all other locations not specified in .1 and .2 which would normally be visited during routine inspection, adjustment and maintenance;
- .4 at points on all normally used access routes, unless covered by positions already specified above, at intervals not greater than 10 m;

It will not be necessary to record each position as defined above in areas where the measured sound pressure level does not vary significantly.

D.2.11 Measurements on bridge wings

Measurements shall be taken on both navigating bridge wings but should only be taken when the navigating bridge wing to be measured is on the lee side of the ship.

D.2.12 Measurements in accommodation spaces

D.2.12.1 One measurement shall be taken in the middle of the space. The microphone shall be moved slowly horizontally and/or vertically over a distance of 1 m (+/- 0.5 m, taking into account the measurement criteria in *Section D.2.9.1*). Additional measurements should be performed at other points if appreciable differences, i.e. greater than 3 dB(A), in the level of sound inside the room occur, especially near the head positions of a sitting or lying person.

D.2.12.2 For ships with a large number of crew cabins, such as passenger/cruise ships, it will be acceptable to reduce the number of measurement positions. The selection of cabins to be tested shall be representative for the group of cabins being tested by selecting those cabins in closer proximity to noise sources.

Cabins which are obviously affected by noise, i.e. cabins adjacent to machinery or casings, must be considered in any case. To identify those cabins a walkthrough inspection by the noise expert is required for all cabins.

D.2.13 Measurements at open deck

On open deck measurements shall be taken in any spaces provided for the purpose of recreation and in any work space.

D.2.14 Measurements in normally unoccupied spaces

D.2.14.1 In addition to the spaces referred to in D.2.9 to D.2.14, measurements shall be taken in all locations with unusually high noise levels where seafarers may be exposed, even for relatively short periods, and at intermittently used machinery locations, for example at cargo discharge pumps.

D.2.14.2 In order to restrict the number of measurements and recordings, noise levels need not be measured for normally unoccupied spaces, holds, deck areas and other spaces which are remote from sources of noise and where a preliminary walkthrough inspection shows that the noise levels are well below the limit specified in C.3.1.

D.2.14.3 Where a preliminary investigation shows that the noise levels in large cargo holds are not well below the limit specified in C.3.1, at least three microphone positions in parts of holds where personnel are likely to carry out work shall be used.

D.3 Reporting

A noise survey report shall be made for each ship. The report shall comprise information on the noise levels in the various spaces on board. The report shall show the reading at each specified measuring point. The points shall be marked on a general arrangement plan, or on accommodation drawings attached to the report, or shall otherwise be identified.

The format for noise survey reports is set out in Appendix 1 of IMO Code on noise levels onboard Ships. A template of a measurement report can be found in Annex 2E.

Section 3 Vibration

A	General	3-1
B	MLC 2006 Vibration Requirements.....	3-1
C	Required Vibration Limits.....	3-2
D	Vibration Measurements.....	3-3

A General

A.1 Primary purpose of this Section is

- to define quantitative vibration acceptance criteria that reflect the qualitative MLC 2006 requirements
- to define methods of quantifying vibrations in relation to these criteria

A.2 In this context vibration is defined as whole-body vibration caused by structural oscillations in the frequency range of 1 to 80 Hz and excludes hand-arm vibration induced by working tools.

A.3 Individual requirements according to current regulations of the responsible Flag State regarding acceptable vibration levels, measurement requirements, etc. shall be fulfilled independently of these Guidelines.

A.4 In general, these Guidelines is based on the following international standards:

- ISO 6954 edition 2000, "Mechanical vibration – Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships"
- ISO 2631-1 edition 1997, "Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Part 1: General requirements"
- ISO 2631-2 edition 1989, "Mechanical vibration and shock – Evaluation of human exposure to whole – body vibration – Part 2: Continuous and shock induced vibration in buildings (1 - 80 Hz)"
- ISO 8041 edition 1990, "Human response to vibration – Measuring instrumentation"

B MLC 2006 Vibration Requirements

B.1 The following paragraphs are original extracts from the MLC 2006 and represent the most relevant requirements with respect to noise exposure:

Regulation 3.1 – Accommodation and recreational facilities

1. "Each Member shall ensure that ships that fly its flag provide and maintain decent accommodations and recreational facilities for seafarers working or living on board, or both, consistent with promoting the seafarers' health and well-being."

Guideline B3.1.12 – Prevention of noise and vibration

5. "No accommodation or recreational or catering facilities should be exposed to excessive vibration."

Regulation 4.3 1.

"Each Member shall ensure that seafarers on ships that fly its flag are provided with occupational health protection and live, work and train on board ship in a safe and hygienic environment."

Standard A3.1 6.(h)

„Accommodation and recreational and catering facilities shall meet the requirements in Regulation 4.3, and the related provisions in the Code, on health and safety protection and accident prevention, with respect to preventing the risk of exposure to hazardous levels...of vibration ... and to provide an acceptable occupational and on-board living environment for seafarers.“

Standard A4.3.4

“Compliance with the requirements of applicable international instruments on the acceptable levels of exposure to workplace hazards on board ships and on the development and implementation of ships’ occupational safety and health policies and programmes shall be considered as meeting the requirements of this Convention.”

C Required Vibration Limits

C.1 As stated in Standard A4.3.4 compliance with the requirements of international instruments shall be considered as meeting the requirements of MLC 2006. The most recognised international standard with regard to habitability on ships is ISO 6954. Most of the following requirements have therefore been taken from this standard.

C.2 MLC 2006 is calling for decent working and living conditions on board ship. This requirement goes beyond the health protection aspect. The required limit value given in Table 3.1 is taken from ISO 6954.

Table 3.1 Required vibration limit

	v_{OA} [mm/s]
accommodation, recreation, catering and working spaces	6

C.3 The required limit value refer to the overall frequency-weighted rms value (v_{OA}) in the range of 1 to 80 Hz according to ISO 2631-2.

C.4 Working spaces are areas normally occupied for a longer period of time (20min or longer). Holds, stores, open bridge wings, steering gear room, engine and machinery compartments, passage ways and similar are not classified as working spaces. Workshops are considered as working spaces.

C.5 Some Competent Authorities define vibration limits in way of Daily Exposure Action and Daily Exposure Limit Values based on the “Daily Vibration Exposure A(8)” acc. to ISO 2631-1. Note that the v_{OA} of 6mm/s corresponds to a A(8) value of 0.37m/s². The Daily Exposure Action and Daily Exposure Limit Values according to the Directive 2002/44/EC of the EU defining minimum health and safety requirements are given for reference as well in Table 3.2.

Table 3.2 Required vibration limit expressed as daily vibration exposure

	A(8) m/s ²
v_{OA} of 6mm/s lasting 24h expressed as A(8) Value	0.37
A(8) Action Value acc. EU Directive 2002/44/EC	0.50
A(8) Limit Value acc. EU Directive 2002/44/EC	1.15

D Vibration Measurements

D.1 General

D.1.1 Vibration measurements and their evaluation shall be carried out by experienced technicians employed by a service supplier approved by GL according to the requirements as defined in Section 4. If desired, GL will conduct measurements with own experts.

D.1.2 Measurements shall be conducted for each ship of a series.

D.2 Measuring Conditions

D.2.1 Ships show different vibration behaviour for different loading conditions. Therefore, in general the vibration acceptance test shall be conducted at the design draught.

D.2.2 Because of operational matters or in case the measurements are conducted during sea trial it might not always be possible to reach the design draught. In such cases at least all propellers shall be immersed in stillwater condition.

D.2.3 GL's acceptance for draughts deviating from the design draught shall be obtained prior to the measurements. The acceptance will be decided by GL on a case-by-case basis.

D.2.4 Propulsion machinery shall produce the necessary power to reach the ship's normal service speed (design speed). The power shall be not less than 80 % of the maximum continuous rating (MCR).¹

Engines driving generators for propulsion (gen-sets) shall be running at rated speed with a constant governor setting under conditions of 100 % power (rated propulsion power).

D.2.5 For ships which shall normally be operated with Dynamic Positioning (DP) systems for longer periods than 1 hour per day additional measurements are to be performed in DP mode. The DP system shall produce the power necessary to keep the ship's position at sea state 3.

D.2.6 The minimum water depth during measurements shall be at least five times the aft draught. For ships normally operating in shallow waters, corresponding conditions shall be chosen for measurements.

D.2.7 Sea state 3 and a wind force of 4 Beaufort shall not be exceeded. For more severe weather conditions, the acceptance of measurements will be decided by GL on a case-by-case basis.

D.2.8 The course of the vessel shall be as straight as possible. Rudder angles shall not exceed +/-2 degrees.

D.2.9 The ship shall be fully outfitted, and all systems contributing to vibration shall be in normal operation condition.

D.2.10 Measurements at other conditions than seagoing condition (e.g. elevated condition of wind turbine installation vessels, piling or dredging operations) are required in case of crew complaints only. The measurements are to be conducted at representative conditions. Vibrations dominated by pulse excitation (e.g. pile driving, dredging) are to be assessed in terms of vibration exposure.

¹ In case of measurements during sea trial for cargo ships equipped with fixed pitch propellers it might not always be possible to fulfil both requirements at the same time. In such a case the measurements shall be taken at rated engine speed.

D.3 Performance of Measurements

D.3.1 Instrumentation

D.3.1.1 Measurement instruments shall be calibrated in suitable intervals. Calibration sheets shall be provided. Calibration checks of the measurement chain shall be performed prior to the measurements on site. On GL's demand evidence of calibration checks has to be submitted.

D.3.1.2 On non-magnetic floors, measuring sensors shall be mounted on a three-legged plate of about 1.5 kg.

D.3.1.3 Provision shall be made for the storage of all spectra and a limited number of time records.

D.3.1.4 The instrumentation shall comply with the requirements of ISO 8041.

D.3.2 Measurement Locations and Directions

D.3.2.1 Horizontal Directions

The quantity and position of measurement locations shall be chosen in a way that measurement results adequately reflect the horizontal vibration level. Measurements are required in all three directions at a minimum of two locations on each deck.

In case of slender superstructures measurements shall be performed at least at two locations on each deck at the superstructure's front wall, one on centre line and the other at the outmost port or starboard position in order to account for the longitudinal and transverse bending and torsional vibration mode shapes of the superstructure.

D.3.2.2 Vertical Direction

At least at the following locations vertical measurements are required:

- all crew cabins. For combined living and sleeping rooms one position, for separate rooms two measurement positions
- all accommodation, recreation (inner and outer), catering and working spaces which are normally occupied for a longer period of time (20 min or longer)

D.3.3 Measurement Procedure

To ensure comparability of the spectra, the following parameters shall be applied for data acquisition and signal processing:

- measurement time per point: ≥ 1 min
- sampling rate: ≥ 200 Hz
- spectral frequency range: 1 Hz to 80 Hz
- minimum spectral resolution: 0.25 Hz
- FFT window function: flat top (if not available, Hanning window)
- FFT averaging mode: linear averaging (stable mean)

D.4 Measurement Report

D.4.1 The report has to be signed by the person in charge conducting the measurement and a ship owner's and shipyard's representatives as far as applicable.

D.4.2 A template of a measurement report can be found in Annex 3 and is also given in ISO 6954.

D.5 Determination of Vibration Exposure

In case of determination of vibration exposure the following should be observed:

D.5.1 The assessment of the level of exposure to vibration is based on the calculation of daily exposure A(8) expressed as equivalent continuous acceleration over an eight-hour period, calculated as the

Section 3 Vibration

highest (rms) value of the frequency-weighted accelerations, determined on three orthogonal axes in accordance with ISO standard 2631-1.

D.5.2 The choice of measurement locations shall be representative of the individual exposure of the seafarer. Therefore a survey of specific work and living pattern has to be done and documented for all individual occupation groups onboard.

D.5.3 Since it is not feasible to conduct such a survey or an exposure level measurement during sea-trial it is recommended to perform the vibration acceptance measurements according to ISO6954 and the requirements above and to apply a work and living pattern assessment afterwards. The applied work and living pattern shall realistically reflect the seafarer's occupation and the ship's operation profile.

D.5.4 The vibration levels gained by measurements according to ISO6954 can be converted to daily vibration exposure levels as follows:

$$DVE = \sqrt{\sum_i (a_{wi} \cdot \sqrt{t_i/8})^2} \quad \sum_i t_i = 24[h]$$

DVE : Daily Vibration Exposure [A(8) m/s²]

t : Typical daily exposure time of individual seafarer at measured location i [h]

a_{wi} : Measured frequency-weighted acceleration at location i determined on three orthogonal axes (1.4a_{wx}, 1.4a_{wy}, a_{wz}) [m/s²]

Note: The horizontal (X and Y) axis values are each multiplied by a factor of 1.4, to account for the sensitivity of the human body to vibration in these directions.

D.5.5 As a simplified procedure to determine the daily vibration exposure the following formula can be applied whenever no individual work and living pattern is available:

For horizontal measurement directions:

$$DVE_{xy} = 1.4 \sqrt{(a_{wW} \cdot \sqrt{t_W/8})^2 + (a_{wR} \cdot \sqrt{20 - t_W/8})^2 + (0.5 \cdot a_{wD})^2 + (0.5 \cdot a_{wM})^2}$$

For vertical measurement direction

$$DVE_z = \sqrt{(a_{wW} \cdot \sqrt{t_W/8})^2 + (a_{wR} \cdot \sqrt{20 - t_W/8})^2 + (0.5 \cdot a_{wD})^2 + (0.5 \cdot a_{wM})^2}$$

t_w : National limit on maximum hours of work [h]

a_{wW} : frequency-weighted acceleration at the primary working station of the seafarer [m/s²]

a_{wR} : frequency-weighted acceleration at the seafarer's cabin [m/s²]

a_{wD} : frequency-weighted acceleration at the seafarer's recreation room [m/s²]

a_{wM} : frequency-weighted acceleration at the seafarer's mess [m/s²]

D.5.6 Only vibrations in the frequency range from 1 Hz to 80 Hz shall be considered.

Section 4 Approval of Service Suppliers

A	General	4-1
B	Objective	4-1
C	Application	4-1
D	Procedure for Approval	4-1
E	Certificate of Approval.....	4-3
F	Information of Alterations to the Certified Service Operation System	4-3
G	Cancellation of Approval.....	4-3
H	Special Requirements for Various Categories of Service Suppliers	4-4

A General

A.1.1 Firms providing measurements which are used for the issuance of MLC 2006 Noise and Vibration Certificate of Compliance are subject to approval by GL.

A.1.2 An Application Form for Approval as a Service Supplier can be found in Annex 4.

B Objective

The objective of this procedure is to set basic standards for qualifying service suppliers.

C Application

C.1 This procedure applies to the approval of the following categories of service suppliers:

- Companies engaged in sound pressure level measurements
- Companies engaged in whole-body vibration measurements

C.2 In the following such measurements are referred to as “the services”.

C.3 In the following such companies are referred to as “the supplier”.

D Procedure for Approval

D.1 Submission of documents

The following documents are to be submitted to GL for review:

- Outline of company, e.g. organisation and management structure
- List of nominated agents, if any
- Experience of the company in the specific service area
- List of operators/technicians documenting training and experience within the relevant service area, and qualifications according to recognised national, international or industry standards, as relevant
- Description of equipment used for the particular service for which approval is sought

Section 4 Approval of Service Suppliers

- A guide for operators of such equipment
- Training programmes
- Check lists, record formats for recording results and template of measurement reports of the services
- Quality Manual and/or documented procedures
- Evidence of approval/acceptance by other bodies, if any
- Information on the other activities which may present a conflict of interest
- Record of customer claims and of corrective actions requested by certification bodies
- Where relevant, list and documentation of licenses granted by equipment's manufacturer

D.2 General requirements

D.2.1 Extent of Approval – The supplier shall demonstrate that it has the competence and control needed to perform the services for which approval is sought.

D.2.2 Training of personnel – The supplier is responsible for the qualification and training of its personnel to a recognised national, international or industry standard as applicable. Where such standards do not exist, the supplier is to define standards for the training and qualification of its personnel relevant to the functions each is authorised to perform. The personnel shall also have an adequate experience and be familiar with the operation of any necessary equipment. Where it is not possible to perform internal training, a program of external training may be considered as acceptable.

D.2.3 Supervision – The supplier shall provide supervision for all services provided. For a supplier consisting of one person, that person shall meet the requirements of a supervisor.

D.2.4 Personnel records – The supplier shall keep records of the approved operators/technicians/inspectors. The record shall contain information on age, formal education, training and experience for the services for which they are approved

D.2.5 Equipment and facilities – The supplier shall have the necessary equipment and facilities for the service to be supplied. A record of the equipment used shall be kept. The record shall contain information on maintenance and calibration.

D.2.6 Procedures – The supplier shall have documented work procedures covering all services supplied.

D.2.7 Subcontractors – The supplier shall give information of agreements and arrangements if any parts of the services provided are subcontracted. Particular emphasis shall be given to quality management by the supplier in following-up of such subcontracts. Subcontractors providing anything other than subcontracted personnel or equipment shall also meet the requirements of 2 and 5.

D.2.8 Verification – The supplier shall verify that the services provided are carried out in accordance with approved procedures.

D.3 Auditing of the Supplier – Upon reviewing the submitted documents with satisfactory result, the supplier is audited in order to ascertain that the supplier is duly organised and managed in accordance with the submitted documents, and that it is considered capable of conducting the services for which approval is sought.

D.4 Approval is conditional on a practical demonstration of the services as well as satisfactory reporting being carried out.

D.5 Quality System

D.5.1 The supplier shall have a documented system covering at least the following:

- code of conduct for the relevant activity

Section 4 Approval of Service Suppliers

- maintenance and calibration of equipment
- training programmes for operators/technicians/inspectors
- supervision and verification to ensure compliance with operational procedures
- recording and reporting of information
- quality management of subsidiaries and agents
- job preparation
- periodic review of work process procedures, complaints, corrective actions, and issuance, maintenance and control of documents

D.5.2 A documented Quality system complying with the most current version of ISO 9000 series and including the above items, would be considered acceptable.

E Certificate of Approval

E.1 Upon satisfactory completion of both the audit of the supplier and the demonstration test, if required, the Society will issue a Certificate of Approval stating that the supplier's service operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted.

The Certificate shall clearly state the type and scope of services and any limitations or restrictions imposed. The supplier will be included in GL's record of approved service suppliers.

E.2 Renewal of the certificate is to be made at intervals not exceeding three years by verification through audits that approved conditions are maintained.

E.3 Where several servicing stations are owned by a given company, each station is to be assessed and approved when deemed necessary by GL.

F Information of Alterations to the Certified Service Operation System

In case of any alteration to the certified service operation system, GL is to be informed immediately. Re-audit may be required when deemed necessary.

G Cancellation of Approval

G.1 Approval may be cancelled in the following cases:

- Where the service was improperly carried out or the results were improperly reported.
- Where GL finds deficiencies in the approval service operation system of the supplier and appropriate corrective action is not taken.
- Where the supplier fails to inform of any alteration as in F above to GL.
- Where wilful acts against the approval requirements or omissions are ascertained.

G.2 GL reserves the right to cancel the approval.

G.3 A supplier whose approval was cancelled may apply for re-approval provided he has corrected the non-conformities which resulted in cancellation, and GL is able to confirm he has effectively implemented the corrective action.

H Special Requirements for Various Categories of Service Suppliers

H.1 Firms engaged in noise level measurements onboard ship

H.1.1 Extent of engagement

Sound pressure level measurements onboard ships.

H.1.2 Supervisor

The supervisor shall have minimum 2 years experience as an operators in sound pressure level measurements onboard Ship

He bears the total responsibility for the execution of the assignment and for the final report.

H.1.3 Operators

The operator is to have the following qualifications

- Knowledge in the field of sound measurements and handling of Measurement equipment
- Adequate knowledge of the applicable international requirements (SOLAS Regulation II-1/3-12 and IMO Code on noise levels onboard Ships)
- At least 1-year experience as an assistant operator before carrying out a measurements
- Training concerning the procedures specified in IMO Code on noise levels onboard Ships
- Be able to document theoretical and practical training onboard in using Sound level meter.

H.1.4 Equipment

H.1.4.1 Sound level meters

Measurement of sound pressure levels shall be carried out using precision integrating sound Level meters. Such meters shall be manufactured to IEC 61672-1(2002-05) type/class 1 standard as applicable.

H.1.4.2 Octave filter set

When used alone, or in conjunction with a sound level meter, as appropriate, an octave filter set shall conform to IEC 61260 (1995)3 or an equivalent standard acceptable to the Administration.

H.1.4.3 Sound calibrator

Sound calibrators shall comply with the standard IEC 60942 (2003-01) and shall be approved by the manufacturer of the sound level meter used.

H.1.4.4 Calibration

Sound calibrator and sound level meters shall be verified at least every two years by a national Standard laboratory or a competent laboratory accredited according to ISO 17025 (2005). A record with a complete description of the equipment used shall be kept, including a calibration log.

H.1.5 Procedures and instructions

Documented work procedures are at least to contain information on survey preparation, selection & identification of sound level measurement locations, Calibration Checks and report preparation.

The supplier shall have documented procedures and instructions to carry out service of the equipment. The procedure should include requirements for recording the nature and extent of damages to and defects found in equipment during servicing and repair work. This data shall be made available to the Society upon request.

H.1.6 Reporting

A noise survey report shall be made for each ship. The report shall comprise information on the noise levels in the various spaces on board. The report shall show the reading at each specified measuring

Section 4 Approval of Service Suppliers

point. The points shall be marked on a general arrangement plan, or on accommodation drawings attached to the report, or shall otherwise be identified.

The format for noise survey reports is set out in appendix 1 of IMO Code on noise levels onboard Ships.

The report may conform to any other specific requirement of the society. The report shall include a copy of the Certificate of Approval

H.1.7 Verification

The supplier must have the Surveyor's verification of each separate job, documented in the report by his signature.

H.2 Firms engaged in whole-body vibration measurements

H.2.1 Extent of engagement

Whole-body vibration measurements onboard Ship.

H.2.2 Supervisor

The supervisor shall have had minimum two years experience as a technician within the field of whole-body vibration measurements acc. ISO 6954:2000. Supervisor shall have adequate knowledge about the frequency weighting and the "Daily Vibration Exposure A(8)" acc. ISO 2631-1.

He bears the total responsibility for the execution of the assignment and for the final report.

H.2.3 Operators

The operator is to have the following qualifications

- Knowledge in the field of whole-body vibration measurements and handling of Measurement equipment
- Adequate knowledge of the applicable international standard ISO 6954:2000
- At least 1-year experience as an assistant operator before carrying out a measurements

H.2.4 Equipment

- The instrumentation shall comply with requirements of ISO 8041.
- The equipment shall be calibrated at periodic intervals of not more than two years. Calibration sheets shall be provided.
- The instrumentation shall allow for calculation of the weighted rms value in terms of vibration velocity according to ISO 6954:2000.
- Provision shall be made for the storage of all spectra and a limited number of time records.
- On non-magnetic floors, measuring sensors should preferably be mounted on a three-legged plate with a minimum weight of 1500 g.

H.2.5 Instructions – Documented work procedures are at least to contain information on measurement preparation in office and onboard, calibration, data acquisition, signal processing, selection and identification of test locations and reporting.

H.2.6 Reporting – The vibration measurement reports shall comprise, as a minimum, the information as given in Annex 3 of these Guidelines.

Annex 2a References

- MSC 337(91); *CODE ON NOISE ON BOARD SHIPS*
- IMO Resolution A.468(XII)- 11:1981; *CODE ON NOISE ON BOARD SHIPS*
- DIRECTIVE 2003/10/EC; *On the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)*
- LärmVibrationsArbSchV; *Verordnung zum Schutz der Beschäftigten vor Gefährdungen durch Lärm und Vibrationen*
- ISO 2923; *Measurement of noise on board vessels – issue 3:2003*
- ISO 9612:2009; *Acoustics - Determination of occupational noise exposure - Engineering method*
- ISO 4869-2:1994; *Acoustics - Hearing protectors - Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn*
- ISO 17020-2004; *General criteria for the operation of various types of bodies performing inspection*
- ISO 17025-2005; *General requirements for the competence of testing and calibration laboratories*
- IEC 61672-1:2002; *Electroacoustics - Sound level meters - Part 1: Specifications*
- IEC 1260:1995; *Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications*
- IEC 60942 – 1:2003; *Electroacoustics - Sound calibrators*
- ISO 717-1:1996 as amended (1:2006), Part 1; *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*
- ISO 10140-2:2010; *Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation*
- ISO 140-4:1998; *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 4: Field measurement of airborne sound insulation between rooms*

Annex 2b Definitions and Terminology

- Accommodation spaces

Cabins, offices (for carrying out ship's business), hospitals, mess rooms, recreation rooms (such as lounges, smoke rooms, cinemas, gymnasiums, libraries and hobbies and games rooms) and open recreation areas to be used by seafarers.

- Apparent weighted sound reduction index, R'_w

A single number value expressed in decibels (dB) which describes the overall sound insulation performance in situ of walls, doors or floors provides (see EN ISO 717-1: 1996 as amended by 1:2006).

- A-weighted equivalent continuous sound level $L_{Aeq,T}$ (often also called: L_{eq})

A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval, T, has the same mean square sound pressure as a sound under consideration which varies with time. It is expressed in decibels A (dB(A)) and is given by the following equation:

$$L_{Aeq,T} = 10 \log \frac{1}{T} \int_0^T \frac{p_a(t)^2}{p_o^2} \cdot dt$$

where:

- T : measurement time
 $p_a(t)$: A-weighted instantaneous sound pressure
 p_o : 20 μ Pa (the reference level)

(see also IEC 61672-1 for details)

- C-weighted equivalent continuous sound level $L_{Ceq(T)}$

C-weighted sound pressure level of a continuous steady sound that within a measurement time interval, T, has the same mean square sound pressure as a sound under consideration which varies with time. It is expressed in decibels C (dB(C)) and is given by the following equation:

$$L_{Ceq,T} = 10 \log \frac{1}{T} \int_0^T \frac{p_c(t)^2}{p_o^2} \cdot dt$$

where:

- T : measurement time
 $p_c(t)$: C-weighted instantaneous sound pressure
 p_o : 20 μ Pa (the reference level)

- C-weighted peak sound level L_{Cpeak}

C-weighted maximum instantaneous sound pressure level. It is expressed in decibels C (dB(C)) and is given by the following equation:

$$L_{Cpeak} = 10 \log \frac{p_{peak}^2}{p_o^2}$$

where:

- p_{peak} : C-weighted maximum instantaneous sound pressure

Annex 2b Definitions and Terminology

p_0 : 20 μPa (the reference level)

- C-weighted sound pressure level or noise level

The quantity measured by a sound level meter in which the frequency response is weighted according to the C-weighting curve (see IEC 61672-1 (2002-05)).

- Continuously manned spaces

Spaces in which the continuous or prolonged presence of seafarers is necessary for normal operational periods.

- Daily noise exposure level ($L_{ex,24h}$) represents the equivalent noise exposure level for a period of 24 hours.

$$L_{ex,24h} = L_{Aeq,T} + 10 \log \frac{T}{T_0}$$

where:

T is the effective duration on board

T_0 is the reference duration 24 h.

The total equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$), shall be calculated by using the different noise levels (L_{Aeq,T_i}) and associated time periods with the following equation:

$$L_{Aeq,T} = 10 \log \left[\frac{1}{T} \sum_{i=1}^n \left(T_i \cdot 10^{0,1 L_{Aeq,T_i}} \right) \right]$$

where:

L_{Aeq,T_i} is the equivalent continuous A-weighted sound pressure level, in decibels, averaged over time interval T_i :

$$T = \sum_{i=1}^n T_i$$

$L_{ex,24h}$: $L_{Aeq,24h}$, when seafarers are on board over a period of 24 hours.

- Hearing loss

Hearing loss is evaluated in relation to a reference auditory threshold defined conventionally in ISO Standard 389-1 (1998). The hearing loss corresponds to the difference between the auditory threshold of the subject being examined and the reference auditory threshold.

- Machinery spaces

Any space which contains steam or internal-combustion machinery, pumps, air compressors, boilers, oil fuel units, major electrical machinery, oil filling stations, thrusters, refrigerating, stabilizing, steering gear, ventilation and air conditioning machinery, etc., and trunks to such spaces.

- Navigating bridge wings

Those parts of the ship's navigating bridge extending towards the ship's sides.

- Noise emission

Any noise which is radiated from e.g. machinery, exhaust gas pipes, walls, floors and ceilings. Noise emission causes noise immission.

- Noise immission

Any noise which is received at human's ear. Noise immission is the consequence of noise emission.

Annex 2b Definitions and Terminology

- Noise exposure

Noise exposure is given if seafarers are working in a noisy work space or living in a noisy environment. High noise exposure will lead to hearing loss if the dose rate exceeds the recommended noise exposure limits. Permanent noise exposure can also have an effect on human health like e.g. sleep disturbance.

- Port condition

The condition in which all machinery solely required for propulsion is stopped.

- Potentially hazardous noise levels

Those levels at and above which persons exposed to them without protection are at risk of sustaining a noise induced hearing loss.

- Sound pressure level L_p or SPL

Sound pressure level expressed in decibel (dB), of a sound or noise given by the following equation

$$L_p = 10 \log \frac{p^2}{p_0^2}$$

where:

p : sound pressure, in pascal

p_0 : 20 μ Pa (the reference level)

- Voyages of short duration

Voyages where the ship is not generally underway for periods long enough for seafarers to require sleep, or long off-duty periods, during the voyages.

- Weighted sound reduction index, R_w

A single number value expressed in decibels (dB) which describes the overall sound insulation performance (in laboratory) of walls, doors or floors provides (see ISO 717-1:1997 as amended by 1:2006).

Annex 2c Determination of Noise Exposure (simplified procedure based on ISO 9612:2009)

A.1 General

In order to ensure that seafarers will not be exposed to an $L_{ex(24)}$ exceeding 80 dB(A) this Appendix is providing information on a simplified procedure for determining the workplace related noise exposure. The determination of noise exposure should be usually carried out based on ISO 9612: 2009.

A simplified method based on the noise measurements during a noise acceptance test and a job-profile for crew members is described in the following:

A.2 Work analysis/job profiling and off-duty hours

With the help of a crew-list different job-categories (groups) are to be defined.

Example:

- Captain
- Chief engineer
- Electrician
- Cook
- etc.

For each job-category a job-profile has to be defined individually. The job-profile is related to the work spaces on board the vessel.

Example:

- Wheelhouse
- Ships office
- Machinery Control Room
- Workshop
- Engine room
- Galley

For each job category the working shift is to be divided into partitions [i] related to the work spaces. A similar assessment should be made for off-duty hours.

(The partitions are based on estimations in the responsibility of the owner/operator/employer)

Example:

A full day for an electrician may be divided into the following five partitions:

i = 1 Workshop	:	$T_i = 5$ hours
i = 2 Machinery Control Room	:	$T_i = 2$ hours
i = 3 Ship Office	:	$T_i = 2$ hours
i = 4 Engine room	:	$T_i = 1$ hours
i = 5 off-duty	:	$T_i = 14$ hours
<hr/>		
Total working shift	:	$T_{total} = 24$ hours

A.3 Determination of estimated noise exposure levels

Based on the noise report and the estimated working times and off-duty hours for each job category the noise exposure level can be calculated according to the formula in Annex 2b.

Note, it is a precondition that the maximum noise level of workers wearing hearing protectors does not exceed 85 dB(A). Regarding the required quality of hearing protectors see [Section 2, C.2.4.1](#).

The noise contribution of each space is calculated as follows:

$$L_{ex,24h,i} = L_{Aeq,i} + 10 \log \left[\frac{T}{T_0} \right]$$

where

T_i is the effective duration on board for each of space

T_0 is the reference duration 24 h

$L_{Aeq,i}$ is the A-weighted equivalent continuous sound level for each space.

The daily noise exposure level is calculated from the noise contribution from each space as follows:

$$L_{ex,24h} = 10 \lg \left[\sum_{i=1}^n 10^{\frac{L_{ex,24h,i}}{10}} \right]$$

Example: Result Sheet

Job category		Location /Space						
		Navigation Bridge	Ship Office	Machinery Control Room	Workshops	Engine-room	Galley	Off-Duty
Measured L_{Aeq} [dB(A)]	Electrician	64	63	75	84	85	72	60
Duration/stay T_i [h]		0	2	2	5	1	0	14
Noise contribution $L_{EX,24h,i}$ [dB]		0	52.2	64.2	77.2	71.2	0	57.7
daily noise exposure level $L_{EX,24h}$ [dB]		78.3 → 78						

Annex 2d Guidance on the Inclusion of Noise Issues in Safety or Occupational Health and Risk Management Systems

A.1 Instruction to seafarers

A.1.1 Seafarers shall be instructed in the hazards of high and long duration noise exposures and the risk of noise induced hearing loss. Instruction shall be given to all seafarers on initial employment and periodically thereafter to those regularly working in spaces with noise levels in excess of 85 dB(A). Instruction in the provisions of the Guideline shall include:

- .1 noise exposure limits and the use of warning notices;
- .2 the types of hearing protectors provided, their approximate attenuation and their proper use, fitting, and the effects on normal communications when first wearing such protection;
- .3 company policies and procedures related to hearing protection and where appropriate any monitoring programme which may be available for seafarers working in spaces covered by warning notices; and
- .4 guidance on the possible signs of hearing loss such as ringing in the ear, dead ear, or fullness in the ear and mitigating techniques to be effected when those signs occur.

A.1.2 Appropriate seafarers shall receive such instruction as is necessary in the correct use and maintenance of machinery and silencers or attenuators in order to avoid the production of unnecessary noise.

A.2 Responsibility of ship operators/ seafarer's employer

A.2.1 The ship operator/seafarer's employer shall be responsible for ensuring that means for noise reduction and control are applied and maintained such that the requirements of the Guideline are met.

A.2.2 Where noise levels in any space exceed the limit of 85 dB(A), ship owners shall ensure that:

- .1 the space is identified and relevant provisions of the Guideline are complied with;
- .2 the master and senior officers of the ship are aware of the importance of controlling entry into the space and the importance of the use of suitable hearing protection;
- .3 suitable and sufficient hearing protection is provided for distribution on an individual basis to all relevant crew members; and
- .4 the master, senior officers and any safety officer on board a ship are aware of the need for the relevant training and information to be provided on board.

A.2.3 Where hand tools, galley and other portable equipment produce noise levels above 85 dB(A) in normal working conditions, ship owners shall ensure that warning information is provided.

A.3 Responsibility of seafarers

A.3.1 Seafarers shall be made aware of the need to ensure that:

- .1 all measures adopted for noise control are utilized;
- .2 any defective noise control equipment is reported to responsible persons under the ships safety management system;
- .3 suitable hearing protectors are always worn when entering areas in which their use is required by warning notices and that those protectors are not removed in those spaces, even for short periods; and
- .4 the hearing protectors provided for their use are not damaged or misused and are maintained in a sanitary condition.

Annex 2e Noise Measurement Report

NOISE MEASUREMENT REPORT

Noise Measurements on Board Vessel

Page 1 of 6

I. General Data

1	Class/Reg.-No.:		IMO-No.:	
2	Shipyard:		Yard Building-No.:	
3	Ship's Name:		Flagstate:	
4	Shipowner:		Measurement according to Rule/Standard: (e.g. IMO A.468(XII), ISO 2923)	
5	Service Supplier/ Measurement Company:		Expert(s) in Charge:	
6	Report-No.:		Issue date of the Report:	
7	Measurements were carried out on behalf of:			

II. Hull Data

8	Type of Ship:	<input type="checkbox"/> Container vessel <input type="checkbox"/> Multi Purpose <input type="checkbox"/> Tanker <input type="checkbox"/> Bulk Carrier <input type="checkbox"/> Passenger vessel <input type="checkbox"/> Ferry <input type="checkbox"/> Tug <input type="checkbox"/> Other		
9	Length (Lpp) [m]:		Breadth [m]:	
10	Depth [m]:		Scantling Draught [m]:	
11	Gross Tonnage [t]:		Design Speed:	
12	Remarks:			

III. Nominal Machinery Data

13	Main Engine	Manufacturer:		Type:	
14		Number of Units:		No. of Cyl./Stroke:	
15		Nominal Power [kW]			
16		Engine Mounting:	<input type="checkbox"/> Rigid <input type="checkbox"/> Resilient		
17	Aux. Engine	Manufacturer:		Type:	
18		Generator (Maker/Type):			
19		Number of Units:		No. of Cyl./Stroke:	
20		Nominal Power [kW]:		Revolution Rate [rpm]:	
21		Electrical Power [kVA]:		Frequency Rate [Hz]:	
22		Engine Mounting:	<input type="checkbox"/> Rigid <input type="checkbox"/> Resilient		
23	Gearbox	Manufacturer:		Type:	
24		Number of Units:		Reduction Ratio:	
25		Power Rating [kW]:			
26	Propeller	Manufacturer:		Kind of propeller:	

Annex 2e Noise Measurement Report

27		Number of Propellers:		Number of Blades:	
28		Diameter:		Nominal Revolution Rate [rpm]:	
29	Remarks:				

IV. Machinery Condition during Measurement

30	Main Engine	Number of Units in Op.:		MCR [%] / Power [kW]:	
31		Revolution rate [rpm]:		Shaft Generator [kW]:	
32	Propeller		<input type="checkbox"/> FPP (Fixed Pitch) <input type="checkbox"/> CPP (Controllable Pitch)		
33		Revolution rate [rpm]:			
34		Propeller Pitch [°]:			
35	Aux. Engine	Number of Units in Op.:		Power Rating [kW]:	
36		Revolution rate [rpm]:			
37	Engine room ventilation	Number of Units in Op.:		Power Rating [kW]:	
38		Revolution rate [rpm]:		Operating mode: high / low / variable	
39	AC-Units/ Water chiller	Number of Units in Operation:		Power Rating [kW]:	
40	Remarks				

V. Environmental and Hull Floating Condition during Measurement

41	Kind of Voyage	<input type="checkbox"/> Sea Trial <input type="checkbox"/> Loaded Voyage <input type="checkbox"/> Others			
42	Date / Time	Date of measurements:			
43		Starting time:		Finished:	
44	Draught	Aft [m]:		Forward [m]:	
45	Ship speed	[kts]		[°]	
46	Water Depth	[m]			
47	Weather	Wind Speed [bft]: Wind direction [°]:		Sea State: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> higher	
48	Sea Area	Area:			
49	Remarks:				

VI. Measurement Equipment

50	Sound Level Meter	Type:		Manufacturer:	
51	(approved according to IEC 651 or IEC 61672-Type/Class 1)	Serial-No.:		Last Calibration:	
52	Calibrator	Type:		Manufacturer:	
53		Serial-No.:		Last Calibration:	
54	Other Equipment (e.g. octave-filter-set according to IEC 61260)	Type:		Manufacturer:	
55		Serial-No.:		Last Calibration:	

VII. Noise Abatement Measures installed on the Vessel (if applicable)

56	Deck	Location / Space / Engine	Kind of measures (i.e. resilient mounting, floating floor, absorbing ceiling systems, baffle system, silencers)	Condition (i.e. Finished/Not completed/no furniture)

(Note: Add rows if required with TAB key in the last cell of the table)

VIII. Noise Level Measurements (Sound Pressure Levels, SPL/ L_{Aeq})

A. Noise Measurements are Required for the Following Spaces:

Work spaces

- Machinery spaces
- Machinery control rooms
- Workshops
- Non-specified workspaces

Navigation spaces

- Navigating bridge and chartrooms
- Listening posts, including navigating bridge wings and windows
- Radio rooms
- Radar rooms

Accommodation spaces

- Cabin and hospitals
- Mess rooms
- Recreation rooms
- Open recreation areas
- Offices

Service spaces

- Galleys, without food processing equipment operating
- Serveries and pantries

Normally unoccupied spaces

Annex 2e Noise Measurement Report

B. Measurement Result Table:

Note: The results in the table below are valid only with a measurement location plan

57	Space No *	ID-No.	Measurement Location/Description	Measured SPL in dB(A)	Limit db(A) **	NR-Curve Figure-No.	Remarks (i.e. single tones, dominant noise sources)

(Note: Add rows if required with TAB key in the last cell of the table)

* According to the measurement location plan enclosed.

** the applicable Regulation has to be applied

Annex 2e Noise Measurement Report

IX. Final Statements to the Measurement Report

59	Statement: Expert in Charge		
	Herewith it is confirmed that all measurements were carried out according to the above mentioned standard/regulation		
	Place / Date	Stamp	Name and Signature Expert in Charge
60	Statement: Representatives		
	Herewith we confirm that noise measurements on board the above mentioned vessel were carried out:		
	Place / Date	Stamp	Name and Signature Owner Representative
	Place / Date	Stamp	Name and Signature Yard Representative
	Place / Date	Stamp	Name and Signature GL Representative

Annex 3 Vibration Measurement Report

Vibration Measurements for CoC (Certificate of Compliance) on board vessels according to
GL Guidelines for Compliance with MLC 2006 Noise and Vibration Requirements

1. General Data

1	Class/Reg.-No.:		IMO-No.:	
2	Shipyard:		Yard Building-No.:	
3	Ship's Name:		Flagstate:	
4	Shipowner:		Expert(s) in Charge:	
5	Measurement Company:		Issue date of the Report:	
6	Report-No.:			
7	Measurements were carried out on behalf of:			

2.

3. Hull Data

8	Type of Ship:	<input type="checkbox"/> Container vessel <input type="checkbox"/> Multi Purpose <input type="checkbox"/> Tanker <input type="checkbox"/> Bulk Carrier <input type="checkbox"/> Passenger vessel <input type="checkbox"/> Ferry <input type="checkbox"/> Tug <input type="checkbox"/> Other		
9	Length (Lpp) [m]:		Breadth [m]:	
10	Depth [m]:		Scantling Draught [m]:	
11	Gross Tonnage [t]:		Design Speed:	
12	Remarks:			

4. Nominal Machinery Data

13	Main Engine	Manufacturer:		Type:	
14		Number of Units:		No. of Cyl./Stroke:	
15		Power MCR [kW]:		Revolution Rate [rpm]:	
16		Engine Mounting:	<input type="checkbox"/> Rigid <input type="checkbox"/> Resilient <input type="checkbox"/> Semi Resilient		
17	Aux. Engine	Manufacturer:		Type:	
18		Generator (Maker/Type):			
19		Number of Units:		No. of Cyl./Stroke:	
20		Power MCR [kW]:		Revolution Rate [rpm]:	
21		Electrical Power [kVA]:		Frequency Rate [Hz]:	
22		Engine Mounting:	<input type="checkbox"/> Rigid <input type="checkbox"/> Resilient <input type="checkbox"/> Semi Resilient		
23	Gearbox	Manufacturer:		Type:	
24		Number of Units:		Reduction Ratio:	
25		Power Rating [kW]:			
26	Propeller	Manufacturer:		Kind of propeller:	

Annex 3 Vibration Measurement Report

27		Number of Propellers:		Number of Blades:	
28		Diameter:		Nominal Revolution Rate [rpm]:	
29	Remarks:				

5. Machinery Condition during Measurement

30	Main Engine	Number of Units in Op.:		Total Power [kW]:	
31		Revolution rate [rpm]:		Shaft Generator [kW]:	
32	Propeller		<input type="checkbox"/> FPP (Fixed Pitch) <input type="checkbox"/> CPP (Controllable Pitch)		
33		Revolution rate [rpm]:			
34		Propeller Pitch [°]:			
35	Aux. Engine	Number of Units in Op.:		Power Rating [kW]:	
36		Revolution rate [rpm]:			
37	Engine room ventilation	Number of Units in Op.:		Power Rating [kW]:	
38		Revolution rate [rpm]:		Operating mode: high/how/variable	
39	Remarks:				

6. Environmental and Hull Floating Condition during Measurement

40	Kind of Voyage	<input type="checkbox"/> Sea Trial <input type="checkbox"/> Loaded Voyage <input type="checkbox"/> Others			
41	Date /Time	Date of measurements:			
42		Starting Time:		Finished:	
43	Draught	Aft [m]:		Forward [m]:	
44	Ship speed	[kts]	Water Depth	[m]	
45	Weather	Wind Speed [bft]:	Sea State: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> higher		
46	Sea Area	Area:			
47	Remarks:				

7. Measurement Equipment

48	Analyser	Type:		Manufacturer:	
49		Serial-No:		Last Calibration:	
50	Transducer	Type:		Manufacturer:	
51		Serial-No:		Last Calibration:	
52		Mounting Method:			

Annex 3 Vibration Measurement Report

8. Signal Processing

53	Analysis Parameter	Sampling Frequency:		Measurement Time per Point:	
54		Averaging Mode:	<input type="checkbox"/> Linear <input type="checkbox"/> Peak Hold	Frequency Resolution:	
55		Sampling Window:	<input type="checkbox"/> Flat Top <input type="checkbox"/> Hanning <input type="checkbox"/> Others		
56		Time Signal available	<input type="checkbox"/>	Frequency Spectrum available:	<input type="checkbox"/>

9. Measurement Results (ISO 6954 Edition 2000)

57	Measurement Point No.	Measurement Location/Description	Direction (x, y, z)	VOA **) [mm/s]	Limit Value [mm/s]	Spectrum Plot Figure No.
	MP1					
	MP2					

Annex 3 Vibration Measurement Report

- *) According to the measurement location plan enclosed (see Appendix A)
- ***) V_{QA} : Overall frequency weighted r.m.s.-values (1 – 80 Hz) of vibration velocity

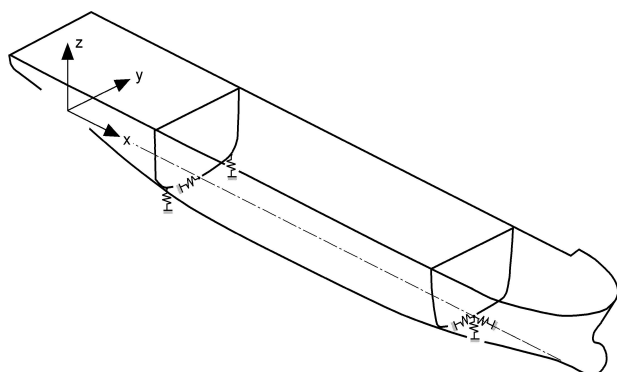
10.Final Statements to the Measurement Report

58	Statement: Expert in Charge		
	Herewith it is confirmed that all measurements were carried out according to the above mentioned standard/regulation.		
	_____	_____	_____
	Place	Date	Signature (Expert in charge)
59	Statement: Representatives		
	Herewith we confirm that vibration measurements on board the above mentioned vessel were carried out.		
	_____	_____	_____
	Place	Date	Signature (Owner attendee)
	_____	_____	_____
	Place	Date	Signature (GL Surveyor)
	_____	_____	_____
	Place	Date	Signature (Shipyard attendee)

Appendix A

Required Measurement Locations and Directions

Measurement Point No.	Measurement Location/Description	Direction (X, Y, Z)
Bridge Deck		
MP1	Bridge Console	Z
MP2	Card Table	Z
MP3	Radio Room	Z
MP4	CL (mid of room)	Z
MP5	Longitudinal wall PS (forward corner)	X, Y, Z
MP6	Bridge Wing PS (at steering position)	X, Y, Z
MP7	Bridge Wing SB (at steering position)	X, Y, Z
Accommodation Decks		
MP8 ...	Day Room Master	Z
	Sleeping Room Master	Z
	Day Room Chief	Z
	Sleeping Room Chief	Z
	Day Room 1 st officer	Z
	Sleeping Room 1 st officer	Z
	Living & Sleeping Rooms of other Crew members	Z
	Hospital	Z
	Galley	Z
	Ships office (if applicable)	Z
	Officer Mess (middle of room)	Z
	Officer Mess (below table)	Z
	Crew Mess (middle of room)	Z
	Crew Mess (below table)	Z
	Gymnasium (if applicable)	Z
	Recreation areas (if applicable)	Z
Every Deck (2 global measurement points)		
	Longitudinal wall PS (forward corner)	X, Y, Z
	Front wall (in a window frame)	Y
Machinery Spaces		
	Engine Control Room	Z
	Workshop	Z



X: longitudinal
 Y: transverse
 Z: vertical

Annex 4 Application Form for Approval

Application Form for Approval



Page 1 of 1

of Service Suppliers providing Services in terms of GL's Guidelines for Compliance with MLC 2006 Noise and Vibration Requirements

1 Firm's Data

Name of Firm

Address

ZIP / City

Country

Phone. No.

Telex / E-mail

2 Scope of Activities

- Sound pressure level measurements
 Whole body vibration measurements

We hereby apply for approval of activities as indicated above.

We agree to the data quoted in the approval certification being electronically stored and published by Germanischer Lloyd also in the form of extracts.

Place / Date

Stamp / Signature

The latest edition of the General Terms and Conditions of Germanischer Lloyd is applicable. German law applies.

