



GUIDE FOR

**COMPLIANCE WITH THE ILO MARITIME LABOUR
CONVENTION, 2006 TITLE 3 REQUIREMENTS**

MAY 2009 (Updated October 2010 – see next page)

**American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862**

**Copyright © 2009
American Bureau of Shipping
ABS Plaza
16855 Northchase Drive
Houston, TX 77060 USA**

Updates

October 2010 consolidation includes:

- May 2009 version plus Notice No. 1

Foreword

The International Labour Organization (ILO) is the United Nation's (UN) specialized agency that seeks the promotion of social justice and internationally recognized human and labor rights.

The ILO provides legal instruments aimed at protecting and improving working conditions, including those of seafarers. Recently, the International Labour Organization produced the Maritime Labour Convention, 2006 (MLC) which was adopted during the 94th Session of the ILO on February 23, 2006.

The MLC provides a comprehensive code regarding seafarers' rights, and the obligations of States and vessel Owners with respect to these rights. The MLC incorporates the fundamental principles of many ILO Conventions and updates standards of 68 existing ILO Conventions into one document. The MLC comprises three different but related parts: the Articles, the Regulations, and the Code. The Articles and Regulations set out the core rights and principles and the basic obligations of Members ratifying the MLC. The Code contains the details for the implementation of the Regulations. The Regulations and the Code are organized into general areas under 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
- Title 4: Health protection, medical care, welfare, and social security protection
- Title 5: Compliance and enforcement

Title 3 of the MLC, "Accommodation, recreational facilities, food and catering" addresses issues related to quality of life at sea, including the physical design of seafarer accommodations and the characteristics of the ambient environment (e.g., whole-body vibration, noise, indoor climatic variables, and lighting) which seafarers are exposed to during work, rest, and recreation. Guidance for complying with the Title 3 requirements is provided in this Guide, the *ABS Guide for Compliance with the ILO Maritime Labour Convention, 2006 Title 3 Requirements*. This Guide is based on ABS' interpretation of the intent of the Part A requirements and on what ABS considers satisfactory compliance with the Part A requirements.

This Guide provides the assessment criteria and measurement methodology for obtaining an ABS Maritime Labor Convention (MLC) Accommodations (ACCOM) notation (**MLC-ACCOM**). This Guide focuses on five (5) categories of design criteria addressed in Title 3. These categories are accommodations design, whole-body vibration, noise, indoor climatic variables, and lighting.

To be awarded an **MLC-ACCOM** notation, a vessel must meet all the appropriate criteria across the various accommodations categories. This notation is only related to Title 3.

General guidance for complying with Titles 1, 2, 3, 4 and 5 is provided in a separate document called the *ABS Guidance Notes on the ILO Maritime Labour Convention, 2006*. The *ABS Guidance Notes on the ILO Maritime Labour Convention, 2006* is intended to assist vessel Owners and Operators to understand the requirements of the MLC and provide relevant examples for addressing these requirements within a company's management system.

This Page Intentionally Left Blank



GUIDE FOR COMPLIANCE WITH THE ILO MARITIME LABOUR CONVENTION, 2006 TITLE 3 REQUIREMENTS

CONTENTS

SECTION 1	General	1
1	Introduction	1
2	Application	1
3	Scope	1
4	Terminology	2
5	Associated Documentation	2
6	Notation.....	2
7	Data and Plans to be Submitted	2
	7.1 General	2
	7.2 Accommodations.....	3
	7.3 Ambient Environment.....	3
8	Process for Obtaining a Notation.....	3
	8.1 Accommodations.....	4
	8.2 Ambient Environment.....	5
	8.3 Results	5
9	Initial Requirements	5
10	Surveys after Construction	5
	10.1 Annual Surveys.....	5
	10.2 Special Periodical Surveys.....	6
	10.3 Requirements for Vessel Alterations	8
	10.4 Requirements for Geographical Area of Vessel Operations	8
11	Alternatives	8
	11.1 General	8
	11.2 National Regulations	8
	11.3 Departures from Criteria.....	9
	FIGURE 1 Process for Obtaining an MLC-ACCOM Notation.....	4
SECTION 2	Accommodations Design	11
1	Background	11
2	Scope	11
3	Terminology	11

4	Associated Documentation	12
5	Criteria.....	12
6	Accommodations Documentation	12
6.1	Data Requirements	12
7	Submittal Review and Verification	12
8	Results	12
SECTION 3	Whole-body Vibration	13
1	Background	13
2	Scope	13
3	Terminology	14
4	Associated Documentation	15
5	Criteria.....	15
6	Test Plan	16
6.1	Documentation	17
6.2	Test Personnel	17
6.3	Test Conditions	17
6.4	Measurement Locations	17
6.5	Data Acquisition and Instruments.....	17
6.6	Data Analysis	17
6.7	Test Schedule	17
7	Test Requirements.....	17
7.1	General.....	17
7.2	Data Acquisition and Instruments.....	18
7.3	Test Conditions	18
7.4	Measurement Locations	19
8	Test Report	20
8.1	Test Details	20
8.2	Measurement Equipment Details	20
8.3	Results	20
8.4	Deviations.....	21
8.5	Surveyor Witnessing Documentation	21
9	Results	21
TABLE 1	Maximum Weighted Root-Mean-Square Vibration Level.....	16
FIGURE 1	Measurement Axes	16
FIGURE 2	Process for the Measurement and Analysis of Whole-body Vibration.....	18
SECTION 4	Noise	23
1	Background	23
2	Scope	23
3	Terminology	24

4	Associated Documentation	25
5	Criteria	25
5.1	A-weighted Sound Pressure Level	25
5.2	Acoustic Insulation	26
6	Test Plan	26
6.1	Documentation	27
6.2	Test Personnel	27
6.3	Test Conditions	27
6.4	Measurement Locations	27
6.5	Data Acquisition and Instruments	27
6.6	Data Analysis	27
6.7	Test Schedule	27
7	Test Requirements	27
7.1	General	27
7.2	Data Acquisition and Instruments	27
7.3	Test Conditions	27
7.4	Measurement Locations	29
7.5	Measurement Procedures and Recorded Results	30
8	Test Report	31
8.1	Test Details	31
8.2	Measurement Equipment Details	31
8.3	Results	31
8.4	Deviations	32
8.5	Surveyor Witnessing Documentation	32
9	Results	32
	TABLE 1 Noise Criteria	26

SECTION 5	Indoor Climate	33
1	Background	33
2	Scope	33
3	Terminology	34
4	Associated Documentation	35
5	Criteria	35
5.1	Air Temperature	35
5.2	Relative Humidity	36
5.3	Air Exchange Rate	36
5.4	Summary	36
6	Test Plan	36
6.1	Documentation	36
6.2	Test Personnel	36
6.3	Test Conditions	37
6.4	Measurement Locations	37
6.5	Data Acquisition and Instruments	37
6.6	Data Analysis	37
6.7	Test Schedule	37

7	Test Requirements.....	37
	7.1 General.....	37
	7.2 Data Acquisition and Instruments.....	37
	7.3 Test Conditions	37
	7.4 Measurement Locations	38
8	Test Report	39
	8.1 Test Details	39
	8.2 Transducer Measurement Positions.....	40
	8.3 Measurement Equipment Details	40
	8.4 Results	40
	8.5 Deviations.....	40
	8.6 Surveyor Witnessing Documentation	40
9	Results	40

TABLE 1	Summary of Indoor Climate Requirements.....	36
---------	---	----

SECTION 6	Lighting.....	41
1	Background.....	41
2	Scope.....	41
3	Terminology	42
4	Associated Documentation	43
5	Criteria.....	43
	5.1 General and Task Lighting	43
6	Test Plan.....	43
	6.1 Documentation	43
	6.2 Test Personnel	43
	6.3 Test Conditions	43
	6.4 Measurement Locations	44
	6.5 Data Acquisition and Instruments.....	44
	6.6 Data Analysis	44
	6.7 Test Schedule	44
7	Test Requirements.....	45
	7.1 General.....	45
	7.2 Data Acquisition and Instruments.....	45
	7.3 Test Conditions	45
	7.4 Measurement Locations	46
8	Test Report	47
	8.1 Test Details	47
	8.2 Measurement Positions.....	47
	8.3 Measurement Equipment Details	48
	8.4 Results	48
	8.5 Deviations.....	48
	8.6 Surveyor Witnessing Documentation	48
9	Results	48

TABLE 1	Lighting Criteria for Seafarer Accommodations Spaces	44
---------	---	----

APPENDIX 1	References	49
1	General References.....	49
2	Accommodations References.....	49
3	Whole-body Vibrations References.....	50
4	Noise References.....	50
5	Indoor Climate References.....	51
6	Lighting References.....	51
APPENDIX 2	Procedural Requirements for External Specialists Performing Ambient Environmental Testing	53
1	Terminology.....	53
2	Objective.....	53
3	Application.....	53
4	Procedure for Approval and Certification.....	54
4.1	Submission of Documents.....	54
4.2	General Requirements.....	54
4.3	Auditing of the External Specialist.....	55
4.4	Certification.....	55
4.5	Quality Assurance System.....	55
4.6	External Specialist Relations with the Test Equipment Manufacturer.....	56
5	Certificate of Approval.....	56
5.1	Renewal.....	56
6	Alterations.....	56
7	Cancellation of Approval.....	57
8	Detailed Requirements by Ambient Environmental Aspect.....	57
8.1	Whole-body Vibration.....	57
8.2	Noise.....	58
8.3	Indoor Climate.....	59
8.4	Lighting.....	60
9	References.....	61
APPENDIX 3	Accommodations Criteria	63
	Accommodations Criteria – General.....	63
	Accommodations Criteria – Berthing.....	65
	Accommodations Criteria – Food Service.....	68
	Accommodations Criteria – Sanitary Spaces.....	69
	Accommodations Criteria – Recreation.....	71
	Accommodations Criteria – Laundry.....	72
APPENDIX 4	Acronyms and Abbreviations	73
APPENDIX 5	Associated Documentation	75



SECTION 1 General

1 Introduction

Accommodations standards are a measure of the acceptability of seafarer accommodations and workspaces for living and working. The *ABS Guide for Compliance with the ILO Maritime Labour Convention, 2006 Title 3 Requirements* has been developed to assist vessel Owners and Operators to understand and fulfill the Maritime Labour Convention's (MLC) Title 3, "Accommodation, Recreational Facilities, Food and Catering" requirements. This Guide is intended for use by vessel Owners or companies requesting the optional notation of **MLC-ACCOM**.

The accommodations and ambient environmental criteria provided in this Guide are derived from human factors, ergonomics, and safety practices and principles, as well as available research data and standards. These criteria establish levels of safety and health consistent with the intent of the MLC. The criteria are based on ABS' interpretation of the intent of the Part A requirements and on what ABS considers satisfactory compliance with the Part A requirements of the MLC Regulations 3.1 and 3.2.

2 Application

Except as expressly provided otherwise, the ILO Maritime Labour Convention applies to all vessels (and the seafarers on those vessels), whether publicly or privately owned, ordinarily engaged in commercial activities. It defines a seafarer as any person who is employed or is engaged or works in any capacity onboard a vessel. The Convention does not apply to vessels engaged in fishing or in similar pursuits, vessels which navigate exclusively in inland waters or waters within, or closely adjacent to, sheltered waters or areas where port regulations apply; and vessels of traditional build such as dhows and junks. The Convention does not apply to warships or naval auxiliaries.

In the event of doubt as to whether this Convention applies to a vessel or particular category of vessels, the question shall be determined by the competent authority in each ILO Member State after consultation with the vessel Owners' and the seafarers' organizations concerned. [Article II, paragraphs 4 and 5]

3 Scope (15 October 2010)

This Guide focuses on five (5) aspects of vessel design and layout that can be controlled, measured, and assessed. These five (5) aspects are broken into two (2) major types in this Guide: accommodations design and characteristics of the ambient environment.

Accommodations criteria pertain to dimensional or physical aspects of spaces/areas where seafarers work, eat, sleep, recreate, and conduct routine activities.

The criteria associated with the **MLC-ACCOM** notation is applicable only to accommodation spaces where seafarers sleep, rest, dine, and recreate.

This Guide, particularly in Section 3, "Whole-body Vibration" and Section 4, "Noise", provides additional guidance related to seafarer work spaces. This guidance can be used if any voluntary ambient environmental testing is to be done in seafarer work spaces. This testing is recommended, but not required.

4 Terminology

Accommodation: Includes such sleeping rooms, mess rooms, sanitary, hospital and recreation accommodations as provided for the use of the seafarer. Basically, vessel areas where the primary purpose is to rest or recreate.

Ambient Environment: Ambient environment refers to the environmental conditions that the seafarer is exposed to during periods of work, leisure, or rest. Specifically, this Guide provides criteria and limits for whole-body vibration, noise, indoor climate, and lighting.

Associated Documentation: Documents referenced in this Guide that are needed to provide measuring techniques and further guidance.

External Specialists: Specialized test personnel who must meet the requirements of Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”.

Manned Space: Any space where a seafarer may be present for twenty (20) minutes or longer at one time during normal, routine daily activities. Such spaces would include working or living spaces.

Recreational and Public Spaces: Those portions of the seafarer accommodations which are used for halls, dining rooms, lounges, and similar spaces.

Seafarer: Any person onboard a vessel, including the Master, who is not a passenger.

Seafarer Spaces: All areas on a vessel intended for seafarers only, such as seafarer accommodations spaces and seafarer work spaces.

Shall: Expresses a provision that is mandatory.

Should: Expresses a provision that is a recommended or preferred guideline.

Test Plan: Document containing the requisite information regarding vessel design and layout, test personnel, test conditions, measurement locations, data acquisition, instruments, data analysis, and test schedule necessary for verifying the measurements for the ambient environmental aspects of accommodations.

5 Associated Documentation

Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”, defines the process for External Specialist approval and certification with regard to testing and evaluating ambient environmental conditions onboard vessels.

6 Notation

At the request of the Owner or shipyard, a vessel complying with the criteria contained in this Guide for seafarer accommodations and the associated ambient environmental characteristics (i.e., whole-body vibration, noise, indoor climate, and lighting) shall be assigned a notation of **MLC-ACCOM**.

7 Data and Plans to be Submitted

7.1 General

The following General Arrangement type drawings of the vessel shall be submitted:

- i) Inboard profile detailing the location of the main vertical zone boundaries, the location of the main watertight bulkheads, as well as the various deck levels
- ii) Plan view of each deck annotating the various spaces on each deck

7.2 Accommodations

At a minimum, scaled arrangement drawings of the various seafarer accommodations spaces (elevation and plan views) and the vessel’s accommodations specifications shall be submitted to ABS Engineering. Details of the seafarer accommodations data requirements are provided in Subsection 2/6, “Accommodations Documentation”.

7.3 Ambient Environment

The following items are to be submitted for each ambient environmental aspect.

7.3.1 Test Plans

Test plans shall serve as the principal means for verifying the measurements for the ambient environmental aspects of accommodations. Separate test plans are required for vibration, noise, indoor climate, and lighting. Specific test plan details for the various ambient environmental criteria are outlined in later sections of this Guide as follows:

<i>Environmental Aspect</i>	<i>Test Plan Details</i>
Whole-body Vibration	Subsection 3/6
Noise	Subsection 4/6
Indoor Climate	Subsection 5/6
Lighting	Subsection 6/6

The test plans require approval by ABS Engineering before any measurements are made. The Bureau shall notify the vessel Owner or shipyard whether the test plans have been approved or require alteration. A Bureau-approved copy of the Test Plan shall become part of the vessel’s official documentation.

7.3.2 Test Reports

Upon completion of the ambient environmental testing, test reports shall be submitted to the ABS Surveyor. In addition, a copy of the test reports shall become part of the vessel’s official documentation. These reports contain ambient environmental information such as test results, testing details, measurement equipment details, etc. The specific report contents for the various ambient environmental criteria are outlined in later sections of this Guide as follows:

<i>Environmental Aspect</i>	<i>Test Report Details</i>
Whole-body Vibration	Subsection 3/8
Noise	Subsection 4/8
Indoor Climate	Subsection 5/8
Lighting	Subsection 6/8

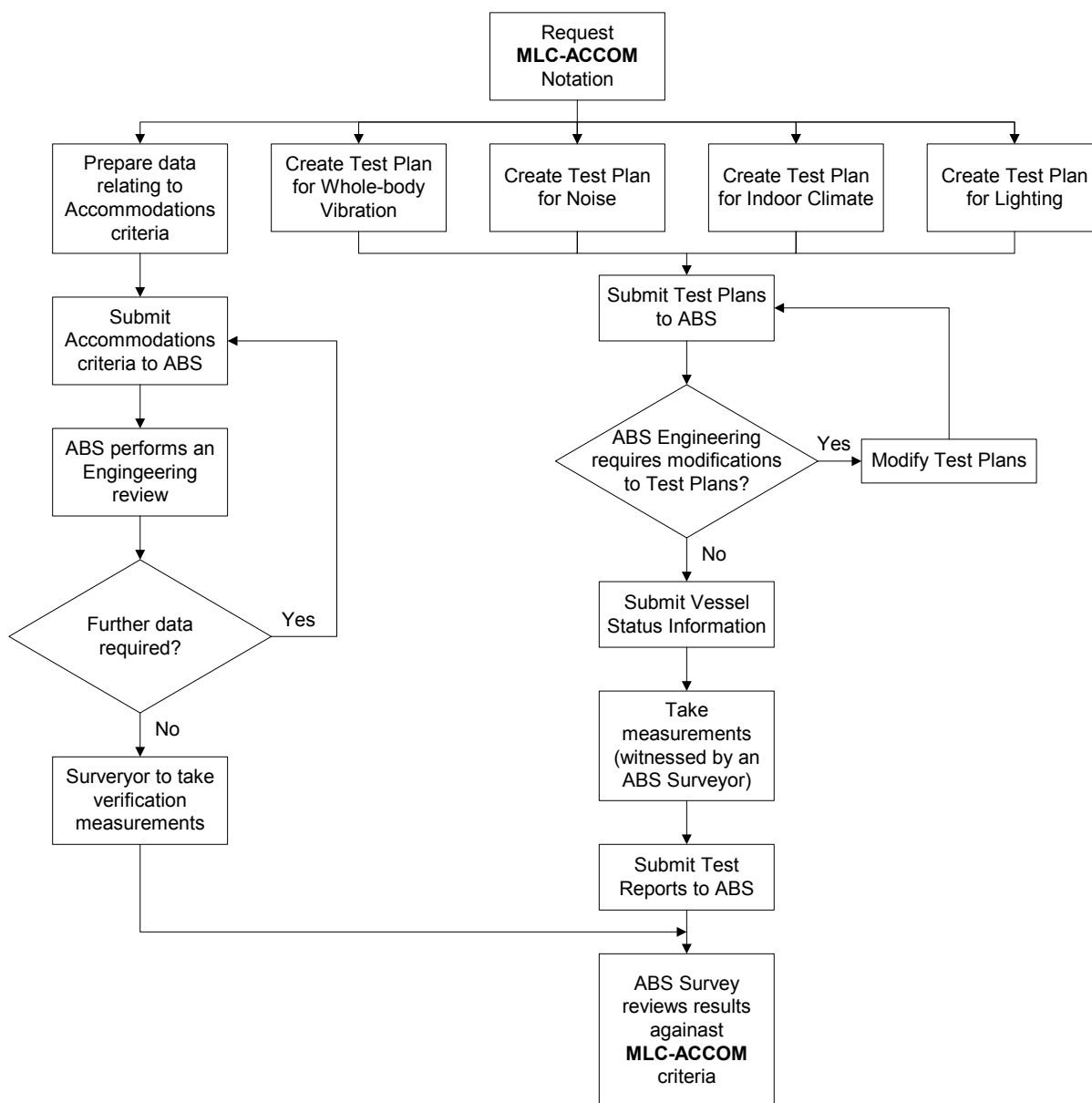
8 Process for Obtaining a Notation

Prior to scheduling accommodations verification or ambient environmental testing activities, the vessel Owner or shipyard shall certify the operational status of the vessel as being fully operational and/or inclusive of all equipment and furnishings. If the vessel is not fully operational, a complete listing of deficiencies of areas, components, equipment, etc., shall be submitted to the Bureau for review.

The Bureau shall then make a determination and notify the vessel Owner or shipyard as to whether accommodations verification activities or ambient environmental testing can commence.

Section 1, Figure 1, “Process for Obtaining an **MLC-ACCOM** Notation”, charts the process for obtaining an **MLC-ACCOM** notation. The following Paragraphs briefly describe the notation process.

FIGURE 1
Process for Obtaining an MLC-ACCOM Notation



8.1 Accommodations

Arrangement drawings, plans, and vessel design specifications for seafarer accommodations spaces shall be prepared and submitted to ABS Engineering for review. For new construction, the drawings shall be provided to ABS Engineering during the detailed design phase. For existing vessels, the arrangement drawings and plans reflecting the current seafarer accommodations configurations shall be provided to and approved by ABS Engineering in advance of ABS Surveyor verifications.

Follow-up physical verification measurements of seafarer accommodations criteria shall be performed by an ABS Surveyor. The ABS Surveyor shall select verification measurement sites.

The results of the ABS Engineering review and actual ABS Surveyor verification shall be reviewed by the ABS Surveyor during the notation confirmation process.

8.2 Ambient Environment

Ambient environmental test plans for whole-body vibration, noise, indoor climate, and lighting shall be prepared and submitted to ABS Engineering. These test plans shall serve as a primary vehicle for verifying the measurement locations and measurement process, as well as specifying the external specialist who will perform the ambient environmental testing.

Testing, inspections, and data collection shall be performed by External Specialists and witnessed by an ABS Surveyor. Test reports for ambient environmental testing shall be prepared by External Specialists and submitted to the ABS Surveyor for review.

8.3 Results

The ABS Engineering seafarer accommodations assessment, ABS Surveyor verification measurements, ambient environmental test reports, and test results, shall be reviewed by the ABS Surveyor for determination of notation confirmation.

9 Initial Requirements

The initial process for obtaining an **MLC-ACCOM** notation shall comprise ABS Engineering reviews, ABS Surveyor verifications, and ambient environmental testing. Testing shall be in accordance with the submitted test plans reviewed and approved by ABS Engineering in advance of the testing. Testing shall be witnessed by an ABS Surveyor. If the criteria specified in this Guide have been met, then the notation shall be confirmed.

10 Surveys after Construction

It is intended that all surveys after construction are to be aligned with Classification Surveys. Harmonization of surveys is to be carried out at the first available opportunity.

10.1 Annual Surveys

In order to maintain the **MLC-ACCOM** notation, an Annual Survey shall be made within three (3) months before or after each annual anniversary date of the crediting of the Initial Survey or the previous Special Periodical Survey. The following information shall be reviewed by the attending ABS Surveyor for issues that could effect the Accommodations notation.

- i)* Vessel's log since previous Initial, Annual, or Special Periodical Survey
- ii)* Chief Engineer's log since previous Initial, Annual, or Special Periodical Survey
- iii)* Collision and grounding reports since previous Initial, Annual, or Special Periodical Survey
- iv)* Fire, repair, and damage reports since previous Initial, Annual, or Special Periodical Survey
- v)* A list of all alterations to the vessel since previous Initial, Annual, or Special Periodical Survey
- vi)* Verification that equipment and facilities continue to be fit for purpose and are operating in accordance with Accommodations Criteria stated within this Guide

During the attending ABS Surveyor's review of the information, a determination will be made as to whether changes or alterations have taken place that could affect the Accommodations notation. As a result, the vessel may be subject to the review, ambient environmental testing, and inspection requirements of this Guide.

10.2 Special Periodical Surveys

In order to maintain the **MLC-ACCOM** notation, a Special Periodical Survey shall be completed within five (5) years after the date of build or after the crediting date of the previous Special Periodical Survey. A Special Periodical Survey will be credited as of the completion date of the survey but not later than five (5) years from date of build or from the date recorded for the previous Special Periodical Survey. If the Special Periodical Survey is completed within three (3) months prior to the due date, the Special Periodical Survey will be credited to agree with the effective due date. The Special Periodical Survey may be commenced fifteen (15) months prior to the due date and be continued with completion by the due date.

10.2.1 Special Periodical Survey Number 1 (Age \leq 5 Years)

The Survey shall comprise ABS Engineering reviews, ABS Surveyor verifications, and ambient environmental testing. The Survey will cover all five (5) accommodations aspects.

The following shall be submitted to the Bureau three (3) months prior to carrying out the ambient environmental testing:

- i)* Collision and grounding reports since previous Annual Survey
- ii)* Fire, repair, or damage reports since previous Annual Survey
- iii)* A list of all alterations to the vessel since previous Annual Survey, if applicable
- iv)* Any drawings/arrangements of seafarer spaces, HVAC, electrical, etc., affected by alterations, if applicable

The Special Periodical Survey data submittal serves several purposes. The first is to perform an ABS Engineering review of seafarer spaces against any alterations to the vessel since the Initial Survey and to allow scheduling of measurement verifications and ambient environmental testing.

A Special Periodical Survey Test Plan for each ambient environmental aspect of accommodations shall be submitted in accordance with the criteria stated below. The approved Initial Test Plans can be used as a basis for creating the Special Periodical Survey Test Plans.

For the creation of the Special Periodical Survey Test Plans, Subsection 6, "Test Plan", and Subsection 7, "Test Requirements", of this Guide specify the requirements for each ambient environmental aspect (i.e., 3/6, 3/7, 4/6, 4/7, etc.). For specifying measurement locations for the Special Periodical Survey Test Plans, the following changes to 7.4., "Measurement Locations", of each ambient environmental aspect of accommodations shall be followed:

- i)* Measurements shall be taken in all areas affected by vessel alterations. Measurements would be limited to the ambient environmental aspect affected by the alteration. For example, structural changes would require both vibration and noise measurements. Structural changes would not necessarily require indoor climate or lighting measurements. Changes to luminaires would require lighting measurements but not vibration, noise, or indoor climate measurements.
- ii)* Measurements shall be taken in all worst case or problem area locations. Worst case or problem area locations for a particular ambient environmental aspect shall be selected based on the requirements set forth in 7.4, "Measurement Locations", of the appropriate Section of this Guide. For example, worst case for vibration is described in 3/7.4.1i).
- iii)* For whole-body vibration, additional measurements shall be taken in seafarer cabins and staterooms throughout the vessel. For vessels with fewer than one hundred (100) seafarer cabins and staterooms, ten (10) percent of cabins and staterooms shall be measured.
- iv)* Regardless of the number of seafarer cabins and staterooms on a vessel, attention must be given to selecting a variety of locations port, starboard, fore, amidships, and aft. The worst case locations can be considered part of the representative sample for seafarer cabins and staterooms, if applicable.

- v) For whole-body vibration, additional measurements shall also be taken in seafarer living and working spaces other than seafarer cabins and staterooms. Where a single instance of one (1) type of manned space exists within the vessel (e.g., bridge, radio room, officer's mess, gymnasium, library, etc.), that location shall be selected for measurement. Where multiple instances of seafarer recreational spaces exist, a representative sample of at least ten (10) percent of each type shall be selected for measurement. The worst case locations are to be considered part of the representative sample, if applicable.
- vi) If any of the spaces identified for measurement extend or are situated over a large portion of the vessel, measurement locations shall be selected throughout the length of the vessel and on each deck. Additionally, attention must be given to selecting a variety of locations port, starboard, amidships, fore, and aft.
- vii) For noise, indoor climate, and lighting, where a single instance of a particular seafarer space exists, that location shall be selected for measurement. The worst case locations can be considered part of the single instance representative sample, if applicable.
- viii) For noise and indoor climate, where multiple instances of a particular type of seafarer space exist, a representative sample of at least ten (10) percent of these spaces shall be selected for measurement. The worst case locations can be considered part of the multiple instance representative samples, if applicable.
- ix) For lighting, a sample of at least ten (10) percent of spaces where seafarers are involved in recreational activities (e.g., mess rooms or recreation areas) shall be selected for measurement.

Where a number of cabins, staterooms and sanitary spaces are identical in configuration in terms of lighting systems, surface treatments, geometry, furnishings and equipment layout, only two (2) of the spaces shall be selected to determine whether the lighting requirements are met. A sample of at least fifteen (15) percent of the remaining spaces shall be visually inspected.

The worst case locations can be considered part of these lighting representative samples, if applicable.

For all ambient environmental conditions, walkthrough verification inspection locations shall be conducted in accordance with 7.4, "Measurement Locations" of the appropriate Section of this Guide.

10.2.2 Special Periodical Survey Number 2 (5 Years < Age ≤ 10 Years)

The Survey will comprise ABS Engineering reviews, ABS Surveyor verifications, and ambient environmental testing. The Survey will cover all five (5) accommodations areas and will follow the same procedures and requirements as the Initial Survey except for the drawing and information submittals stated here.

The following is to be submitted to the Bureau three (3) months prior to carrying out the ambient environmental testing:

- i) Collision and grounding reports since previous Annual Survey
- ii) Fire, repair, and damage reports since previous Annual Survey
- iii) A list of all alterations to the vessel since previous Annual Survey
- iv) Any drawings/arrangements of seafarer spaces, HVAC, electrical, etc., affected by alterations

The Special Periodical Survey data submittal serves several purposes. The first is to perform an ABS Engineering review of seafarer spaces against any alterations to the vessel since the Initial Survey and to allow scheduling of measurement verifications and ambient environmental testing.

A Special Periodical Survey Test Plan for each ambient environmental aspect of accommodations shall be submitted in accordance with Subsection 6, “Test Plans” and Subsection 7, “Test Requirements” of the appropriate ambient environment Section. The Test Plan shall incorporate the same procedures and requirements as the Initial Survey with the following addition. Measurement locations will be specified for spaces where vessel alterations have occurred or where such alterations may affect the ambient environmental aspects associated with a space. Regardless, the approved Initial Test Plans can be used as a basis for creating the new Special Periodical Survey Test Plans.

10.2.3 Special Periodical Survey Number 3 (10 Years < Age ≤ 15 Years)

The Survey is to follow the same procedures and requirements as described in 1/10.2.1, “Special Periodical Survey Number 1 (Age < 5 Years)”.

10.2.4 Subsequent Special Periodical Surveys (Age > 15 Years)

The Survey is to follow the same procedures and requirements as described in 1/10.2.2, “Special Periodical Survey Number 2 (5 Years < Age ≤ 10 Years)”.

10.3 Requirements for Vessel Alterations

No alterations which affect or may affect the Accommodations notation, including alterations to the structure, machinery, electrical systems, piping, furnishings, or lighting systems, are to be made to the vessel unless plans of the proposed alterations are submitted and approved by the Bureau before the work of alteration is commenced. If the Bureau determines that the alteration will affect the Accommodations notation, the altered vessel shall be subject to the review, verification, and ambient environmental testing requirements of this Guide.

10.4 Requirements for Geographical Area of Vessel Operations

When it is intended to change the geographical area of vessel operations, which may affect the Accommodations notation, the details of such a change are to be submitted to the Bureau for review. If the review determines that the change will affect the Accommodations notation, the vessel shall be subject to the review and ambient environmental testing requirements in Section 3, “Whole-body Vibration”, Section 4, “Noise”, and/or Section 5, “Indoor Climate” of this Guide.

11 Alternatives

11.1 General

The Bureau will consider alternative arrangements, criteria, and procedures, which can be shown to meet the performance standards contained in the criteria directly cited or referred to in this Guide. The demonstration of an alternative’s acceptability can be made through either the presentation of satisfactory service experience or systematic analysis based on valid engineering principles.

11.2 National Regulations

The Bureau will consider for its acceptance alternative arrangements and details, which can be shown to comply with standards recognized in the country (flag state) in which the vessel is registered or built, provided they are not less effective.

11.3 Departures from Criteria

The criteria contained in this Guide envision application to vessels that are engaged in the usual trades and services expected of such vessels, within the scope of, but not limited to, the following:

- *ABS Rules for Building and Classing Steel Vessels*
- *ABS Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in Length*
- *ABS Rules for Building and Classing Aluminum Vessels*
- *ABS Rules for Materials and Welding (Part 2) – Aluminum and Fiber Reinforced Plastics (FRP)*
- *ABS Guide for Building and Classing High Speed Craft*
- *ABS Guide for Building and Classing Passenger Vessels*
- *ABS Guide for Building and Classing Motor Pleasure Yachts*

It is recognized that unusual or unforeseen conditions may lead to a case where one or more of the parameters of interest in granting a notation may temporarily fall outside the range of acceptability.

When a departure from criteria is identified, during either the notation's initial issuance or reconfirmation process, it shall be reviewed by the Bureau in consultation with the Owner. When the design of the accommodations or ambient environmental (e.g., vibration, noise, indoor climate, and/or lighting) test results contain departures from the stated criteria, these will be the subject of special consideration upon the receipt of details about the departure. Depending on the degree and consequences of the departure, the Owner may be required to provide an assessment and remediation plan to obtain or maintain the notation. Failure to complete the agreed remediation by the due date will lead to withdrawal of the notation.

This Page Intentionally Left Blank



SECTION 2 Accommodations Design

1 Background

With reductions in staffing and increases in the complexity of onboard systems, it is vital that seafarers maintain enhanced levels of mental and physical fitness while onboard vessels. To maintain such fitness, seafarers must be provided with supportive accommodations spaces. Proper accommodations design will promote reliable human performance by reducing the potential for fatigue and human errors. Appropriate accommodations design has the further potential to promote the seafarers' living and working conditions.

Conversely, improper accommodations design can adversely impact the seafarers' ability to reliably perform their duties, fully relax, sleep, and recover from mentally and physically demanding work activities. This in turn may impact their ability to carry out duties on succeeding watches with the required diligence and accuracy. Providing an onboard environment that increases seafarer member alertness and well-being should be of concern to responsible vessel Owners.

2 Scope

This Section and Appendix 3, "Accommodations Criteria", provide the assessment and measurement criteria for accommodations spaces on vessels. In particular, Appendix 3 encompasses the criteria for berthing, sanitary spaces, food services, recreation areas, and laundry.

Compliance with this Section is a prerequisite for the **MLC-ACCOM** notation confirmation. Meeting the requirements of this Accommodations Section will fulfill the physical design (but not the procedural or managerial) requirements as contained in International Labor Organization Maritime Labour Convention (MLC). Note: additional criteria imposed by individual Flag Administrations may also be applicable.

Enhanced levels of accommodations criteria intended to improve seafarer habitability, comfort, and safety can be found in the following:

- *ABS Guide for Crew Habitability on Ships*
- *ABS Guide for Crew Habitability on Offshore Installations*
- *ABS Guide for Crew Habitability on Workboats*

3 Terminology

Accommodation: Includes such sleeping rooms, mess rooms, sanitary, hospital, and recreation accommodations as provided for the use by seafarers. Basically, vessel areas where the primary purpose is to rest or recreate.

4 Associated Documentation

- Appendix 3, “Accommodations Criteria”
- The ILO Maritime Labour Convention, 2006

5 Criteria

The Accommodations criteria for the **MLC-ACCOM** notation are provided in Appendix 3, “Accommodations Criteria”.

6 Accommodations Documentation

As stated in 1/7.2, “Accommodations”, accommodations documentation shall be prepared and submitted to ABS Engineering for review. Confirmatory verification measurements shall be performed by an ABS Surveyor. The following data shall be submitted to ABS Engineering:

6.1 Data Requirements

The submitted data shall serve as a means for validating and verifying that the vessel meets the accommodations criteria specified in Appendix 3, “Accommodations Criteria”.

6.1.1 New Construction

For new construction, scaled arrangement drawings of the accommodations spaces (elevation and plan views), details of the accommodations outfitting, and vessel’s design specification in relation to the accommodations spaces shall be submitted to ABS Engineering. The drawings and specifications shall be provided during the detailed design phase.

6.1.2 Existing Vessels

For existing vessels, appropriate arrangement drawings and plans, reflecting the current accommodations configurations shall be provided to ABS Engineering along with any current vessel accommodations design specifications.

7 Submittal Review and Verification

Arrangement drawings, plans, and vessel specifications for the accommodations shall be prepared and submitted for review by ABS Engineering. For new construction, the drawings shall be provided to ABS Engineering during the detailed design phase. For existing vessels, the arrangement drawings and plans, reflecting the current accommodations configurations shall be provided to ABS Engineering, in advance of onboard ABS Surveyor verifications.

ABS Engineering shall review the submitted accommodations documentation. ABS Engineering shall report any deviation from criteria to the Owner/shipyard for resolution and shall also identify any criteria that the ABS Surveyors must field verify.

8 Results

The results of the ABS Engineering review and actual ABS Surveyor verification shall be reviewed by the ABS Surveyor against the appropriate **MLC-ACCOM** criteria for notation confirmation.

SECTION **3 Whole-body Vibration**

1 Background

Working and/or living aboard vessels can impose a series of low- and high-frequency mechanical vibrations as well as single-impulse shock loads on the human body.

Low-frequency vibrations (i.e., oscillations) are generally imposed by vessel motions, which are produced by the various sea states in conjunction with vessel speed. Oscillation may result in motion sickness, body instability, fatigue, and increased health risk aggravated by shock loads induced by vessel slamming. Vessel slamming may be caused by dynamic impact loads being exerted on the vessel's bottom or bow flare because of vessel size, speed, and wave conditions.

High-frequency vibration is often associated with high-speed rotating machinery. The imposition of higher frequency vibrations induces corresponding motions and forces within the human body, creating discomfort and possibly resulting in degraded performance and health (Griffin, 1990).

2 Scope

The 2006 MLC has Regulations relating to whole-body vibration levels aboard vessels. They are contained in the following list:

- i) Regulation A3.1.6(h) states: *“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 **vibration** and other ambient factors and chemicals on board ships, and to provide an acceptable occupational and on-board living environment for seafarers.”*
- ii) MLC Regulation A3.1.6(h) calls out Regulation 4.3. Below is listed the physical design and arrangement related aspects of Regulation 4.3 include:
 - A4.3.1(b) *“reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including measures to reduce and prevent the risk of exposure to harmful levels of ambient factors and chemicals as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships;”*
 - A4.3.2(a) *“take account of relevant international instruments dealing with occupational safety and health protection in general and with specific risks, and address all matters relevant to the prevention of occupational accidents, injuries and diseases that may be applicable to the work of seafarers and particularly those which are specific to maritime employment;”* and
 - 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.”*

ABS considers compliance with the whole-body vibration criteria in this Section satisfactory for compliance with the hazardous vibration aspects of A3.1.6(h).

The criteria in this Section provide an acceptable level of exposure to and methods for assessing whole-body vibration relating to seafarer accommodations onboard vessels. The criteria were selected to limit potential vibration-related interference with work tasks and to promote the seafarers living and working conditions. Whole-body vibration limits defined in this Section are based on currently available standards and research.

Consideration of the external loads imposed is restricted to motions transmitted from surrounding structures to the entire human body through the feet of a standing person in the frequency range 1.0 to 80 Hertz (Hz). Motions transmitted to the body of a seated or recumbent person have been omitted from this Guide. This Section applies to manned spaces occupied by seafarers for twenty (20) minutes or longer at any one time. Examples of such spaces include workspaces (duty stations), cabins, staterooms, dining, and recreation spaces. Compliance with this Section is one requirement for the Accommodations (**MLC-ACCOM**) notation confirmation.

Enhanced levels of whole-body vibration criteria intended to improve seafarer habitability, comfort, and safety can be found in the following:

- *ABS Guide for Crew Habitability on Ships*
- *ABS Guide for Crew Habitability on Offshore Installations*
- *ABS Guide for Crew Habitability on Workboats*

3 Terminology (15 October 2010)

Acceleration: A vector quantity that specifies the rate of change of velocity (i.e., meters-per-second squared, m/s²).

Calibration Checks: Field calibration of a measuring instrument conducted before and after a field test using a reference calibrated signal or through zero calibration.

Frequency: The number of complete cycles of a periodic process occurring per unit time. Frequency is expressed in Hertz (Hz) which corresponds to the number of completed cycles-per-second.

Frequency Weighting: A transfer function used to modify a signal according to a required dependence on vibration frequency.

In human response to vibration, various frequency weightings have been defined in order to reflect known or hypothesized relationships between vibration frequency and the various human responses. The units of a frequency weighting should be those of the response divided by those of the vibration waveform, but it is often assumed that the weighting is non-dimensional.

The frequency weightings used to evaluate whole-body vibration in this Guide are as follows:

W_m : Frequency weighting used to evaluate x, y, and z-axes vibration when standing with respect to seafarers' living and working conditions

Manned Space: Any space where a seafarer may be present for twenty (20) minutes or longer at one time during normal, routine daily activities. Such spaces would include working or living spaces.

Multi-Axis Acceleration Value: The Multi-Axis Acceleration Value is calculated from the root-sums-of-squares of the weighted rms acceleration values in each axis (a_{xw} , a_{yw} and a_{zw}) at the measurement point using the following expression:

$$a_w = \sqrt{a_{xw}^2 + a_{yw}^2 + a_{zw}^2}$$

where a_{xw} , a_{yw} and a_{zw} are the weighted rms acceleration values measured in the x-, y- and z-axes, respectively.

Multi-Axis Vibration: Mechanical vibration or shock acting in more than one (1) direction simultaneously.

Peak Value: The largest deviation of a signal from the arithmetic mean of that signal. The positive peak value is the maximum positive deviation; the negative peak value is the maximum negative deviation.

Reference Calibration: Calibration of a measuring instrument conducted by an accredited Testing and Calibration Laboratory with traceability to a national or international standard.

Stationkeeping: Maintaining a vessel in a position relative to other vessels or a fixed point. This may include the use of main engines and/or thrusters.

Thruster Conditions: Those conditions when thrusters are used to maintain the vessel's position and heading during stationkeeping.

Transit Conditions: Those conditions where the vessel's primary form of propulsion is via main engine and propeller. This does not include occurrences such as vessel entry or departure from port or dock.

Vibration: The variation with time of the magnitude of a quantity which is descriptive of the motion or position of a mechanical system, when the magnitude is alternately greater and smaller than some average value.

Weighted Root-Mean-Square Acceleration Value (a_w): The weighted root-mean-square (rms) acceleration a_w , in meters-per-second squared, is defined by the expression:

$$a_w = \sqrt{\frac{1}{T} \int_0^T a_w^2(t) dt}$$

where $a_w(t)$ is the weighted acceleration as a function of time in meters-per-second squared (m/s^2) and T is the duration of the measurement in seconds.

Whole-body Vibration: Mechanical vibration (or shock) transmitted to the human body as a whole. Whole-body vibration is often due to the vibration of a surface supporting the body.

4 Associated Documentation

The following documents provide details about test plan preparation, test measurement procedures and/or test reporting:

- ISO 6954: 2000, Mechanical vibration – Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships
- ISO 8041:2007, Human response to vibration – Measuring instrumentation
- WMO: 1995, Sea State Code

Further guidance can be found in:

- ISO 2923:1996, Acoustics – Measurement of noise on board vessels
- ISO 4867:1984, Code for the measurement and reporting of on board vibration data

5 Criteria

The whole-body vibration criteria for the **MLC-ACCOM** notation are provided in Section 3, Table 1, “Maximum Root-Mean-Square Vibration Level”. The severity of the vibration shall be indicated by the weighted root-mean-square acceleration value (a_w) as defined in ISO 8041:2007.

Vibration measurements shall only be taken in manned spaces. A space is considered “manned” if it is occupied by seafarers for twenty (20) minutes or longer at a time for normal, routine daily activities. Specific locations are referred to in 3/7.4, “Measurement Locations”.

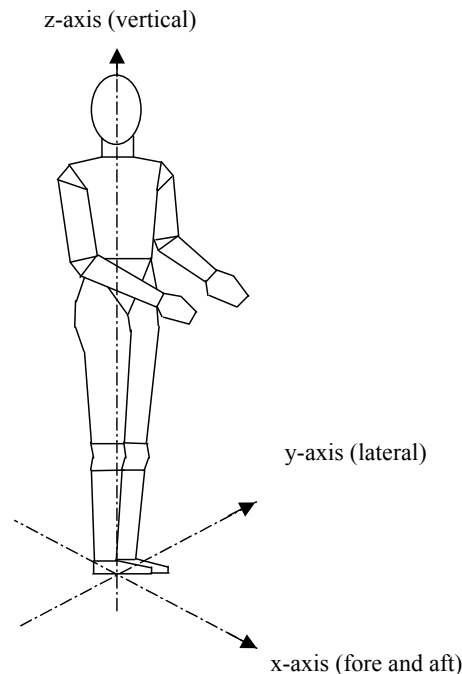
The maximum vibration levels in Section 3, Table 1, “Maximum Weighted Root-Mean-Square Vibration Level”, shall not be exceeded under normal operating conditions. Expression and assessment of vibration levels can be based on acceleration or velocity values. The **MLC-ACCOM** notation maximum vibration level is primarily aimed at preventing severe discomfort and interference with seafarer’s task performance.

TABLE 1
Maximum Weighted Root-Mean-Square Vibration Level (15 October 2010)

Notation	Frequency Range	Acceleration Measurement	Maximum RMS Level	
			Transit Conditions	Thruster Conditions
MLC-ACCOM	1.0 - 80 Hz	a_w	214 mm/s ² (6mm/s)	286 mm/s ² (8mm/s)

For the purpose of this Section, the notation applies to the vibration levels occurring on the deck supporting the human body in the three (3) translational (x-, y- and z-) axes as shown in Section 3, Figure 1, “Measurement Axes”. The vibration levels are computed for each axis individually, as well as combined as a multi-axis acceleration value. Each is expressed as a frequency weighted root-mean-square (a_w) value. To meet the vibration criteria, the multi-axis a_w level must be less than or equal to the maximum level expressed in Section 3, Table 1.

FIGURE 1
Measurement Axes



6 Test Plan

As stated in 1/7.3.1, “Test Plans”, a Test Plan shall be developed to serve as the principal means for verifying the measurements to be performed to verify compliance with whole-body vibration criteria. The Test Plan shall include the following:

6.1 Documentation

The Test Plan shall include appropriate drawings indicating the location of all vibration sources.

6.2 Test Personnel

The Test Plan shall provide information about the External Specialists who shall be conducting the test and their approval and certification in accordance with Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”.

6.3 Test Conditions

The Test Plan shall detail the conditions under which the tests are expected to be performed. Further details about test conditions are given in 3/7.3, “Test Conditions”.

6.4 Measurement Locations

The Test Plan shall document, in detail, on appropriate drawings, all spaces where measurements will be taken. In addition, transducer measurement positions shall be indicated. Details on selecting measurement locations and determining transducer measurement positions are provided in 3/7.4, “Measurement Locations”.

6.5 Data Acquisition and Instruments

Information shall be provided regarding the methods and instrumentation to be used for measurement and data collection. Instrumentation specification details shall include type of instruments to be used, accuracy, calibration, sensitivity, conformance with ISO 8041:2007, and frequency range. More details on data acquisition and instruments are provided in 3/7.2, “Data Acquisition and Instruments”.

6.6 Data Analysis

Information shall be provided regarding the methods, software and instrumentation to be used for data analysis.

6.7 Test Schedule

Information shall be provided regarding the proposed test schedule.

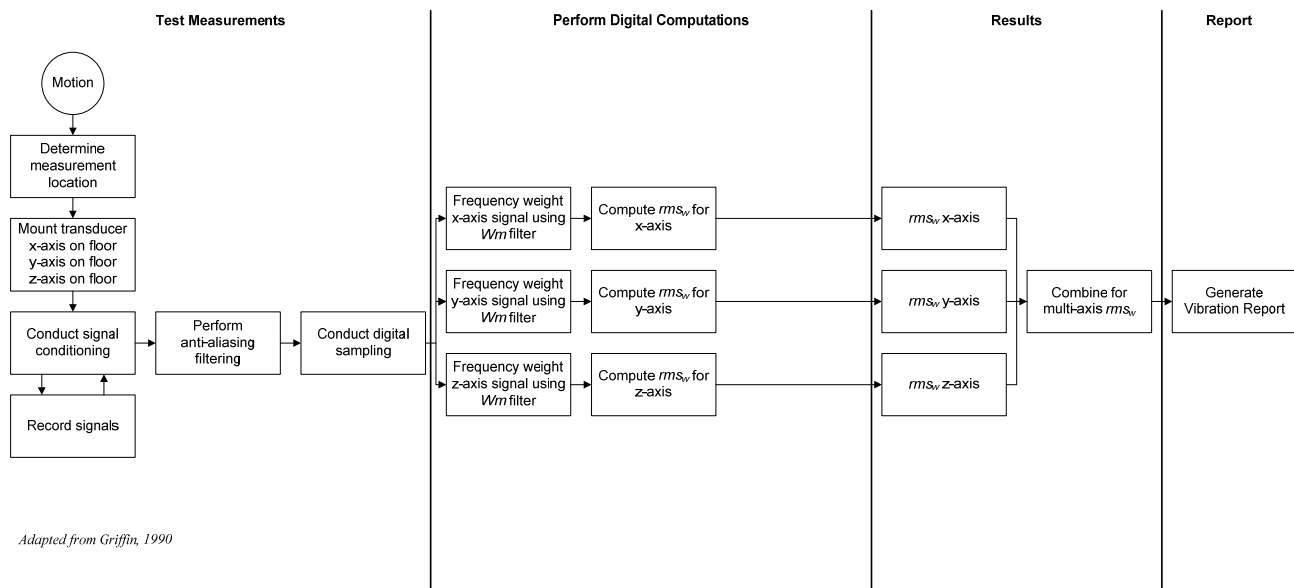
7 Test Requirements

7.1 General

Whole-body vibration measurements shall be in accordance with the procedures described in ISO 6954: 2000. When the procedures described in this Guide deviate from any requirements or procedures mentioned in ISO 6954: 2000, the requirements of this Guide take precedence.

The relationship between the various factors to be considered when taking whole-body vibration measurements and computing results is illustrated in Section 3, Figure 2, “Process for the Measurement and Analysis of Whole-body Vibration”. A comprehensive resource with regards to human response to whole-body vibration is provided in Griffin’s (1990) *Handbook of Human Vibration*.

FIGURE 2
Process for the Measurement and Analysis of Whole-body Vibration



7.2 Data Acquisition and Instruments (15 October 2010)

For the **MLC-ACCOM** notation, a single sample of data shall be recorded for each whole-body vibration measurement position **during transit and, if applicable, stationkeeping/thruster conditions**. Each whole-body vibration measurement sample shall be at least sixty (60) seconds in duration. Where significant frequency components exist in the range below two (2) Hz, measurement duration of at least **120 seconds** is required. In the case of high speed craft, each whole-body vibration measurement sample shall be at least 227 seconds in duration.

The above measurement samples shall all be taken using the appropriate Type 1 or 2 instrumentation (ISO 8041: 2007), then frequency weighted and analyzed in accordance with ISO 6954: 2000. It is desirable to employ equipment that records and stores acceleration time histories.

7.3 Test Conditions

The test conditions required for the whole-body vibration measurements shall be in accordance with the following Subparagraphs.

7.3.1 Power Output (15 October 2010)

- i) Transit:* The propulsion machinery shall run at normal service speed and at no less than eighty (80) percent of the maximum continuous rating (MCR).
- ii) Stationkeeping:* Stationkeeping devices (azimuth or tunnel thrusters automatic or manual) shall be in operation and run at a service speed sufficient to maintain position in sea conditions equal to or less than Sea State three.

7.3.2 Equipment Operation (15 October 2010)

As appropriate for the mode of operation (transit or stationkeeping), all machinery essential for vessel operation shall operate under normal conditions throughout the measurement period. Heating, Ventilation, and Air Conditioning (HVAC) systems are to be running as for normal seagoing conditions during the whole-body vibration measurements.

7.3.3 Course and Water Depth

Where possible, whole-body vibration measurements are to be taken with the vessel in a depth of water not less than five (5) times the draft of the vessel. The vessel shall maintain a single heading and a constant speed during the test.

7.3.4 Rudder *Conditions (15 October 2010)*

The rudder angle shall be restricted to a range of $0^\circ \pm 2^\circ$. Minimal rudder action is desirable. *During stationkeeping, measurements shall be taken while the vessel is maintaining a position relative to another vessel or fixed point (e.g., offshore installation).*

7.3.5 Sea Conditions

Whole-body vibration measurements shall be taken under sea state conditions not exceeding sea state 3 as defined by the World Meteorological Organization (WMO) (1995) *Sea State Code*.

Test measurements may be taken under more severe sea state conditions. However, the resulting values must conform to the vibration limits presented in Subsection 3/5, "Criteria", to be acceptable.

7.3.6 Loading Conditions *(15 October 2010)*

The loading condition of a vessel shall be *as close as possible to normal operating conditions*.

7.3.7 Test Interference

During the whole-body vibration measurements, noise and vibration arising from every kind of unnecessary human activity shall be avoided. For this reason, only the personnel needed for the normal operation of the equipment in the space and those carrying out the measurements shall be present in the space being tested.

7.4 Measurement Locations

7.4.1 Selection of Spaces where Measurements are to be Conducted

The measurement locations shall be selected in accordance with the following criteria:

- i)* Select potential worst case locations based on their proximity to vibration emitting sources such as propulsion or other rotating machinery or where vibration is likely to be transmitted to manned spaces, accommodations, and recreation areas via the vessel's structure. Measurements shall be taken in all identified worst case locations (e.g., a control room).
- ii)* Where a single instance of one (1) type of manned space exists within the vessel (e.g., bridge, TV room, gymnasium, library, etc.), that location shall be selected for measurement.
- iii)* Select a representative sample of seafarer cabins and staterooms throughout the vessel. This sample shall include measurements in at least forty (40) percent of seafarer cabins on each level of the accommodations area.

7.4.2 Walkthrough Verification Inspection Locations

An additional sample of at least ten (10) percent of all manned spaces not covered by physical measurements shall be subject to a walkthrough verification inspection. The ABS Surveyor shall identify these spaces from those that were not selected for physical measurement under 3/7.4.1, "Selection of Spaces where Measurements are to be Conducted". The purpose of the walkthrough verification is to subjectively assess the whole-body vibration qualities of the selected spaces. The walkthrough verification inspection shall be conducted by the External Specialist during onboard testing. If any space is deemed to deviate from the whole-body vibration requirements provided in this Guide, it shall be verified by the External Specialist by conducting spot measurements and the results recorded in the Vibration Test Report.

7.4.3 Transducer Measurement Positions

Transducer locations shall be selected on the decks of occupied spaces in sufficient quantity in order to satisfactorily characterize the vibration of the vessel with regard to habitability. Transducer orientation shall correspond to the three translational axes of the vessel: longitudinal, transversal, and vertical.

8 Test Report

As stated in 1/7.3.2, “Test Reports”, a Test Report shall be submitted to the ABS Surveyor to determine whether the vibration levels meet the whole-body vibration criteria and whether this part of the notation requirement has been met. The details listed in the following Paragraphs shall be provided in the Vibration Test Report.

8.1 Test Details

The following details shall be recorded for each period of testing:

- i)* References to standards
- ii)* Date and place of the test
- iii)* Identification of persons and organizations performing the test
- iv)* Principle vessel design characteristics
- v)* Conditions of vessel and environment experienced during the test
- vi)* Locations and orientations of transducers
- vii)* All deviations from the approved Test Plan shall be reported
- viii)* Note equipment operating in proximity to the measurement position
- ix)* For spaces that were checked by walkthrough verification inspection and spot check measurements, the following information shall be provided:
 - Name and number of space
 - Walkthrough verification inspection results
 - Spot measurement results (where appropriate)

8.2 Measurement Equipment Details

Details of measuring and analysis equipment (e.g., manufacturer, type and serial number, accuracy, and resolution), including frequency analysis parameters (e.g., resolution, averaging time, filtering, and window functions) shall be provided.

Copies of the relevant instrumentation reference calibration certificates, together with the results of field setup and calibration checks before and after the field tests, shall be provided.

8.3 Results

The following results, per measurement location and sample period as appropriate for the notation, shall be provided in table format:

- i)* Measurement positions (i.e., space and location within space)
- ii)* Number of people present in the space at time of measurement
- iii)* Measurement period
- iv)* Time at start and finish of measurement

- v) Note any open doors and windows
- vi) Note equipment operating in proximity to the measurement position
- vii) Results of the measurements

For all the remaining spaces that were checked by walkthrough verification inspection and spot check measurements, the following information shall be provided:

- i) Name and number of space
- ii) Walkthrough verification inspection results
- iii) Spot measurement results (where appropriate)

8.4 Deviations

All deviations from the approved Test Plan shall be reported.

8.5 Surveyor Witnessing Documentation

The equipment calibration and data collection process of vibration tests conducted at sea shall be witnessed by an ABS Surveyor. The ABS Surveyor shall provide documentation stating whether all steps of the vibration testing were completed to his/her satisfaction. A copy of the witnessing document shall be given to the person conducting the onboard testing, for insertion into the final Whole-Body Vibration Test Report. The original shall be retained for the Bureau's files.

9 Results

The Whole-body Vibration Test Report and test results shall be reviewed by the ABS Surveyor against the **MLC-ACCOM** criteria for notation confirmation.

This Page Intentionally Left Blank

SECTION 4 Noise

1 Background

The noise levels provided in this Section were obtained from the IMO Resolution A.468(XII) (1981): Code on noise levels on board ships. This Code was designed to provide standards to prevent the occurrence of potentially hazardous noise levels on board ships and to provide standards for an acceptable environment for seafarers. The Code's intent is to limit noise levels and to reduce exposure to noise, in order to:

- i) Provide for safe working conditions by giving consideration to the need for speech communication and for hearing audible alarms
- ii) Provide an environment where clear-headed decisions can be made in control stations, navigation and radio spaces and manned machinery spaces
- iii) Protect the seafarer from excessive noise levels which may give rise to a noise-induced hearing loss
- iv) Provide the seafarer with an acceptable degree of comfort in rest, recreation and other spaces and also provide conditions for recuperation from the effects of exposure to high noise levels

2 Scope

The 2006 MLC has Regulations relating to noise levels aboard vessels. They are contained in the following list:

- i) Regulation A3.1.6(h) states: *“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 vibration and other ambient factors and chemicals on board ships, and to provide an acceptable occupational and on-board living environment for seafarers.”*
- ii) MLC Regulation A3.1.6(h) calls out Regulation 4.3. Below is listed the physical design and arrangement related aspects of Regulation 4.3 include:
 - A4.3.1(b) *“reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including measures to reduce and prevent the risk of exposure to harmful levels of ambient factors and chemicals as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships;”*
 - A4.3.2(a) *“take account of relevant international instruments dealing with occupational safety and health protection in general and with specific risks, and address all matters relevant to the prevention of occupational accidents, injuries and diseases that may be applicable to the work of seafarers and particularly those which are specific to maritime employment;”* and

- 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.”

ABS considers compliance with the noise criteria in this Section satisfactory for compliance with the hazardous noise aspects of A3.1.6(h).

The criteria in this Section provide an acceptable level of exposure to noise and methods for assessing noise relating to accommodations onboard vessels. The noise criteria have been selected to enhance the seafarers’ living and working conditions. In this instance, “living and working conditions” means the ability of the seafarer to use a space for its intended purpose with minimal interference or annoyance from noise.

This Section applies to manned spaces occupied by seafarers for twenty (20) minutes or longer at any one time. Examples of such spaces include workspaces (duty stations), cabins, staterooms, and dining and recreation spaces. Compliance with this Section is one requirement for the Accommodations notation (**MLC-ACCOM**) confirmation.

Enhanced levels of noise criteria intended to improve seafarer habitability, comfort and safety can be found in the following:

- *ABS Guide for Crew Habitability on Ships*
- *ABS Guide for Crew Habitability on Offshore Installations*
- *ABS Guide for Crew Habitability on Workboats*

3 Terminology

A-weighted sound pressure level: The magnitude of a sound, expressed in decibels (i.e., 20 micropascals); the various frequency components are adjusted according to the A-weighted values given in IEC 61672.1 (2002) in order to account for the frequency response characteristics of the human ear. The symbol is L_A ; the unit is dB(A).

Accommodation: Includes such sleeping rooms, mess rooms, sanitary, hospital and recreation accommodations as provided for the use of the seafarer. Basically, vessel areas where the primary purpose is to rest or recreate.

Auxiliary Machinery: Machinery other than main propelling machinery that is in service when the vessel is in normal service (e.g., auxiliary diesel engines, turbo-generators, hydraulic motors and pumps, compressors, boiler ventilation fans, gear pumps).

Calibration Checks: Field calibration of a sound measuring instrument, conducted before and after a field test using a reference sound signal of known frequency and sound pressure level.

Duty Stations: Those spaces in which the main navigating equipment, the vessel’s radio or the emergency source of power are located or where the fire recording or fire control equipment is centralized and also those spaces used for galleys, main pantries, stores (except isolated pantries and lockers), mail and specie rooms, workshops other than those forming part of the machinery spaces and similar such spaces.

Machinery Spaces: All spaces containing propulsion machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air-conditioning machinery and similar spaces, and trunks to such spaces.

Manned Space: Any space where a seafarer may be present for twenty (20) minutes or longer at one time during normal, routine daily activities. Such spaces would include working or living spaces.

Navigation Bridge Wings: Those parts of the vessel's navigation bridge extending towards the vessel's sides.

Noise: For the purpose of this Guide, all sound which can result in hearing impairment, or which can be harmful to health or be otherwise dangerous.

Normally Unoccupied Spaces: Those exposures typically occurring once per week, or less frequently.

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

Reference Calibration: Calibration of measuring instrument conducted by an accredited Testing and Calibration Laboratory with traceability to a signal or through zero calibration.

Seafarer: Any person onboard a vessel, including the Master, who is not a passenger.

4 Associated Documentation

The following documents provide details about test plan preparation, test measurement procedures and/or test reporting:

- IEC 61672-1:2002, Electroacoustics – Sound Level Meters – Part 1: Specifications
- IMO Resolution A.468(XII) (1981): Code on noise levels on board ships
- ISO 140-3 (2004) – Acoustics - Measurement of sound insulation in buildings and of building elements Part 3: laboratory measurements of airborne sound insulation of building elements
- ISO 2923, (1996): Acoustics – Measurement of noise on board vessels
- ISO 717 (2006): Rating of Sound Insulation for Dwellings
- WMO, (1995): Sea State Code

Further guidance can be found in:

- ISO 4867, (1984): Code for the measurement and reporting of on board vibration data

5 Criteria

5.1 A-weighted Sound Pressure Level

The noise criteria for the Accommodations notation are provided in Section 4, Table 1, “Noise Criteria”. Noise levels shall be determined for the test conditions specified in 4/7.3, “Test Conditions” and shall not exceed the maximum acceptable levels indicated in Section 4, Table 1, “Noise Criteria” for each type of space or area. The maximum acceptable noise levels given in Section 4, Table 1, “Noise Criteria” are determined as appropriate to the character of the noise (see 4/7.5, “Measurement Procedures and Recorded Results”).

These noise criteria are the same as IMO Resolution A.468(XII) (1981): Code on noise levels on board ships. For noise criteria for areas other than the accommodations areas covered by this notation, consult the IMO Resolution A.468(XII) (1981): Code on noise levels on board ships.

TABLE 1
Noise Criteria*

<i>Space</i>	<i>Noise Limit dB(A) Maximum</i>
Accommodation Spaces	
Cabins and hospitals	60
Mess rooms	65
Recreation room	65
Open recreation areas	75
Offices	65
Service Spaces	
Galleys, without food processing equipment operating	75
Serveries and pantries	75

* In any manned space with noise levels above 85 dB(A), hearing protection should be worn in accordance with appropriate IMO regulations.

5.2 Acoustic Insulation

5.2.1 General

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, cargo-handling, etc.).

5.2.2 Sound insulation index

The airborne sound insulation properties for bulkheads and decks within the accommodation shall comply at least with the following airborne sound insulation index (ℓ_a) according to ISO Standard 717 (2006):

- Cabin to cabin $\ell_a = 30$
- Messrooms, recreation rooms to cabins and hospitals $\ell_a = 45$

The airborne sound insulation properties shall be determined by laboratory tests in accordance with ISO 140-3 (2004).

5.2.3 Erection of materials

Care shall be taken in the erection of materials and in the construction of accommodation spaces to ensure to the greatest practicable extent that the attenuation values specified in 4/5.2.2, "Sound insulation index" are not significantly impaired.

6 Test Plan

As stated in 1/7.3.1, "Test Plans", a Test Plan shall be developed to serve as the principal means for verifying the measurements to be performed to demonstrate or confirm compliance with noise criteria. The Test Plan shall include the following:

6.1 Documentation

The Test Plan shall include appropriate design information including noise specifications for the vessel. It shall also include layout drawings indicating the locations of all noise sources and noise generating equipment. The information shall be of such detail to enable an ABS Surveyor to verify compliance with the criteria set in this Guide.

The Test Plan shall also include the acoustic insulation plan, calculations, and relevant supporting documentation for review and approval by ABS Engineering. With the Test Plan, the acoustic insulation test results (see 4/5.2, “Acoustic Insulation”) shall be submitted for review.

6.2 Test Personnel

The Test Plan shall provide information about the External Specialists who will be conducting the test and their approval and certification in accordance with Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”.

6.3 Test Conditions

The Test Plan shall detail the conditions under which the tests will be performed. Further details about test conditions are given in 4/7.3, “Test Conditions”.

6.4 Measurement Locations

The Test Plan shall document, in detail, on appropriate drawings, all spaces or areas where measurements will be taken. In addition, measurement positions shall be indicated. Details on selecting measurement locations are provided in 4/7.4, “Measurement Locations”.

6.5 Data Acquisition and Instruments

Information shall be provided regarding the methods and instrumentation to be used for measurement and data collection. Instrumentation specification details shall include type of instruments to be used, accuracy, calibration, and sensitivity. More details on data acquisition and instruments are provided in 4/7.2, “Data Acquisition and Instruments”.

6.6 Data Analysis

Information shall be provided regarding the methods, software, and instrumentation to be used for data analysis.

6.7 Test Schedule

Information shall be provided regarding the proposed test schedule.

7 Test Requirements

7.1 General

In general, the noise measurements shall be carried out in accordance with the requirements of IMO Resolution A.468(XII) (1981) Code on Noise Levels On Board Ships. However, where the IMO requirements differ from those in this Guide, this Guide shall take precedence.

7.2 Data Acquisition and Instruments *(15 October 2010)*

The integrating-averaging sound level meter shall meet the requirements for a Type 1 or 2 instrument specified in IEC 61672-1 (2002).

For the **MLC-ACCOM** notation, a single sample of data shall be recorded for each noise measurement position during transit and, if applicable, stationkeeping/thruster conditions.

7.3 Test Conditions

The test conditions required for the noise measurements shall be in accordance with the following Subparagraphs, which are taken or adapted from ISO 4867:1984 and ISO 2923:1996. These conditions are consistent with those for whole-body vibration measurements covered in 3/7.3, “Test Conditions”.

7.3.1 Operating Conditions During at Sea Measurement

- i)* Measurements shall be taken with the vessel in the loaded or ballast condition. The main propulsion machinery shall be run at normal design service shaft speed. Controllable pitch and Voith-Schneider propellers, if any, shall be in the normal seagoing position.
- ii)* All auxiliary machinery, navigation instruments, radio and radar sets, etc., normally, or likely to be, in use at any one time shall operate throughout the measurement period.
- iii)* Measurements in spaces containing emergency diesel engine-driven generators, fire pumps or other emergency equipment that would normally be run only in emergency, or for test purposes, shall be taken with the equipment operating. Adjoining spaces need not be measured with such equipment operating, however, unless it is likely that the equipment will be operated for periods other than those mentioned above.
- iv)* Mechanical ventilation and air-conditioning equipment shall be in normal operation, taking into account that the capacity shall be in accordance with the design conditions.
- v)* Doors and windows shall in general be closed but they shall be open in spaces where this is the normal condition, for instance in the navigation bridge where the door on the lee side is normally open.
- vi)* Spaces shall be furnished with all necessary equipment. Measurements without soft furnishings may be made but no allowance shall be made for their absence.
- vii)* Vessels fitted with bow thrusters, stabilizers, etc., may be subject to high noise levels when in operation. Measurements shall be taken at positions around such machinery when in operation and in adjacent accommodation spaces and duty stations.

7.3.2 Operating Conditions During in Port Measurement

Measurements as specified below shall be taken with the vessel in port condition:

- i)* Measurements shall be taken with the vessel’s cargo handling equipment in operation, in those areas and accommodation spaces affected by its operation. Noise originating from sources external to the vessel shall be discounted.
- ii)* Where the vessel is a vehicle carrier and noise during loading and discharging originates from vehicles, the noise level in the cargo spaces and the duration of the exposure shall be measured.

7.3.3 Environmental Conditions During Noise Measurement

- i)* The depth of water under the vessel’s keel and the presence of large reflecting surfaces in the vessel’s vicinity may affect the readings obtained, and shall, therefore, be noted in the noise survey report.
- ii)* The meteorological conditions such as wind and rain, as well as sea state, shall be such that they do not influence the measurements. Wind force 4 and sea state 3 shall not be exceeded. If this cannot be achieved, the actual conditions shall be reported.
- iii)* Care shall be taken to see that noise from extraneous sound sources, such as people, construction and repair work, does not influence the noise level on board the vessel at the positions of measurement. If necessary, readings may be corrected for steady state background noise according to the energy summation principle.

7.4 Measurement Locations

7.4.1 Points of Measurement

If not otherwise stated, measurements shall be performed with the microphone at a height of between 1.2 m (47 inches) and 1.6 m (63 inches) from the deck. The distance between two measurement points shall be at least 2 m (80 inches), and in large spaces not containing machinery, measurements shall be taken at intervals not greater than 7 m (23 feet) throughout the space including positions of maximum noise level. In large cargo holds no more than three measurements need be taken. In no case shall measurements be taken closer than 0.5 m (20 inches) from the boundaries of a space.

7.4.2 Accommodation Spaces

One measurement shall be made in the middle of the space. The microphone shall be moved slowly horizontally and/or vertically over a distance of 1 m (40 inches) and the mean reading recorded. Additional measurements shall be performed at other points if appreciable differences (i.e., greater than 10 dB(A)), in the level of sound inside the room occur, especially near the head positions of a sitting or lying person.

7.4.3 Machinery Spaces

- i) Measurements shall be made at the principal working and control stations of the seafarers in the machinery spaces and in the adjacent control rooms, if any; special attention is paid to telephone locations and to positions where voice communication and audible signals are important.
- ii) Readings shall not normally be taken closer than 1 m (40 inches) 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.
- iii) Measurements from machinery which constitutes a sound source shall be taken at 1 m (40 inches) from the machinery. Measurement shall be made at a height of 1.2 m (47 inches) to 1.6 m (63 inches) above the deck, platform or walkway as follows:
 - At a distance of 1 m (40 inches) from, and at intervals not greater than 3 m (10 feet) around, all sources such as: main turbines or engines at each level; main gearing; turbo-blowers; purifiers; electrical alternators and generators; boiler firing platform; forced and/or induced draught fans; compressors; cargo pumps (including their driving motors or turbines)

Note: In order to avoid an unnecessarily large and impractical number of measurements and recordings in the case of large engines and of machinery spaces where the measured sound pressure level in dB(A) at the intervals above does not vary significantly, it will not be necessary to record each position. Full measurement at representative positions and at the positions of maximum sound pressure level shall, however, be made and recorded, subject to at least four measurements being recorded at each level.;

- At local control stations (e.g., the main maneuvering or emergency maneuvering stand on the main engine and the machinery control rooms)
- At all other locations not specified in 4/7.4, "Measurement Locations" which would normally be visited during routine inspection, adjustment and maintenance
- At points on all normally used access routes, unless covered by positions already specified above, at intervals not greater than 10 m (33 feet)
- In rooms within the machinery space (e.g., workshops)

Note: In order to restrict the number of measurements and recordings, the number of recordings can be reduced as above, subject to a total of at least four measurements (including those specified in this paragraph) being recorded at each machinery space level up to the upper deck.)

7.4.5 Duty Stations

The noise level shall be measured at all points where the work is carried out. Additional measurements shall be performed in spaces containing duty stations if variations in noise level are thought to occur in the vicinity of the duty stations.

7.4.6 Normally Unoccupied Spaces

Measurements shall be made 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 cargo discharge pumps.

7.4.7 Open Deck

Measurements shall be taken in any areas provided for the purpose of recreation and additionally where a preliminary survey indicates that the limits specified in 4/5.1, "A-Weighted Sound Pressure Level" may be exceeded.

7.4.8 Intake and Exhaust Openings

When measuring noise levels at the intake and exhaust of engines and near ventilation, air-conditioning and cooler systems, the microphone shall, where possible, be placed outside the gas stream at a distance of 1 m (40 inches) from the edge of the intake or exhaust opening and at a 30-degree angle away from the direction of the gas stream and as far as possible from reflecting surfaces.

7.4.9 Navigation Bridge Wings

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

7.4.10 Walkthrough Verification Inspection Locations

An additional sample of at least ten (10) percent of all manned crew spaces not covered by physical measurements shall be subject to a walkthrough verification inspection. The ABS Surveyor shall identify these spaces from those that were not selected for physical measurement under 4/7.4.1, "Points of Measurement", above. The purpose of the walkthrough verification is to subjectively assess the noise qualities of the selected spaces. The walkthrough verification inspection shall be conducted by the External Specialist during onboard testing. If any space is deemed to deviate from the noise requirements provided in this Guide, it shall be verified by the External Specialist by conducting spot measurements and the results recorded in the Test Report.

7.5 Measurement Procedures and Recorded Results

7.5.1 Persons Present During Measurements

When External Specialist personnel are conducting noise level measurements in any space, only seafarers necessary for the operation of that space shall be present.

7.5.2 Sampling Duration

A-weighted sound pressure levels shall be reported for each measurement location. The sampling duration shall be sufficient to achieve a stable reading. Sampling time shall be fifteen (15) seconds or longer.

7.5.3 Cyclic Noise

If the noise within a space is cyclic, the sampling duration shall be sufficient to capture an integer number of complete cycles. If a long-duration sample is judged impractical, a value shall be determined and reported for the high-noise portion of the cycle.

7.5.4 Intermittent Noise

If the noise within a space is present intermittently, a value shall be determined and reported for a period of high-level noise.

8 Test Report

As stated in 1/7.3.2, “Test Reports”, a Test Report shall be submitted to the ABS Surveyor to determine whether the noise levels are below the limits and whether this part of the notation requirement has been met. The details listed in the following Paragraphs shall be provided in the Noise Test Report.

8.1 Test Details

The following details shall be provided for each period of testing:

- i)* Hull number, name, gross tonnage, main dimensions and type of vessel
- ii)* The leading particulars of the vessel’s machinery
- iii)* Names of the builder and owner of the vessel
- iv)* Date and time of the measurements
- v)* The type of voyage, the meteorological conditions, sea state and the vessel’s position during the measurements
- vi)* The underkeel clearance during the measurements
- vii)* The main operating conditions as required by 4/7.3 “Test Conditions”, including those items on the main machinery line which were operating and the operating condition
- viii)* The name and address of those carrying out the measurements
- ix)* Actual measurement location positions shall be indicated on appropriate drawings
- x)* A list of the main noise abatement measures applied aboard the vessel
- xi)* All deviations from the approved Test Plan shall be reported
- xii)* Other particulars deemed to be important

8.2 Measurement Equipment Details

Details of measuring and analysis equipment (e.g., manufacturer, type and serial number, accuracy, sampling frequency, and resolution) shall be provided.

Copies shall be provided of the relevant instrumentation reference calibration certificates, together with the results of field setup and calibration checks, before and after the field tests.

8.3 Results

The following results, per measurement location and sample period as appropriate for the notation, shall be provided in table format:

- i)* Measurement positions (i.e., space and location within space)
- ii)* Number of people present in the space at time of measurement
- iii)* Measurement period
- iv)* Time at start and finish of measurement
- v)* Note any open doors and windows
- vi)* Note equipment operating in proximity to the measurement position
- vii)* Results of the measurements

For all the remaining spaces that were checked by walkthrough verification inspection and spot check measurements, the following information shall be provided:

- i)* Name and number of space
- ii)* Walkthrough verification inspection results
- iii)* Spot measurement results (where appropriate)

8.4 Deviations

All deviations from the approved Test Plan shall be reported.

8.5 Surveyor Witnessing Documentation

The equipment calibration and data collection process of the noise level tests shall be witnessed by an ABS Surveyor. The ABS Surveyor shall provide documentation stating whether all steps of the noise level testing were completed to his/her satisfaction. A copy of the witnessing document shall be given to the person conducting the testing, for insertion into the final Noise Test Report. The original shall be retained for the Bureau's files.

9 Results

The Noise Test Report and test results shall be reviewed by the ABS Surveyor against the appropriate **MLC-ACCOM** criteria for notation confirmation.

SECTION 5 Indoor Climate

1 Background

Thermal comfort is defined in ISO 7730:1994(E) as “...that condition of mind which expresses satisfaction with the thermal environment”. The sensation of thermal comfort is therefore largely subjective and will vary from person to person. Due to differences in metabolism and expectations, there are distinct individual differences among people’s perception of comfort as a function of temperature, humidity, and other atmospheric characteristics. Acclimatization, habits, and expectations affect perceived comfort. These individual differences render it difficult to specify a single thermal environment that will be satisfactory to everyone. A thermal environment is therefore typically defined to be acceptable to at least eighty (80) percent of the occupants of an interior space.

Individually, the perception of thermal comfort is largely determined by the interaction of thermal environmental factors such as air temperature, mean radiant temperature, air velocity, relative humidity, and factors related to activity and clothing.

The thermal control or Heating, Ventilation, and Air Conditioning (HVAC) systems on a vessel shall be designed to effectively control the indoor thermal environmental parameters to within acceptable limits to facilitate the thermal comfort of the occupants.

2 Scope

The 2006 MLC has Regulations relating to indoor climatic variables levels aboard vessels. They are contained in the following list:

- i) Regulation A3.1.6(b) states: “*the accommodations shall be adequately insulated*”
- ii) Regulation A3.1.6(h) states: “*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 vibration and other **ambient factors** and chemicals on board ships, and to provide an acceptable occupational and on-board living environment for seafarers.*”
- iii) MLC Regulation A3.1.6(h) calls out Regulation 4.3. Below is listed the physical design and arrangement related aspects of Regulation 4.3 include:
 - 4.3.1(b) “*reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including measures to reduce and prevent the risk of exposure to **harmful levels of ambient factors** and chemicals as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships;*”
 - 4.3.2(a) “*take account of relevant international instruments dealing with occupational safety and health protection in general and with specific risks, and address all matters relevant to the prevention of occupational accidents, injuries and diseases that may be applicable to the work of seafarers and particularly those which are specific to maritime employment;*” and

- 4.3.4 *“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.”*
- iv) Regulation A3.1.7(a) states: *“Sleeping rooms and mess rooms shall be adequately ventilated”*
- v) Regulation A3.1.7(b) states: *“Ships, except those regularly engaged in trade where temperate climatic conditions do not require this, shall be equipped with air conditioning for seafarer accommodation, for any separate radio room and for any centralized machinery control room.”*
- vi) Regulation A3.1.7(d) states: *“adequate heat through an appropriate heating system shall be provided, except in ships exclusively on voyages in tropical climates”*
- vii) Regulation B3.1.2.2(a) states: *“Air-conditioning systems, whether of a centralized or individual unit type, should be designed to maintain the air at a satisfactory temperature and relative humidity as compared to outside air conditions, ensure a sufficiency of air changes in all air conditioned spaces, take account of the particular characteristics of operations at sea and not produce excessive noise or vibrations.”*
- viii) Regulation B3.1.8.2 states: *“The arrangement of the entrance, berths, lighting, ventilation, heating and water supply should be designed to ensure the comfort and facilitate the treatment of the occupants.”*

ABS considers compliance with the indoor climate criteria in this Section satisfactory for compliance with the hazardous indoor climate aspects of A3.1.6, A3.1.6(b), A3.1.7(a), A3.1.7(b), and A3.1.7(d).

This Section provides the assessment criteria, verification, and measurement methodology for indoor climatic variables relating to accommodations on vessels to fulfill the indoor climate related MLC requirements.

The thermal environmental variables covered by this Guide include the ambient qualities of air temperature, air velocity, and relative humidity. The thermal environmental criteria provided in this Guide are for persons wearing typical indoor clothing occupied with light, primarily sedentary activity and resulting in a thermal environment acceptable to at least eighty (80) percent of the occupants.

This Section applies to manned spaces occupied by seafarers for twenty (20) minutes or longer at any one time for normal, routine daily activities. Examples of manned spaces include accommodations, bridge, engine control room, hospital, and indoor workspaces.

Compliance with this Section is a pre-requisite for the Accommodations notation (**MLC-ACCOM**) confirmation.

Enhanced levels of indoor climate criteria intended to improve seafarer habitability, comfort and safety can be found in the following:

- *ABS Guide for Crew Habitability on Ships*
- *ABS Guide for Crew Habitability on Offshore Installations*
- *ABS Guide for Crew Habitability on Workboats*

3 Terminology

Air Velocity or Movement: The rate of displacement of ambient air in a specific direction in meters-per-second (m/s) or feet-per-second (ft/s).

Air Temperature: The temperature of the air surrounding a person, measured with a standard thermometer whose bulb is kept dry and shielded from radiation.

Comfort Zone: That range of environmental conditions in which at least eighty (80) percent of seafarers experience thermal comfort.

HVAC Zone: A space or group of spaces that is independently controlled for temperature, humidity, air cleanliness, and air distribution. A zone usually comprises common duct work fed from an air handler.

Reference Calibration: Calibration of a measuring instrument, conducted by an accredited Testing and Calibration Laboratory, with traceability to a national or international standard.

Relative Humidity (RH): The ratio of the amount of vapor contained in the air (absolute humidity) to the maximum amount of vapor the air can hold at a given temperature before precipitation (condensation) occurs.

Thermal Comfort: An ordinal ranking or subjective index of “that condition of mind which expresses satisfaction with the thermal environment”.

Ventilation: Ventilation is the process of supplying air to and removing air from any space by natural or mechanical means. From the standpoint of comfort and health, ventilation issues involve both quantity and quality.

4 Associated Documentation

The following documents provide details about test plan preparation, test measurement procedures and/or test reporting:

- ANSI/ASHRAE 55a, (1995). Thermal environmental conditions for human occupancy
- ISO 7726 (E), (1998), Ergonomics of the thermal environment – Instruments for measuring physical quantities
- NEBB, (1998). Procedural standards for testing, adjusting, balancing of environmental Systems

5 Criteria

The indoor climate criteria for the Accommodations notation (**MLC-ACCOM**) are provided in Section 5, Table 1, “Summary of Indoor Climate Requirements”.

Indoor climate measurements shall be taken only in manned spaces. A space is considered “manned” if it is occupied by seafarers for twenty (20) minutes or longer at a time. Specific locations are referred to in 5/7.4, “Measurement Locations”. The thermal environmental comfort ranges and conditions shall be achievable, under the test conditions specified in 5/7.3, “Test Conditions”, for normal operating conditions, in selected manned spaces.

The **MLC-ACCOM** notation criteria provide for a preset return air temperature maintained by a temperature controller for each zone and is primarily aimed at HVAC systems that do not make provision for individual adjustment to suit personal preferences and activities within a specific space. If individual adjustment is provided then the adjustable range of air temperatures shall be between Winter: 22 to 27°C (71.5 to 80°F) and Summer: 20 to 25°C (68 to 77°F). *Note:* This is not a requirement for the **MLC-ACCOM** notation.

5.1 Air Temperature

The HVAC system shall be capable of providing return air temperatures as noted in Section 5, Table 1, “Summary of Indoor Climate Requirements” to an HVAC zone for a set of habitable spaces. This temperature shall be maintained by a temperature controller. Each zone shall have a thermostat for reheat and dehumidification purposes.

5.2 Relative Humidity

The HVAC system shall be capable of providing and maintaining a relative humidity within a range from thirty (30) percent minimum to seventy (70) percent maximum.

5.3 Air Exchange Rate

The rate of air change for enclosed spaces shall be at least six (6) complete changes-per-hour.

5.4 Summary

A summary of the indoor climate requirements is presented in Section 5, Table 1, “Summary of Indoor Climate Requirements”.

**TABLE 1
Summary of Indoor Climate Requirements**

<i>Item</i>	<i>Requirement or Criterion</i>
Air Temperature	Non-adjustable air temperature between Winter or Summer: 22 to 25°C (71.5 to 77°F)
Relative Humidity	A range from 30% minimum to 70% maximum
Air Exchange Rate	The rate of air change for enclosed spaces shall be at least six (6) complete changes-per-hour.

6 Test Plan

As stated in 1/7.3.1, “Test Plans”, a Test Plan shall be developed to serve as the principal means for submitting design details of the HVAC system for review by ABS Engineering and for verifying the measurements to be performed to verify compliance with indoor climate criteria.

6.1 Documentation

The Test Plan shall include the following documentation and data to enable the ABS Surveyor to verify compliance to the indoor climate criteria set in this Guide and to identify spaces where measurements shall be taken:

- i) Appropriate vessel and HVAC system design specifications
- ii) Schematics/layout drawings of the HVAC system
- iii) General arrangement drawings of the vessel

A report of the total system Testing, Adjusting, and Balancing (TAB) shall be provided to ABS Engineering for review of indoor climate suitability. The total system TAB shall be conducted in accordance with the National Environmental Balancing Bureau (NEBB) standard “*NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems*” or other similar certification standards. The NEBB is a nonprofit organization that establishes and maintains HVAC system industry standards, procedures and specifications.

6.2 Test Personnel

The Test Plan shall provide information about the External Specialists who will be conducting the testing and their approval and certification in accordance with Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”.

6.3 Test Conditions

The Test Plan shall detail the conditions under which the tests will be performed. Details about test conditions are given in 5/7.3, “Test Conditions”.

6.4 Measurement Locations

The Test Plan shall document, in detail, on appropriate drawings, all manned spaces or areas where measurements will be taken. In addition, transducer measurement positions shall be indicated. Details on selecting measurement locations and determining transducer positions are provided in 5/7.4, “Measurement Locations”.

6.5 Data Acquisition and Instruments

Information shall be provided regarding the methods and instrumentation to be used for measurement and data collection. Instrumentation specification details shall include type of instruments to be used, accuracy, response time, calibration, and sensitivity. More details on data acquisition and instruments are provided in 5/7.2, “Data Acquisition and Instruments”.

6.6 Data Analysis

Information shall be provided regarding the methods, software, and instrumentation to be used for data analysis.

6.7 Test Schedule

Information shall be provided regarding the proposed test schedule.

7 Test Requirements

7.1 General

Indoor climate measurements shall be in accordance with the requirements of ANSI/ASHRAE 55a-1995. When the procedures described in this Guide deviate from those in ANSI/ASHRAE 55a-1995, the requirements of this Guide shall take precedence.

7.2 Data Acquisition and Instruments

The thermal measurement instrumentation shall meet or exceed the minimum characteristics of instruments for measuring physical quantities characterizing an environment specified in ISO 7726:1998(E).

The following quantities shall be measured in each of the spaces or zones identified in the Test Plan and the results noted in the Indoor Climate Test Report:

- i)* Air temperature
- ii)* Relative humidity

The air temperature and humidity measurements shall be made at least every five (5) minutes for a minimum period of two (2) hours. The minimum, maximum, and average values for the 2-hour period shall be reported for each space measured.

The measuring period for determining the average air velocity at any location shall be three (3) minutes.

7.3 Test Conditions

In order to determine the effectiveness of the HVAC system at providing the environmental conditions specified in this Guide, measurements shall be made under the following conditions:

7.3.1 Testing at Sea

Testing of identified spaces shall be accomplished at sea with all normally functioning equipment in its operational mode.

7.3.2 Equipment Operation

The HVAC system shall be operating in the normal operation or mode.

7.3.3 Doors and Windows

The space doors and windows shall be closed during the evaluation period, except for routine entry and exit. Any open doors or windows shall be noted in the Indoor Climate Test Report.

7.3.4 Equipment and Furnishings

Spaces shall be furnished with all usual equipment and furnishings normally found in the space. Equipment shall be configured to operate in its normal operating mode.

7.3.5 Weather and Climatic Conditions

When thermal conditions in the occupied zone have a high sensitivity to time of day and weather conditions, the measurement shall be made such that the high and low extremes of the thermal parameters are determined (e.g., measurements could therefore be taken during the day and night in the same space). If possible, measurements should be taken with little or no cloud cover.

7.3.6 Test Interference

During the indoor climate measurements, any activity that might affect the indoor climate in the space shall be avoided. For this reason, only the personnel needed for the normal operation of the equipment in the space and those carrying out the measurements shall be present in the space being tested.

Doors and windows shall be closed, except where they are normally left open (such as the door on the lee side of the navigation bridge, which may normally be open). Any open doors or windows shall be noted in the Indoor Climate Test Report. Spaces shall be furnished with all usual equipment and furnishings normally found in the space. Equipment shall be configured to operate in its normal operating mode.

7.4 Measurement Locations

7.4.1 Selection of Spaces where Measurements are to be Conducted

The aim when selecting indoor climate measurement locations shall be to obtain a representative sample of data that reflects the actual conditions in manned spaces. For practical reasons, it is important to select the locations such that an appropriate amount of sample data can be collected during the testing phase. The measurement locations shall be selected in accordance with the following criteria:

- i)* Select potential problem areas where the influence of internal conditions or factors may adversely impact the quality of the indoor climate in manned spaces, seafarer accommodations, and recreation areas. Internal conditions include space proximity to equipment that radiates or absorbs heat (e.g., engine exhaust trunks, freezer spaces, galley, scullery, etc.) and surfaces with thermal differentials in excess of 10°C (18°F) from the ambient temperature in the space. Measurements shall be taken in all identified problem areas.
- ii)* Select potential problem areas where the influence of external ambient environmental conditions (e.g., sun, wind, precipitation, etc.) may adversely impact the quality of the indoor climate. These areas include manned spaces, accommodations, and recreation areas which may be outboard or adjacent to the vessel's hull. Measurements shall be taken in all identified problem areas.

- iii)* Where a single instance of one (1) type of space exists within the vessel (e.g., bridge, radio room, officer's mess, gymnasium, library, etc), that location shall be selected for measurement.
- iv)* Where multiple instances of one (1) type of space exist (e.g., cabins/staterooms, or recreation areas), a representative sample of at least twenty (20) percent of each type shall be selected for measurement. The worst case locations are to be considered part of the representative sample, if applicable.

If any of the spaces identified for measurement extend or are situated over a large portion of the vessel, measurement locations shall be selected throughout the length of the vessel on each deck. Additionally, attention must be given to selecting a variety of locations port, starboard, amidships, fore, and aft.

7.4.2 Walkthrough Verification Inspection Locations

An additional sample of at least ten (10) percent of all manned spaces not covered by physical measurements shall be subject to a walkthrough verification inspection. The ABS Surveyor shall identify these spaces from those that were not selected for physical measurement under 5/7.4.1, "Selection of Spaces where Measurements are to be Conducted". The purpose of the walkthrough verification is to subjectively assess the indoor climatic qualities of the selected spaces. The walkthrough verification inspection shall be conducted by the External Specialist during onboard testing. If any space is deemed to deviate from the indoor climate requirements provided in this Guide, it shall be verified by the External Specialist by conducting spot measurements and the results recorded in the Test Report.

7.4.3 Transducer Measurement Positions

For each space identified in the Test Plan, the transducer locations shall be standardized as follows:

- i)* Air temperature and relative humidity measuring instrumentation shall be set up approximately in the middle of the space to measure general space temperature and humidity levels. Air temperature shall be simultaneously measured at approximately 100 mm (4 in.), 1100 mm (43 in.), and 1700 mm (67 in.) above the deck. Relative humidity shall be measured at a height of approximately 1700 mm (67 in.) above the deck.

8 Test Report

As stated in 1/7.3.2, "Test Reports", a Test Report shall be submitted to the ABS Surveyor to determine whether the indoor climate levels meet the criteria and whether this part of the notation requirement has been met. The details listed in the following Paragraphs shall be provided in the Indoor Climate Test Report.

8.1 Test Details

The following details shall be provided for each period of testing:

- i)* Loading condition
- ii)* Number of seafarers and total number of persons onboard during testing
- iii)* Machinery operating conditions
- iv)* Vessel course and speed, as well as latitude and longitude coordinates during testing
- v)* Weather conditions and meteorological data (i.e., wind speed and direction, ambient outdoor air temperature, outdoor humidity, barometric pressure)
- vi)* Sea state
- vii)* Any indications of abnormal activities or conditions during the test that might skew results

8.2 Transducer Measurement Positions

Actual measurement locations and transducer positions shall be indicated on appropriate drawings.

8.3 Measurement Equipment Details

Details of measuring and analysis equipment (e.g., manufacturer, type and serial number, accuracy, sampling frequency, and resolution) shall be provided.

Copies of the relevant instrumentation reference calibration certificates, together with the results of field setup and calibration checks before and after the field tests, shall be provided.

8.4 Results

The following results, per measurement location and sample period as appropriate for the notation, shall be provided in table format:

- i)* Measurement position
- ii)* Number of people present in the space at time of measurement
- iii)* Measurement period
- iv)* Time at start and end of measurement
- v)* Air temperature (minimum, maximum, and average) at 100 mm (4 in.) above deck
- vi)* Air temperature (minimum, maximum, and average) at 1100 mm (43 in.) above deck
- vii)* Air temperature (minimum, maximum, and average) at 1700 mm (67 in.) above deck
- viii)* Relative humidity (minimum, maximum, and average) at 1700 mm (67 in.) above deck
- ix)* Outdoor wind speed and direction, ambient outdoor air temperature, outdoor humidity, and barometric pressure corresponding to indoor measurement periods

For all the remaining spaces that were checked by walkthrough verification inspection and spot check measurements, the following information shall be provided:

- i)* Name and number of space
- ii)* Walkthrough verification inspection results
- iii)* Spot measurement results (where appropriate)

8.5 Deviations

All deviations from the approved Test Plan shall be reported.

8.6 Surveyor Witnessing Documentation

The equipment calibration and data collection process of the indoor climate tests shall be witnessed by an ABS Surveyor. The ABS Surveyor shall provide documentation stating whether all steps of the indoor climate testing were completed to his/her satisfaction. A copy of the witnessing document shall be given to the person conducting the testing, for insertion into the final Indoor Climate Test Report. The original shall be retained for the Bureau's files.

9 Results

The Indoor Climate Test Report and test results shall be reviewed by the ABS Surveyor against the appropriate **MLC-ACCOM** criteria for notation confirmation.

SECTION 6 Lighting

1 Background

The lighting of seafarer spaces should facilitate visual task performance and facilitate the movement of seafarers in the space and aid in the creation of an appropriate visual environment. Lighting design involves integrating these aspects to provide adequate illumination for the safety and well-being of seafarers as well as for the various tasks performed onboard vessels.

The selection of appropriate illuminance levels for specific tasks and seafarer spaces is an important consideration in the design of lighting systems. There is a difference of opinion as to what levels of light may be considered best for visual tasks. Since illuminance recommendations are generally consensus values, for any task, a range of illuminances may apply.

Since visual tasks performed within habitable spaces onboard a vessel are generally similar to tasks encountered ashore, requirements for illuminance on vessels generally correspond to those tasks performed in living, working, and recreation areas on shore.

Visual tasks encountered on vessels vary widely. In addition to the illuminance level, external factors such as contrast with respect to the background, object size, brightness, the time available for viewing or recognition, and reflectance determine the visibility of an object within the visual field. Other considerations include task duration, visual fatigue, task criticality, discomfort glare, veiling reflections, shadows, and the age and visual acuity of the observer. From a subjective viewpoint, aesthetics, color, and the psychological effects of lighting should also be considered. These factors are all interrelated and should be considered together with objective qualities during the process of selecting illuminance levels, but shall not be separately quantified.

2 Scope

The 2006 MLC has Regulations relating to lighting levels aboard vessels. They are contained in the following list:

- i) Regulation A3.1.6(d) states: *“in passenger ships, and in special ships constructed in compliance with the IMO Code of Safety for Special Purpose Ships, 1983, and subsequent versions (hereinafter called “special purpose ships”), the competent authority may, on condition that satisfactory arrangements are made for **lighting** and ventilation, permit the location of sleeping rooms below the load line, but in no case shall they be located immediately beneath working alleyways;”*
- ii) Regulation A3.1.6(g) states: *“**proper lighting** and sufficient drainage shall be provided”*
- iii) Regulation A3.1.8 states: *“With respect to requirements for lighting, subject to such special arrangements as may be permitted in passenger ships, sleeping rooms and mess rooms shall be lit by natural light and provided with **adequate artificial light.**”*
- iv) Regulation B3.1.8.2 states: *“The arrangement of the entrance, berths, **lighting**, ventilation, heating and water supply should be designed to ensure the comfort and facilitate the treatment of the occupants.”*

ABS considers compliance with the lighting criteria in this Section satisfactory for compliance with the artificial lighting aspects of A3.1.6(d), A3.1.6(g), and A3.1.8.

This Section provides criteria for assessing the illuminance levels of general lighting and task lighting on vessels. The main objective of the assessment is to determine whether the various lighting systems comply with minimum standards to accommodate seafarer visual task performance and facilitate seafarer movements and well-being onboard vessels.

Lighting criteria are defined based on currently available objective standards and research data. Compliance with this Section is a pre-requisite for the Accommodations notation (**MLC-ACCOM**) confirmation.

3 Terminology

Calibration Checks: Field calibration of a measuring instrument conducted before and after a field test, using a reference calibrated signal or through zero calibration.

Disability Glare: Glare which reduces the ability to perform a visual task.

Discomfort Glare: Glare which produces viewer discomfort, but which does not interfere significantly with visual task performance or visibility.

General Lighting: Lighting designed to provide a substantially uniform level of illuminance throughout an area, exclusive of any provision for special, localized task requirements. Such lighting should be provided by fixed luminaires.

Glare: The discomfort or impairment of vision experienced when parts of the visual field are excessively bright in relation to the general surroundings.

Illuminance: The luminous flux density at a surface (or the amount of light falling on an object or surface), i.e., the luminous flux incident-per-unit area. Illuminance is measured in units of Lux (lm/m^2) or foot-candles (fc ; lm/ft^2). One foot-candle equals 10.76 Lux.

Lumen: The International System of Units (SI) of luminous flux, used in describing a quantity of light emitted by a source or received by a surface.

Luminaire: A complete lighting unit consisting of a lamp(s) together with the parts designed to distribute the light, to position and protect the lamp, and to connect the lamp to the power supply.

Luminance: The photometric brightness of an illuminated surface (or the amount of light emitted or reflected from the surface). The SI unit of luminance is candela-per-square meter (cd/m^2).

Luminous Flux: The light emitted by a source, or received by a surface and indicates the intensity of a source. Flux is expressed in lumens.

Reference Calibration: Calibration of a measuring instrument, conducted by an accredited Testing and Calibration Laboratory, with traceability to a signal or through zero calibration.

Task Lighting: Lighting provided to meet the illuminance requirements of a specific task. Task lighting refers to the total illuminance requirement that may be obtained by supplementary lighting provided in addition to the general illuminance. Such lighting may be provided by fixed luminaires or via wall brackets, floor lamps, or table lamps.

Task Plane: The horizontal, vertical, or inclined plane in which the visual task lies. If no information is available, the task plane may be considered to be the horizontal and at 750 mm (29.5 in.) above the deck for seated tasks and 1000 mm (39.5 in.) for standing tasks.

Uniformity Ratio: The ratio of the minimum illuminance (or luminance) to the average illuminance (or luminance) applied to the values on the working plane.

4 Associated Documentation

IESNA RP-12-97, Recommended Practice for Marine Lighting, provides details about Test Plan preparation, test measurement procedures and test reporting.

ISO 8995:2000 (CIES 008/E), Lighting of indoor work places, provides a criteria basis.

5 Criteria

The lighting criteria for the Accommodations notation (**MLC-ACCOM**) are provided in Section 6, Table 1, “Lighting Criteria for Seafarer Accommodations Spaces”.

In this Section, general lighting and task lighting requirements are provided for seafarer tasks and spaces normally encountered on vessels. The lighting levels provided in the tables are for new lamps. Emergency lighting is covered in SOLAS and IMO Resolutions and was not considered in the selection of the lighting levels provided in this Guide. For lighting criteria for spaces not covered by this notation, please consult the following:

- *ABS Guide for Crew Habitability on Ships*
- *ABS Guide for Crew Habitability on Offshore Installations*
- *ABS Guide for Crew Habitability on Workboats*

5.1 General and Task Lighting

The minimum maintained illuminance levels in Section 6, Table 1, “Lighting Criteria for Seafarer Accommodations Spaces” shall be achieved under the test conditions specified in 6/7.3, “Test Conditions”, measured with task lighting turned on where provided but with daylight excluded.

6 Test Plan

As stated in 1/7.3.1, “Test Plans”, a Test Plan shall be developed to serve as the principle means for submitting design details of the lighting system for review by ABS Engineering and for verifying the measurements to be performed to verify compliance with lighting criteria. The Test Plan shall include the following:

6.1 Documentation

The Test Plan shall include appropriate design information and layout drawings showing the hull outline, bulkheads, access routes, location of luminaires, outlines of major furniture and equipment, and the space name and number. The drawings shall be to a scale and sized to permit the scaling of survey points (required by 6/7.4, “Measurement Locations”) and lighting equipment and the recording of luminance and other relevant data.

6.2 Test Personnel

The Test Plan shall provide information about the External Specialists who will be conducting the test and their approval and certification in accordance with Appendix 2, “Procedural Requirements for External Specialists Performing Ambient Environmental Testing”.

6.3 Test Conditions

The Test Plan shall detail the conditions under which the tests will be performed. Details about test conditions are given in 6/7.3, “Test Conditions”.

TABLE 1
Lighting Criteria for Seafarer Accommodations Spaces

<i>Space</i>	<i>Illuminance Level in Lux</i>	<i>Space</i>	<i>Illuminance Level in Lux</i>
Entrances and Passageways			
Interior Walkways, Passageways, Stairways and Access Ways	110	Exterior Walkways, Passageways, Stairways and Access Ways (night)	110
Cabins, Staterooms, Berthing and Sanitary Spaces			
General Lighting	150	Bath/Showers (General Lighting)	325
Reading and Writing (Desk or Bunk Light)	540	All other Areas within Sanitary Space (e.g., Toilets, Change Room)	150
Mirrors (Personal Grooming)	540		
Dining Spaces			
Mess Room and Cafeteria	300	Snack and Coffee Bar	500
Vending Machine Area	75		
Recreation Spaces			
Lounges	300	Gymnasiums	300
Library	540	Bulletin Boards/Display Areas	150
Multimedia Resource Center	300	All other Recreation Spaces (e.g., Game Rooms)	300
TV Room	150	Training/Transit Room	540
Medical, Dental and First Aid Center			
Dispensary	540	Wards - General Lighting - Critical Examination - Reading - Toilets	100 810 540 150
Medical and Dental Treatment/Examination Room	810		
Medical Waiting Areas	540		
Laboratories	810		
		Other Medical & Dental Spaces	325

6.4 Measurement Locations

The Test Plan shall document, in detail, on appropriate drawings, all spaces or areas where measurements will be taken. In addition, measurement positions shall be indicated. Details on selecting measurement locations are provided in 6/7.4, "Measurement Locations".

6.5 Data Acquisition and Instruments

Information shall be provided regarding the methods and instrumentation to be used for measurement and data collection. Instrumentation specification details shall include type of instruments to be used, accuracy, response time, calibration, and sensitivity. More details on data acquisition and instruments are provided in 6/7.2, "Data Acquisition and Instruments".

6.6 Data Analysis

Information shall be provided regarding the methods used for data analysis.

6.7 Test Schedule

Information shall be provided regarding the proposed test schedule.

7 Test Requirements

7.1 General

Illuminance measurements shall be carried out in accordance with the requirements of IESNA RP-12-97. When the procedures described in this Guide deviate from those in IESNA RP-12-97, the requirements of this Guide shall take precedence.

7.2 Data Acquisition and Instruments

The illuminance meter (light meter) shall meet the requirements specified in IESNA RP-12-97 or ISO 8995. This defines the instrumentation requirements for measuring white light.

7.3 Test Conditions

The test conditions specified in Section B.4 of IESNA RP-12-97 shall apply. In addition, the following test conditions shall apply:

7.3.1 Location

Lighting measurements may be taken in port, at sea, or both, since the measurements are not dependent on vessel transit.

7.3.2 Spaces with Windows/Portlights

In spaces with windows or portlights where the minimum lighting level shall be provided by artificial light sources only, lighting measurements shall be taken after dark.

7.3.3 Spaces without Windows/Portlights

Interior spaces with no windows or portlights can be measured during daylight hours.

7.3.4 Stray Light

Stray light (e.g., dock lighting and moonlight) shall be masked out as far as practicable. Where it is not possible, measurements of stray light, at appropriate positions, with all lighting turned off, shall be obtained. These readings shall then be deducted from readings taken at the same positions, with the lighting turned on, to determine the illuminance from the lighting.

7.3.5 Light for Sleep

Lighting measurements shall be taken in cabins and staterooms with all cabin and stateroom lights turned off and curtains, shutters, etc., closed.

7.3.6 Test Interference

During the lighting measurements, shadows on the light meter caused by any kind of human activity shall be avoided. For this reason, only the personnel needed for the normal operation of the equipment in the space and those carrying out the measurements shall be present in the space being tested.

Doors and windows shall be closed, except where they are normally left open (such as the door on the lee side of the navigation bridge, which may normally be open). Any open doors or windows shall be noted in the Lighting Test Report. Spaces shall be furnished with all usual equipment and furnishings normally found in the space.

7.4 Measurement Locations

7.4.1 Selection of Spaces where Measurements are to be Conducted

The aim when selecting lighting measurement locations shall be to obtain a representative sample of data that represents the actual conditions in the manned spaces listed in Section 6, Table 1, “Lighting Criteria for Seafarer Accommodations Spaces”. For practical reasons, it is important to select the locations such that an appropriate amount of sample data can be collected during the testing phase. The measurement locations shall be selected in accordance with the following criteria:

- i)* Select problem areas based on the potential for excessive external illumination (daylight) into the space (e.g., bridge). Measurements shall be taken in all identified problem areas.
- ii)* Select potential problem areas based on the positioning of luminaires in the space as indicated on the drawings (e.g., uneven spacing of luminaires resulting in non-uniform illuminance levels and dimly lit areas). Measurements shall be taken in all problem areas.
- iii)* Where a single instance of one (1) type of space exists within the vessel (e.g., bridge, radio room, officer’s mess, gymnasium, library, etc), that location shall be selected for measurement.
- iv)* Where multiple instances of one (1) type of space exist (e.g., seafarer recreation areas or mess) with the exception of cabins/staterooms, a representative sample of at least twenty (20) percent of each type shall be selected for measurement. The problem area locations are to be considered part of the representative sample, if applicable.
- v)* Where a number of seafarer cabin/stateroom spaces are identical in configuration in terms of lighting systems, surface treatments, geometry, furnishings, and equipment layout, only two (2) of the spaces shall be selected to determine whether the lighting requirements are met.

7.4.2 Visual Inspection Locations

A sample of at least ten (10) percent of the spaces and task areas listed in Section 6, Table 1, “Lighting Criteria for Seafarer Accommodations Spaces”, not covered by physical measurements, shall be subject to a walkthrough verification inspection by the External Specialist to verify that the lighting equipment is installed as specified. The ABS Surveyor shall identify these spaces. In spaces where the External Specialist regards the lighting levels to be below the minimum required levels, spot checks shall be made of the general and task lighting levels. Checks will be made in such spaces by taking a single lighting measurement in the center of the space at a height of approximately 750 mm (30 in.) and a single lighting measurement on each work surface or task plane.

If the measured spot check lighting level is below the required minimum level, the space shall be subjected to a full lighting test as described in 6/7.4.3, “General Illuminance Measurement Positions” and 6/7.4.4, “Task Lighting Measurement Positions”.

7.4.3 General Illuminance Measurement Positions

General lighting levels shall be measured with all lights turned on except supplementary detail task lighting, such as desk lights and berth lights. Daylight shall be excluded during the measurements. Measurements shall be taken on a horizontal plane approximately 750 mm (30 in.) above the deck. For traffic areas, readings shall be taken on the deck.

General lighting measurements in selected manned spaces shall be conducted in accordance with the measurement techniques presented in Section B.8 and Section B.10.3 in IESNA RP-12-97.

Average illuminance of regular spaces with symmetrically spaced luminaires and spaces with asymmetrical luminaire arrangements shall be measured and calculated in accordance with the sampling technique presented in Section B.10.3 in IESNA RP-12-97. This technique uses the relationship of symmetry and incorporates a statistical averaging procedure to minimize the required number of data points.

The method presented in Section B.10.3 in IESNA RP-12-97 assumes that there is a large overlap in the luminaire light distribution (low uniformity ratios), that the illuminance variation between maximum, middle, and minimum data points is approximated by a straight line and that identical luminaires are installed in a regular grid pattern throughout the space. This method is not valid where these assumptions are not correct and may not reveal areas in the space where lighting levels are inadequate.

In situations where the statistical averaging method is not valid, the space must be divided into a grid and measurements shall be taken as described in Section B.8 in IESNA RP-12-97.

7.4.4 Task Lighting Measurement Positions

Task lighting measurements in selected manned spaces shall be conducted in accordance with the measurement technique presented in Section B.8 and Section B.10.4 in IESNA RP-12-97.

For task lighting, a representative set of readings as indicated in Table B.1 in IESNA RP-12-97 shall be taken over the task surface with the worker in the normal working position. Task lighting shall be measured with both general and supplementary task lighting turned on. Daylight shall be excluded during the measurements.

Measurements of task lighting shall be made on the surface or in the plane of the task (horizontal, vertical, or at an angle). For small task surfaces [smaller than 0.2 m² (2.15 ft²)], a single measurement shall be taken at the center of the task surface. For larger task surfaces [0.2 m² (2.15 ft²) or larger], the illuminance shall be measured by dividing the task surface into a grid and averaging the measurements taken at the grid intersections. The recommended number of measurements for task surfaces is provided in Table B.1 in IESNA RP-12-97.

Measurements for mirrors shall be taken approximately 400 mm (16 in.) away from the surface of the mirror. For berths and bunks, measurements shall be taken at a point approximately 300 mm (12 in.) above the top of the mattress and 600 mm (24 in.) from the head of the bed.

8 Test Report

As stated in 1/7.3.2, “Test Reports”, a Test Report shall be submitted to the ABS Surveyor to determine whether the lighting levels meet the minimum requirements and whether this part of the notation requirement has been met. The details listed in the following Paragraphs shall be provided in the Lighting Test Report.

8.1 Test Details

The following details shall be provided for each period of testing:

- i)* Power source for lighting during testing
- ii)* External lighting conditions (e.g., Were measurements taken in port or at sea? Were measurements taken during daylight hours or after dark?)

8.2 Measurement Positions

Actual measurement locations shall be indicated on appropriate drawings.

8.3 Measurement Equipment Details

Details of all measuring equipment (e.g., manufacturer, type and serial number, accuracy, and resolution) shall be provided.

Copies of the relevant instrumentation reference calibration certificates, together with the results of field setup and calibration checks before and after the field tests, shall be provided.

8.4 Results

The following results, per space, shall be provided in table format:

- i)* Name and number of space
- ii)* Task areas (if any) in space
- iii)* Average lighting level for general lighting
- iv)* Average lighting level for task lighting on each task surface or plane in space
- v)* Lighting level in cabins/staterooms with lights turned off and curtains, shutters, deadlights, etc., closed

For all the remaining spaces that were checked by visual inspection and spot check measurements, the following information shall be provided:

- i)* Name and number of space
- ii)* Visual inspection results
- iii)* Task areas (if any) in space
- iv)* Single lighting level for general lighting (where appropriate)
- v)* Single lighting level for task lighting on each task surface or plane in space (where appropriate)

8.5 Deviations

All deviations from the approved Test Plan shall be reported.

8.6 Surveyor Witnessing Documentation

An ABS Surveyor shall witness the equipment calibration and data collection process of the lighting tests. The ABS Surveyor shall provide documentation stating whether all steps of the lighting testing were completed to his/her satisfaction. A copy of the witnessing document shall be given to the person conducting the testing, for insertion into the final Lighting Test Report. The original shall be retained for the Bureau's files.

9 Results

The Lighting Test Report and test results shall be reviewed by the ABS Surveyor against the appropriate **MLC-ACCOM** criteria for notation confirmation.



APPENDIX 1 References

1 General References

- 1 American Bureau of Shipping. *Guide for Building and Classing Aluminum Vessels*. Houston, TX: Author.
- 2 American Bureau of Shipping. *Guide for Building and Classing High Speed Craft*. Houston, TX: Author.
- 3 American Bureau of Shipping. *Guide for Building and Classing Motor Pleasure Yachts*. Houston, TX: Author.
- 4 American Bureau of Shipping. *Guide for Building and Classing Passenger Vessels*. Houston, TX: Author.
- 5 American Bureau of Shipping. *Guide for Passenger Comfort on Ships*. Houston, TX: Author.
- 6 American Bureau of Shipping. *Rule Requirements for Materials and Welding: Aluminum and Fiber Reinforced Plastics*. Houston, TX: Author.
- 7 American Bureau of Shipping. *Rules for Building and Classing Steel Vessels*. Houston, TX: Author.
- 8 American Bureau of Shipping. *Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways*. Houston, TX: Author.
- 9 American Bureau of Shipping. *Rules for Building and Classing Steel Vessels Under 90 meters in Length*. Houston, TX: Author.
- 11 The ILO Maritime Labour Convention, 2006

2 Accommodations References

- 1 American Society for Testing and Materials. (1996). *Standard practice for human engineering design for marine systems, equipment and facilities* (ASTM F 1166 – 2000). West Conshohocken, PA: Author.
- 2 Human Factors Society, Inc. (1988). *American national standard for human factors engineering of visual display terminal workstations* (ANSI/HFS Standard No.100-1988). Santa Monica, CA: Author.
- 3 International Labor Office. (1949). *Accommodation of Crews Convention (Revised)* (Convention C92). Geneva: Author.
- 4 The ILO Maritime Labour Convention, 2006. Geneva: Author.
- 5 International Labor Office. (1998). *Maritime labor conventions and recommendations* (4th ed.). Geneva: Author.
- 6 International Maritime Organization. (1997). *International Convention of the Safety of Life at Sea: Means of escape* (Chapter II-2, Regulation 28). London: Author.
- 7 International Organization of Masters, Mates, & Pilots. *Contract requirements for both existing and new ship construction*. Linthicum Heights, MD: Author.

- 8 Sailor's Union of the Pacific. (1996). *Agreement between Sailor's Union of the Pacific and American President Lines, Ltd. In the Offshore and Intercoastal Trades*. San Francisco, CA: Author.
- 9 Seafarers International Union. *Contract requirements for unlicensed seamen*. Camp Springs, MD: Author.
- 10 U.S. Maritime Administration: National Maritime Resource and Education Center. (1995). *Guideline specification for merchant ship construction, prepared by the Office of Ship Design*. Washington, DC: U.S. Department of Transport.
- 11 U.S. Navy. (1995). *Shipboard accommodations design criteria manual (T9640-AB-DDT-010/MLC-ACCOM)*. Arlington, VA: Naval Sea Systems Command.
- 12 Woodson, W.E., Tillman, B., and Tillman, P. (1992). *Human factors design handbook: Information and guidelines for the design of systems, facilities, equipment and products for human use* (2nd ed.). New York: McGraw-Hill, Inc.

3 Whole-body Vibrations References

- 1 American Bureau of Shipping. *Guide for Building and Classing High Speed Craft*. Houston, TX: Author.
- 2 Griffin M. J. (1990). *Handbook of human vibration*. London: Academic Press.
- 3 International Organization for Standardization. (1984). *Code for the measurement and reporting of local vibration data of ship structures and equipment (ISO 4867:1984)*. Geneva: Author.
- 4 International Organization for Standardization. (1996). *Acoustics – Measurement of noise shipboard vessels (ISO 2923:1996)*. Geneva: Author.
- 5 International Organization for Standardization. (1998). *Mechanical mounting of accelerometers for measuring mechanical vibration and shock (ISO 5348:1998(E))*. Geneva: Author.
- 6 International Organization for Standardization. (2007). *Human response to vibration – Measuring instrumentation Amendment 1 (ISO 8041:2007)*. Geneva: Author.
- 7 International Organization for Standardization (2000) *Mechanical vibration – Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships (ISO 6954:2000)*
- 8 World Meteorological Organization (1995). *International Codes Vol I.1 Part A Alphanumeric Codes*. Boston, MA: American Meteorological Society.

4 Noise References

- 1 International Electrotechnical Commission. (2002). *Electroacoustics – Sound Level Meters Integrating-averaging sound level meters (International Standard IEC 64672-1:2002,– Part 1: Specifications)*. Geneva: IEC Central Office.
- 2 International Maritime Organization. (1981). *Code on noise levels on board ships (IMO Resolution A.468(XII))*. London: Author.
- 3 International Organization for Standardization (1996). *Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation (ISO 717-1:1996)*. Geneva: Author.
- 4 International Organization for Standardization (1996). *Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation (ISO 717-2:1996)*. Geneva: Author.

- 5 International Organization for Standardization. (1996). *Acoustics – Measurement of noise on board vessels* (ISO 2923:1996). Geneva: Author.
- 6 International Organization for Standardization. (1984). *Code for the measurement and reporting of shipboard vibration data* (ISO 4867:1984). Geneva: Author.
- 7 Kryter, K.D. (1994). *The handbook of hearing and the effects of noise: Physiology, psychology and public health*. San Diego: Academic Press.
- 8 World Meteorological Organization (1995). *International Codes Vol I.1 Part A Alphanumeric Codes*. Boston, MA: American Meteorological Society.

5 Indoor Climate References

- 1 American National Standards Institute. (1995). *Thermal environmental conditions for human occupancy* (ANSI/ASHRAE 55a-1995). Atlanta, GA: The American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
- 2 International Organization for Standardization. (1998). *Ergonomics of the thermal environment – Instruments for measuring physical quantities* (ISO 7726:1998 (E)). Geneva: Author.
- 3 International Organization for Standardization. (1994). *Moderate thermal environments – Determination of the PMV and PPD indices and specification of the conditions for thermal Comfort* (ISO 7730:1994(E)). Geneva: Author.
- 4 National Environmental Balancing Bureau. (1998). *NEBB Procedural standards for testing, adjusting, balancing of environmental systems*. Gaithersburg, MD: Author.

6 Lighting References

- 1 Chartered Institution of Building Services. (1984). *CIBS CODE for interior lighting*. London: Author.
- 2 Illuminating Engineering Society of North America. (1993). *American national standard practice for office lighting* (ANSI/IESNA RP-1-1993). New York: Author.
- 3 Illuminating Engineering Society of North America. (1997). *Recommended practice for marine lighting* (IESNA RP-12-97). New York: Author.
- 4 Ryer, A. D. (1997). *Light measurement handbook*. Newburyport, MA: International Light, Inc.
- 5 U.K. Ministry of Defence. (1997). *Human factors for designers of equipment, Part 6: Vision and lighting* (DEF STAN 00-25 (Part 6)/Issue 2). Glasgow: Ministry of Defence, Directorate of Standardization.

This Page Intentionally Left Blank

APPENDIX 2 **Procedural Requirements for External Specialists Performing Ambient Environmental Testing**

1 Terminology

Calibration Checks: Field calibration of a measuring instrument, conducted before and after a field test, using a reference calibrated signal or through zero calibration.

External Specialists: Companies providing test or measurement services on behalf of the Owner of a vessel or shipyard for the purposes of meeting ABS Accommodations notation (**MLC-ACCOM**), Habitability (**HAB**) or Comfort (**COMF**) notation related requirements.

Reference Calibration: Calibration of a measuring instrument, conducted by an accredited Testing and Calibration Laboratory, with traceability to a national or international standard.

2 Objective

The objective of this procedure is to set basic standards for qualifying and certifying External Specialists performing ambient environmental testing and evaluation.

3 Application

This procedure applies to the approval of External Specialists that provide the following ambient environment test services:

- i) Whole-body Vibration measurements and analysis
- ii) Noise measurements and analysis
- iii) Indoor Climate measurement and analysis
- iv) Lighting measurement and analysis

General requirements concerning External Specialists are given in A2/4.2, “General Requirements”. Specific requirements for the test services listed above are in Subsection A2/8, “Detailed Requirements by Ambient Environmental Aspect”.

4 Procedure for Approval and Certification

4.1 Submission of Documents

The following documents are to be submitted to the Bureau for review:

- i)* An outline of the company (e.g., organization and management structure) including subsidiaries or subcontractors to be included in the approval/certification
- ii)* A list of company experience in the specific ambient environmental aspect
- iii)* A list of test personnel documenting training and experience in conducting tests within the relevant ambient environmental aspect and qualifications according to recognized national, international, or industry standards, as relevant
- iv)* Description of equipment used for the measurement and analysis of the particular ambient environmental aspect for which approval is sought (e.g., calibration, accuracy, etc.)
- v)* A guide for operators of such equipment
- vi)* Training programs for test personnel
- vii)* Draft checklists and data recording sheets for recording results of the services referred to in Subsection A2/3, “Application”
- viii)* Quality Manual and/or documented procedures covering requirements in this A2/4.5, “Quality Assurance System”
- ix)* Evidence of approval/acceptance by certifying bodies, if any
- x)* Information about other activities which may present a conflict of interest
- xi)* Record of customer claims and of corrective actions requested by certification bodies for the past year
- xii)* Where relevant, list and documentation of licenses granted by equipment’s manufacturer

4.2 General Requirements

4.2.1 Extent of Approval

The External Specialist shall demonstrate, as required by A2/4.2.2, “Training of Personnel” through A2/4.2.9, “Reporting”, that they have the competence, quality control, and quality assurance needed to perform the test and analysis services for which approval is sought.

4.2.2 Training of Personnel

The External Specialist is responsible for the qualification and training of its personnel to a recognized national, international, or industry standard as applicable. Where such standards do not exist, the External Specialist is to define standards for the training and qualification of its personnel relevant to the functions each is authorized to perform. The personnel shall also have adequate experience and be familiar with the operation of any necessary equipment. Test personnel shall have had a minimum of one (1) year tutored on-the-job training.

4.2.3 Supervision

The External Specialist shall provide supervision for all services provided. The responsible supervisor shall have had a minimum of two (2) years experience in supervising tests in the ambient environmental aspect for which the External Specialist is approved.

4.2.4 Personnel Records

The External Specialist shall keep records of the approved test personnel. The records shall contain information about formal education, training, and experience for the ambient environmental test services for which they are approved.

4.2.5 Equipment and Facilities

The External Specialist shall have the necessary equipment and facilities for the ambient environmental aspect to be tested. A record of the equipment used for ambient environmental testing shall be kept. The record shall contain information about maintenance and calibration.

4.2.6 Procedures

The External Specialist shall have documented work procedures covering all ambient environmental test services supplied.

4.2.7 Subcontractors

The External Specialist 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 External Specialist in following-up of such subcontracts. Subcontractors providing anything other than subcontracted personnel or equipment shall also meet the requirements of A2/4.2, "General Requirements" and A2/4.5, "Quality Assurance System".

4.2.8 Verification

The External Specialist shall verify that the services provided are carried out in accordance with approved procedures.

4.2.9 Reporting

The report shall be prepared in a form acceptable to the Bureau as outlined within this Guide. The report shall include a copy of the Certificate of Approval.

4.3 Auditing of the External Specialist

Upon reviewing the submitted documents with satisfactory result, the External Specialist shall be audited every three (3) years in order to ascertain that the External Specialist is duly organized and managed in accordance with the submitted documents and that it is considered capable of conducting the test services for which approval/certification is sought.

4.4 Certification

Certification is conditional on a practical demonstration to the Bureau or its agent of the specific ambient environmental test service performance as well as a sample of a satisfactory report.

4.5 Quality Assurance System

The External Specialist shall have a documented system covering at least the following:

- i)* Operating instructions for the test equipment
- ii)* Maintenance and reference calibration of equipment
- iii)* Training programs for test personnel
- iv)* Supervision and verification to ensure compliance with test procedures
- v)* Recording and reporting of information

- vi)* Quality management of subsidiaries and subcontractors
- vii)* Job preparation
- viii)* Periodic review of test process procedures, complaints, corrective actions, and issuance, maintenance, and control of documents

A documented Quality Assurance system complying with the applicable ISO 9000 standard or equivalent and including the above items would be considered acceptable.

4.6 External Specialist Relations with the Test Equipment Manufacturer

A company which works as a service station and conducts reference calibrations of equipment for a manufacturer (and is an External Specialist in this field) shall be assessed by the manufacturer(s) and nominated as their agent. The manufacturer shall ensure that appropriate instruction manuals, material, etc., are available for the agent, as well as ensuring proper training of the agent's technicians has occurred. Such External Specialists shall be approved either on a case-by-case basis or as follows:

If a manufacturer of equipment (and External Specialist) applies for inclusion of its nominated agents and/or subsidiaries in the approval, then the manufacturer must have implemented a quality assurance system certified in accordance with the relevant ISO 9000 standard or equivalent. The manufacturer must have effective controls of its agents and/or subsidiaries and these agents/subsidiaries must have an equally effective quality control system complying with the relevant ISO 9000 or equivalent. Such approvals shall be based upon an evaluation of the quality assurance system implemented by the applicable company ISO 9000 or equivalent. The Bureau shall follow-up the adherence to this quality assurance system by performing audits on such agents or subsidiaries against the relevant ISO 9000 standard or equivalent.

5 Certificate of Approval

Upon satisfactory completion of both the audit of the External Specialist and practical demonstration, the Bureau shall issue a Certificate of Approval stating that the External Specialist's test and analysis service operation system has been found to be satisfactory and that the results of test and analysis services performed in accordance with that system may be accepted and utilized by the Bureau in making decisions affecting optional Accommodations/comfort classification notations. The Certificate shall clearly state the type and scope of services and any limitations or restrictions imposed. The External Specialist shall also be included in the Bureau's records of approved External Specialists.

Where several ambient environmental aspect measurements are conducted by a given company, each aspect is to be assessed and approved, except as specified in A2/4.6, "External Specialist Relations with the Test Equipment Manufacturer".

5.1 Renewal

The Certificate of Approval is subject to renewal or endorsement at intervals not exceeding three (3) years per External Specialist procedure. The renewal or endorsement shall be accomplished by verification through audits to ensure that approved conditions are maintained.

6 Alterations

When any alteration to the certified test and analysis service operation system of the External Specialist is made, the Bureau is to be immediately notified. Re-audit may be required when deemed necessary by the Bureau.

7 Cancellation of Approval

Approval may be cancelled in the following cases:

- i)* Where the service was improperly carried out or the results were improperly reported
- ii)* Where deficiencies are found in the approved services of the External Specialist and appropriate corrective action is not taken
- iii)* Where the External Specialist fails to inform the Bureau of any alteration, as in Subsection A2/6, “Alterations”
- iv)* Where a renewal audit, if requested per A2/5.1, “Renewal”, has not been carried out
- v)* Where willful acts or omissions are ascertained

The Bureau reserves the right to cancel the approval if any of these cases are met.

An External Specialist whose approval was cancelled may apply for re-approval provided the nonconformities which resulted in cancellation have been corrected, and that the Bureau is able to confirm that the corrective action has been effectively implemented.

8 Detailed Requirements by Ambient Environmental Aspect

8.1 Whole-body Vibration

8.1.1 Extent of Engagement

Whole-body vibration measurement External Specialists are engaged to conduct vibration measurements and analyses onboard vessels.

8.1.2 Supervisor

The supervisor shall:

- i)* be qualified to Level II according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* be a Certified Industrial Hygienist (CIH) with experience in this ambient environmental aspect or
- iii)* have a documented history of at least two (2) years supervising vibration testing onboard marine vessels

The supervisor shall have sufficient knowledge of vessel structures and equipment, measurement and analysis of whole-body vibration according to IS) 6954, to ensure that test procedures are compliant with the required test conditions.

8.1.3 Test Personnel

The test personnel carrying out the measurements shall:

- i)* be qualified to Level I according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* have a documented history of at least two (2) years supervised experience in performing vibration environmental testing onboard marine vessels

The test personnel shall have adequate knowledge of vessel structures and equipment.

8.1.4 Equipment

The Bureau shall verify that the equipment to be used is in accordance with the applicable measurement standard. It shall be demonstrated to the Bureau that it is fit for the intended purpose.

8.1.5 Procedures

Documented work procedures or test instructions are to contain, at a minimum, information about the following:

- i)* Test preparation
- ii)* Selection and identification of measurement locations
- iii)* Surface preparation
- iv)* Calibration checks
- v)* Testing methods
- vi)* Equipment handling
- vii)* Report preparation and content
- viii)* Method for handling previous results if subsequent calibration shows instruments to be out of tolerance

8.1.6 Reporting

The report shall be based on the instructions given in Subsection 3/8, “Test Report”.

8.1.7 Verification

The External Specialist must include a copy of the ABS Surveyor’s witness documentation in the Test Report.

8.2 Noise

8.2.1 Extent of Engagement

Noise measurement External Specialists are engaged to conduct noise measurements and analyses onboard vessels.

8.2.2 Supervisor

The supervisor shall:

- i)* be qualified to Level II according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* be a Certified Industrial Hygienist (CIH) with experience in this ambient environmental aspect or
- iii)* have a documented history of at least two (2) years supervising noise testing onboard marine vessels

The supervisor shall have sufficient knowledge of vessel structures, measuring equipment, ISO 2923:1996, IEC 61672-1, to ensure that test procedures are compliant with the required test conditions.

8.2.3 Test Personnel

The test personnel carrying out the measurements shall:

- i)* be qualified to Level I according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* have a documented history of at least two (2) years supervised experience in performing noise testing onboard marine vessels

The test personnel shall have adequate knowledge of vessel structures and measuring equipment.

8.2.4 Equipment

The Bureau shall verify that the equipment to be used is in accordance with the applicable measurement standard. It shall be demonstrated to the Bureau that it is fit for the intended purpose.

8.2.5 Procedures

Documented work procedures or test instructions are to contain, at a minimum, information about the following:

- i)* Test preparation
- ii)* Selection and identification of measurement locations
- iii)* Surface preparation
- iv)* Calibration checks
- v)* Testing methods
- vi)* Equipment handling
- vii)* Report preparation and content
- viii)* Method for handling previous results if subsequent calibration shows instruments to be out of tolerance

8.2.6 Reporting

The report shall be based on the instructions given in Subsection 4/8, “Test Report”.

8.2.7 Verification

The External Specialist must include a copy of the ABS Surveyor’s witnessing documentation in the Test Report.

8.3 Indoor Climate

8.3.1 Extent of Engagement

Indoor climate measurement External Specialists are engaged to conduct indoor climate measurements and analyses onboard vessels.

8.3.2 Supervisor

The supervisor shall:

- i)* be qualified to Level II according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* be a Certified Industrial Hygienist (CIH) with experience in this ambient environmental aspect or
- iii)* have a documented history of at least two (2) years supervising ambient environmental testing onboard marine vessels

The supervisor shall have sufficient knowledge of vessel structures, measuring equipment, ANSI/ASHRAE 55a and ISO 7726:1998, to ensure that test procedures are compliant with the required test conditions.

8.3.3 Test Personnel

The test personnel carrying out the measurements shall:

- i)* be qualified to Level I according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* have a documented history of at least two (2) years supervised experience in performing ambient environmental testing onboard marine vessels

The test personnel shall have adequate knowledge of vessel structures and equipment.

8.3.4 Equipment

The Bureau shall verify that the equipment to be used is in accordance with the applicable measurement standard. It shall be demonstrated to the Bureau that it is fit for the intended purpose.

8.3.5 Procedures

Documented work procedures or test instructions are to contain, at a minimum, information about the following:

- i)* Test preparation
- ii)* Selection and identification of measurement locations
- iii)* Surface preparation, if applicable
- iv)* Testing methods
- v)* Equipment handling
- vi)* Report preparation and content
- vii)* Method for handling previous results if subsequent calibration shows instruments to be out of tolerance

8.3.6 Reporting

The report shall be based on the instructions given in Subsection 5/8, “Test Report”.

8.3.7 Verification

The External Specialist must include a copy of the ABS Surveyor’s witnessing documentation in the Test Report.

8.4 Lighting

8.4.1 Extent of Engagement

Lighting measurement External Specialists are engaged to conduct illuminance measurements and analyses onboard vessels.

8.4.2 Supervisor

The supervisor shall:

- i)* be qualified to Level II according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii)* be a Certified Industrial Hygienist (CIH) with experience in this ambient environmental aspect or
- iii)* have a documented history of at least two (2) years supervising ambient environmental testing onboard marine vessels

The supervisor shall have sufficient knowledge of vessel structures, measuring equipment and IESNA RP-12, to ensure that test procedures are compliant with the required test conditions.

8.4.3 Test Personnel

The test personnel carrying out the measurements shall:

- i) be qualified to Level I according to a recognized national or international Nondestructive Testing (NDT) standard (ANSI/ASNT CP-189, ISO 9712:1999 or EN 473) or
- ii) have a documented history of at least two (2) years supervised experience in performing ambient environmental testing onboard marine vessels

The test personnel shall have adequate knowledge of vessel structures and equipment.

8.4.4 Equipment

The Bureau shall verify that the equipment to be used is in accordance with the applicable measurement standard. It shall be demonstrated to the Bureau that it is fit for the intended purpose.

8.4.5 Procedures

Documented work procedures or test instructions are to contain, at a minimum, information about the following:

- i) Test preparation
- ii) Selection and identification of measurement locations
- iii) Surface preparation
- iv) Calibration checks
- v) Testing methods
- vi) Equipment handling
- vii) Report preparation and content
- viii) Method for handling previous results if subsequent calibration shows instruments to be out of tolerance

8.4.6 Reporting

The report shall be based on the instructions given in Subsection 6/8, “Test Report”.

8.4.7 Verification

The External Specialist must include a copy of the ABS Surveyor’s witnessing documentation in the Test Report.

9 References

- 1 American National Standards Institute. (1995). *Thermal environmental conditions for human occupancy* (ANSI/ASHRAE 55a-1995). Atlanta: The American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
- 2 American Society for Nondestructive Testing. (1995). *Qualification and certification of nondestructive testing personnel* (ANSI/ASNT CP-189-1995). Washington, DC: American National Standards Institute.
- 3 European Committee for Standardization. (1993). *Qualification and certification of NDT personnel – General principles* (EN 473). Brussels: Author.
- 4 International Electrotechnical Commission. (2002). *Electroacoustics – Sound Level Meters Integrating-averaging sound level meters* (International Standard IEC 64672-1:2002,– Part 1: Specifications). Geneva: IEC Central Office.

Appendix 2 Procedural Requirements for External Specialist Performing Ambient Environmental Testing

- 5 Illuminating Engineering Society of North America. (1997). *Recommended practice for marine lighting* (IESNA RP-12-97). New York: Author.
- 6 International Organization for Standardization. (1996). *Acoustics – Measurement of noise on board vessels* (ISO 2923:1996). Geneva: Author.
- 7 International Organization for Standardization. (2000). *Mechanical vibration – Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships* (ISO 6954:2000). Geneva: Author.
- 8 International Organization for Standardization. (1998). *Ergonomics of the thermal environment – Instruments for measuring physical quantities* (ISO 7726:1998 (E)). Geneva: Author.
- 9 International Organization for Standardization. (1999). *Non-destructive testing – Qualification and certification of personnel* (ISO 9712:1999). Geneva: Author.



APPENDIX 3 Accommodations Criteria

<i>Requirement</i>	<i>Flag Administration's Requirements Reviewed and Included as Appropriate</i>
Have the flag Administration's requirements related to title 3.1 (if any) been identified and compared to the criteria contained in this Appendix to determine if there are additional requirements?	<input type="checkbox"/>

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “General” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – General		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.6(a)	<i>There shall be adequate headroom in all seafarer accommodation; the minimum permitted headroom in all seafarer accommodation where full and free movement is necessary shall be not less than 203 centimeters (80 in.); the competent authority may permit some limited reduction in headroom in any space, or part of any space, in such accommodation where it is satisfied that such reduction: is reasonable; and will not result in discomfort to the seafarers;</i>	<input type="checkbox"/>
A3.1.6(b)	<i>The accommodations shall be adequately insulated (insulation relating to noise and indoor climatic variables are addressed in Section 4, “Noise”, and Section 5, “Indoor Climate”)</i>	<input type="checkbox"/>
A3.1.6(e)	<i>There shall be no direct openings into sleeping rooms from cargo and machinery spaces or from galleys, storerooms, drying rooms or communal sanitary areas.</i>	<input type="checkbox"/>
	<i>That part of a bulkhead separating such places from sleeping rooms and external bulkheads shall be efficiently constructed of steel or other approved substance and be watertight and gas-tight.</i>	<input type="checkbox"/>
A3.1.6(f)	<i>The materials used to construct internal bulkheads, paneling and sheeting, floors and joining shall be suitable for the purpose and conducive to ensuring a healthy environment.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.6(f)	
	The bulkhead surfaces and deck heads are to be of material with a surface easily kept clean. No form of construction likely to harbor vermin is to be used. (B3.1.1.3)	<input type="checkbox"/>
	The bulkhead surfaces and deck heads in sleeping rooms and mess rooms shall be capable of being easily kept clean and light in color with a durable, nontoxic finish. (B3.1.1.4)	<input type="checkbox"/>
	The decks in all seafarer accommodation are to be of approved material and construction and shall provide a non-slip surface impervious to damp and easily kept clean. (B3.1.1.5)	<input type="checkbox"/>
	Where the floorings are made of composite materials, the joints with the sides shall be profiled to avoid crevices. (B3.1.1.6)	<input type="checkbox"/>
	Deck coverings (e.g., mats, carpeting, etc.) shall be supplied where slipping is possible due to occasional water, oil, or liquid on the floors.	<input type="checkbox"/>

Accommodations Criteria – General		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC- ACCOM Requirements</i>
A3.1.6(g)	<i>Proper lighting (addressed in Section 6, “Lighting”) and sufficient draining shall be provided.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.6(g)	
	Deck drains shall be considered in all food service areas subject to flood type cleaning or where normal operations release or discharge water or other liquid onto the deck.	<input type="checkbox"/>
	Deck drains for food service areas shall be considered in number and location so that complete drainage is possible under normal conditions of list and trim.	<input type="checkbox"/>
	There shall be no deck drains inside provision rooms except the thaw room.	<input type="checkbox"/>
	Deck drains shall be provided in the laundry.	<input type="checkbox"/>
A3.1.6(h)	<i>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 vibration and other ambient factors and chemicals on board ships, and to provide an acceptable occupational and on-board living environment for seafarers. (hazardous levels of vibration, noise and the ambient environment qualities of indoor climate and lighting are addressed in Sections 3, “Whole-body Vibration”, 4 “Noise”, 5 “Indoor Climate”, and 6 “Lighting”)</i>	<input type="checkbox"/>
A3.1.7(a)	<i>Sleeping rooms and mess rooms shall be adequately ventilated (addressed in Section 5, “Indoor Climate”)</i>	<input type="checkbox"/>
A3.1.7(b)	<i>Ships, except those regularly engaged in trade where temperate climatic conditions do not require this, shall be equipped with air conditioning for seafarer accommodation, for any separate radio room and for any centralized machinery control room. (addressed in Section 5, “Indoor Climate”)</i>	<input type="checkbox"/>
A3.1.7(c)	<i>Adequate heat through an appropriate heating system shall be provided, except in ships exclusively on voyages in tropical climates. (addressed in Section 5, “Indoor Climate”)</i>	<input type="checkbox"/>
A3.1.8	<i>With respect to requirements for lighting, subject to such special arrangements as may be permitted in passenger ships, sleeping rooms and mess rooms shall be lit by natural light and provided with adequate artificial light.” (artificial light is addressed in Section 6, “Lighting”)</i>	<input type="checkbox"/>
A3.1.12	<i>With respect to requirements for hospital accommodation, ships carrying 15 or more seafarers and engaged in a voyage of more than three days’ duration shall provide separate hospital accommodation to be used exclusively for medical purposes; the competent authority may relax this requirement for ships engaged in coastal trade; in approving on-board hospital accommodation, the competent authority shall ensure that the accommodation will, in all weathers, be easy of access, provide comfortable housing for the occupants and be conducive to their receiving prompt and proper attention.</i>	<input type="checkbox"/>
A3.1.15	<i>All ships shall be provided with separate offices or a common ship’s office for use by deck and engine departments; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the ship owners’ and seafarers’ organizations concerned.</i>	<input type="checkbox"/>
A3.1.16	<i>Ships regularly trading to mosquito-infested ports shall be fitted with appropriate devices as required by the competent authority.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.16	
	Suitable screens are to be provided, as appropriate, for side scuttles, ventilators, and doors to the open deck.	<input type="checkbox"/>

Appendix 3 Accommodations Criteria

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “Berthing” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – Berthing		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.6(c)	<i>In ships other than passenger ships, as defined in Regulation 2(e) and (f) of the International Convention for the Safety of Life at Sea, 1974, as amended (the “SOLAS Convention”), sleeping rooms shall be situated above the load line amidships or aft, except that in exceptional cases, where the size, type or intended service of the ship renders any other location impracticable, sleeping rooms may be located in the fore part of the ship, but in no case forward of the collision bulkhead.</i>	<input type="checkbox"/>
A3.1.6(d)	<i>In passenger ships, and in special ships constructed in compliance with the IMO Code of Safety for Special Purpose Ships, 1983, and subsequent versions (hereinafter called “special purpose ships”), the competent authority may, on condition that satisfactory arrangements are made for lighting and ventilation, permit the location of sleeping rooms below the load line, but in no case shall they be located immediately beneath working alleyways.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.6(d)	
	Accommodation and recreational and catering facilities shall 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. (B3.1.12.1)	<input type="checkbox"/>
	The system of ventilation for sleeping rooms and mess rooms shall be controlled so as to maintain the air in a satisfactory condition and to ensure a sufficiency of air movement in all conditions of weather and climate. (B3.1.2.1)	<input type="checkbox"/>
A3.1.9(a)	<i>In ships other than passenger ships, an individual sleeping room shall be provided for each seafarer; in the case of ships of less than 3,000 gross tonnage or special purpose ships, exemptions from this requirement may be granted by the competent authority after consultation with the ship owners’ and seafarers’ organizations concerned.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.9(a)	
	There shall be adequate berth arrangements on board, making it as comfortable as possible for the seafarer and any partner who may accompany the seafarer. (B3.1.5.1)	<input type="checkbox"/>
A3.1.9(b)	<i>Separate sleeping rooms shall be provided for men and for women.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.9(b)	
	As far as practicable, sleeping rooms of seafarers shall be so arranged that watches are separated and that no seafarers working during the day share a room with watch keepers. (B3.1.5.3)	<input type="checkbox"/>
A3.1.9(c)	<i>Sleeping rooms shall be of adequate size and properly equipped so as to ensure reasonable comfort and to facilitate tidiness. (Room size is covered in requirements A3.1.9(f), (g), and (h).)</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.9(c)	
	Space occupied by berths and lockers, chests of drawers and seats shall be included in the measurement of the floor area. Small or irregularly shaped spaces which do not add effectively to the space available for free movement and cannot be used for installing furniture shall be excluded. (B3.1.5.6)	<input type="checkbox"/>
	Outfitting for sleeping rooms shall, in addition to berths and lockers, contain the following: <ul style="list-style-type: none"> • a table and chair • a mirror with a light • a small cabinet for toilet requisites for each person in the room • a book rack • coat hooks 	<input type="checkbox"/>
	An electric reading light at the head of each berth.	<input type="checkbox"/>

Accommodations Criteria – Berthing		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC- ACCOM Requirements</i>
A3.1.9(d), (e)	<i>A separate berth for each seafarer shall in all circumstances be provided; the minimum inside dimensions of a berth shall be at least 198 centimeters by 80 centimeters.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.9(d), (e)	
	The berth shall be at least 300 millimeters above the deck.	<input type="checkbox"/>
	Head clearance above each berth shall be at least 610 millimeters.	<input type="checkbox"/>
	The framework and leeboard of a berth shall be of approved material, hard, smooth, and not likely to corrode or to harbor vermin.	<input type="checkbox"/>
	Berths constructed from tubular frames shall be completely sealed and without perforations which would give access to vermin.	<input type="checkbox"/>
A3.1.9(f)	<i>In single berth seafarers’ sleeping rooms the floor area shall not be less than:</i> <ul style="list-style-type: none"> • 4.5 square meters in ships of less than 3,000 gross tonnage; • 5.5 square meters in ships of 3,000 gross tonnage or over but less than 10,000 gross tonnage; • 7 square meters in ships of 10,000 gross tonnage or over. 	<input type="checkbox"/>
A3.1.9(g)	<i>However, in order to provide single berth sleeping rooms on ships of less than 3,000 gross tonnage, passenger ships and special purpose ships, the competent authority may allow a reduced floor area.</i>	<input type="checkbox"/>
A3.1.9(h)	<i>In ships of less than 3,000 gross tonnage other than passenger ships and special purpose ships, sleeping rooms may be occupied by a maximum of two seafarers; the floor area of such sleeping rooms shall not be less than 7 square meters.</i>	<input type="checkbox"/>
A3.1.9(i)	<i>On passenger ships and special purpose ships the floor area of sleeping rooms for seafarers not performing the duties of ships’ officers shall not be less than:</i> <ul style="list-style-type: none"> • 7.5 square meters (80.73 square feet) in rooms accommodating two persons; • 11.5 square meters (123.78 square feet) in rooms accommodating three persons; • 14.5 square meters (156.08 square feet) in rooms accommodating four persons 	<input type="checkbox"/>
A3.1.9(j)	<i>On special purpose ships sleeping rooms may accommodate more than four persons; the floor area of such sleeping rooms shall not be less than 3.6 square meters (38.75 square feet) per person.</i>	<input type="checkbox"/>
A3.1.9(k)	<i>On ships other than passenger ships and special purpose ships, sleeping rooms for seafarers who perform the duties of ships’ officers, where no private sitting room or day room is provided, the floor area per person shall not be less than:</i> <ul style="list-style-type: none"> • 7.5 square meters (80.73 square feet) in ships of less than 3,000 gross tonnage; • 8.5 square meters (91.49 square feet) in ships of 3,000 gross tonnage or over but less than 10,000 gross tonnage; • 10 square meters (107.64 square feet) in ships of 10,000 gross tonnage or over. 	<input type="checkbox"/>
A3.1.9(l)	<i>On passenger ships and special purpose ships the floor area for seafarers performing the duties of ships’ officers where no private sitting room or day room is provided, the floor area per person for junior officers shall not be less than</i> <ul style="list-style-type: none"> • 7.5 square meters (80.73 square feet) and for senior officers • not less than 8.5 square meters (91.49 square feet); • junior officers are understood to be at the operational level, and senior officers at the management level. 	<input type="checkbox"/>

Accommodations Criteria – Berthing		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.9(m)	<i>The master, the chief engineer and the chief navigating officer shall have, in addition to their sleeping rooms, an adjoining sitting room, day room or equivalent additional space; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the ship owners' and seafarers' organizations concerned.</i>	<input type="checkbox"/>
	<p>Additional Requirements for A3.1.9(m)</p> <p>Consideration shall be given to extending the facility referred to in Standard B3.1.5.5.</p>	<input type="checkbox"/>
A3.1.9(n)	<i>For each occupant, the furniture shall include a clothes locker of ample space, minimum 475 liters or 0.475 cubic meters (16.77 cubic feet), or and a drawer or equivalent space of not less than 56 liters; if the drawer is incorporated in the clothes locker then the combined minimum volume of the clothes locker shall be 500 liters; it shall be fitted with a shelf and be able to be locked by the occupant so as to ensure privacy.</i>	<input type="checkbox"/>
A3.1.9(o)	<i>Each sleeping room shall be provided with a table or desk, which may be of the fixed, drop-leaf or slide-out type, and with comfortable seating accommodation as necessary.</i>	<input type="checkbox"/>

Appendix 3 Accommodations Criteria

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “Food Service” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – Food Service		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.10(a)	<i>Mess rooms shall be located apart from the sleeping rooms and as close as practicable to the galley; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the ship owners' and seafarers' organizations concerned.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.10(a)	
	Mess lines and mess rooms are protected from weather, objectionable sights (such as garbage disposal areas), and objectionable odors (such as from engines, holds, toilets, fire room, etc.).	<input type="checkbox"/>
A3.1.10(b)	<i>Mess rooms shall be of adequate size and comfort and properly furnished and equipped (including ongoing facilities for refreshment), taking account of the number of seafarers likely to use them at any one time; provision shall be made for separate or common mess room facilities as appropriate.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.10(b)	
	Mess room facilities may be either common or separate. The decision in this respect shall be taken after consultation with seafarers' and ship owners' representatives and subject to the approval of the competent authority. Account shall be taken of factors such as the size of the ship and the distinctive cultural, religious and social needs of the seafarers. (B3.1.6.1)	<input type="checkbox"/>
	On ships other than passenger ships, the floor area of mess rooms for seafarers shall be not less than 1.5 square meters per person of the planned seating capacity. (B3.1.6.3)	<input type="checkbox"/>
	There shall be available at all times when seafarers are on board: (B3.1.6.5) <ul style="list-style-type: none"> • a refrigerator, which shall be conveniently situated and of sufficient capacity for the number of persons using the mess room or mess rooms; • facilities for hot beverages; and • cool water facilities 	<input type="checkbox"/>
	Where available pantries are not accessible to mess rooms, adequate lockers for mess utensils and proper facilities for washing utensils shall be provided. (B3.1.6.6)	<input type="checkbox"/>
	Mess rooms have tables and seats sufficient for the number of persons likely to use them at any one time.	<input type="checkbox"/>
	The tops of tables and seating are capable of being easily cleaned.	<input type="checkbox"/>
	Sufficient storage for dry, refrigerated, and frozen food is provided based on the estimated mass and associated volume based on the duration of the voyage or normal food stores replenishment schedules.	<input type="checkbox"/>
Adequate lockers for mess utensils are provided.	<input type="checkbox"/>	

Appendix 3 Accommodations Criteria

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “Sanitary Spaces” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – Sanitary Spaces		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.7(c)	<i>All sanitary spaces shall have ventilation to the open air, independently of any other part of the accommodation.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.7(c)	
	Sanitary accommodation intended for the use of more than one person shall comply with the following: the accommodation shall be sufficiently lit, heated, and ventilated. (B3.1.7.3(c))	<input type="checkbox"/>
	All toilet spaces shall be ventilated sufficiently to be reasonably free of disagreeable odors and condensation.	<input type="checkbox"/>
A3.1.11(a)	<i>All seafarers shall have convenient access on the ship to sanitary facilities meeting minimum standards of health and hygiene and reasonable standards of comfort, with separate sanitary facilities being provided for men and for women.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.11(a)	
	Toilets shall be situated convenient to, but separate from, sleeping rooms and wash rooms, without direct access from the sleeping rooms or from a passage between sleeping rooms and toilets to which there is no other access; this requirement does not apply where a toilet is located in a compartment between two sleeping rooms having a total of not more than four seafarers; and where there is more than one toilet in a compartment, they shall be sufficiently screened to ensure privacy. (B3.1.7(d))	<input type="checkbox"/>
	Sanitary spaces shall be gender identifiable without entering the space.	<input type="checkbox"/>
	All toilets shall have flush water available at all times and have a hand washing station.	<input type="checkbox"/>
	Water heaters supplying showers shall not support areas that have higher water temperature requirements, such as food service areas. If they do, then anti-scalding devices shall be provided.	<input type="checkbox"/>
	Floors in sanitary spaces shall have a non-slip type deck covering and be easily cleaned.	<input type="checkbox"/>
	Bulkheads in sanitary spaces shall be made of steel or other approved material and be watertight up to 230 millimeters (9 inches) above deck level.	<input type="checkbox"/>
	A public sanitary facility shall be situated convenient to vessel control rooms.	<input type="checkbox"/>
A3.1.11(b)	<i>There shall be sanitary facilities within easy access of the navigating bridge and the machinery space or near the engine room control centre; ships of less than 3,000 gross tonnage may be exempted by the competent authority from this requirement after consultation with the ship owners' and seafarers' organizations concerned.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.11(b)	
	The sanitary facility shall contain a toilet and washbasin having hot and cold running potable water.	<input type="checkbox"/>
	A public sanitary facility shall be situated near the ship's office if it is not conveniently located near the navigation bridge.	<input type="checkbox"/>
A3.1.11(c)	<i>In all ships a minimum of one toilet, one wash basin and one tub or shower or both for every six persons or less who do not have personal facilities shall be provided at a convenient location.</i>	<input type="checkbox"/>

Accommodations Criteria – Sanitary Spaces		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.11(d)	<i>With the exception of passenger ships, each sleeping room shall be provided with a washbasin having hot and cold running fresh water, except where such a washbasin is situated in the private bathroom provided.</i>	<input type="checkbox"/>
A3.1.11(f)	<i>Hot and cold running fresh water shall be available in all wash places.</i>	<input type="checkbox"/>
	<p>Additional Requirements for A3.1.11(f)</p> <p>Water heaters supplying washbasins and showers shall not support areas that have higher water temperature requirements, such as food service areas. If they do, then anti-scalding devices shall be provided.</p>	<input type="checkbox"/>

Appendix 3 Accommodations Criteria

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “Recreation” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – Recreation		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.14	<i>All ships shall have a space or spaces on open deck to which the seafarers can have access when off duty, which are of adequate area having regard to the size of the ship and the number of seafarers on board</i>	<input type="checkbox"/>
A3.1.17	<i>Appropriate seafarers’ recreational facilities, amenities and services, as adapted to meet the special needs of seafarers who must live and work on ships, shall be provided on board for the benefit of all seafarers, taking into account Regulation 4.3 and the associated Code provisions on health and safety protection and accident prevention.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.17	
	Furnishings for recreational facilities shall as a minimum include a bookcase and facilities for reading, writing and, where practicable, games. (B3.1.11.2)	<input type="checkbox"/>
	Consideration shall also be given to including the following facilities at no cost to the seafarer, where practicable: (B3.1.11.4) <ul style="list-style-type: none"> • a smoking room; • television viewing and the reception of radio broadcasts; • showing of films, the stock of which shall be adequate for the duration of the voyage and, where necessary, changed at reasonable intervals; • sports equipment including exercise equipment, table games, and deck games; • where possible, facilities for swimming; • a library containing vocational and other books, the stock of which shall be adequate for the duration of the voyage and changed at reasonable intervals; • facilities for recreational handicrafts; • electronic equipment such as a radio, television, video recorders, DVD/CD player, personal computer and software, and cassette recorder/player; • where appropriate, the provision of bars on board for seafarers unless these are contrary to national, religious, or social customs; and • reasonable access to ship-to-shore telephone communications, and email and Internet facilities, where available, with any charges for the use of these services being reasonable in amount. 	<input type="checkbox"/>

Appendix 3 Accommodations Criteria

Instructions: For the **MLC-ACCOM** notation, the requirements under “Meets **MLC-ACCOM** Requirements” must be met. The “Laundry” accommodations criteria is applicable to all Title accommodations areas.

Accommodations Criteria – Laundry		
<i>MLC Requirement</i>	<i>Requirement</i>	<i>Meets MLC-ACCOM Requirements</i>
A3.1.13	<i>Appropriately situated and furnished laundry facilities shall be available.</i>	<input type="checkbox"/>
	Additional Requirements for A3.1.13	
	The laundry facilities provided for seafarers’ use shall include: (B3.1.7.4) <ul style="list-style-type: none"> • washing machines; • drying machines or adequately heated and ventilated drying rooms; and • irons and ironing boards or their equivalent. 	<input type="checkbox"/>
	Facilities exist for washing and drying clothes on a scale appropriate to the size of the crew and the normal duration of the voyage.	<input type="checkbox"/>
	Laundry facilities shall be sufficient to allow seafarers to be provided with clean and dry underwear once per day and clean and dry outerwear and bedding once per five (5) days.	<input type="checkbox"/>
	Washers and dryers (if provided) are placed relative to each other to facilitate the transfer of clothing from the washer to the dryer and their capacities shall be matched.	<input type="checkbox"/>
	Air vents from laundry space shall not re-circulate in the vessel.	<input type="checkbox"/>



APPENDIX 4 Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ABS	American Bureau of Shipping
ASNT	American Society of Nondestructive Testing
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
a_w	Multi-axis acceleration value
a_{xw}	The weighted root mean square acceleration values measured along the x-axis
a_{yw}	The weighted root mean square acceleration values measured along the y-axis
a_{zw}	The weighted root mean square acceleration values measured along the z-axis
BS	British Standard
cd/m ²	Candela-per-square meter
CIH	Certified Industrial Hygienist
dB(A)	Decibels measured using the A-weighted scale
ft/s	Feet-per-second
fc	Foot-candle
ft	Feet
ft ²	Square feet
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
IEC	International Electrotechnical Commission
IESNA	Illuminating Engineering Society of North America
ILO	International Labor Organization
IMO	International Maritime Organization
in.	Inch
ISO	International Organization for Standardization
lm/m ²	Lumens-per-square meter
lm/ft ²	Lumens-per-square foot
m	Meter
m ²	Square meter
m/s	Meters-per-second
m/s ²	Meter-per-square second
Max	Maximum
Min	Minimum
MLC-ACCOM	Accommodations notation
mm	Millimeter
NASA STD	National Aeronautics and Space Administration Standard

Appendix 4 Acronyms and Abbreviations

NDT	Nondestructive Testing
NEBB	National Environmental Balancing Bureau
RH	Relative humidity
rms	Root-mean square
RP	Recommended Practice
rpm	Revolutions-per-minute
SI	International System of Units
SOLAS	Safety Of Life At Sea
TAB	Testing, Adjusting and Balancing
TX	Texas
USA	United States of America
WMO	World Meteorological Organization



APPENDIX **5** **Associated Documentation**

Titles listed under the heading of “Associated Documentation” throughout this text can be obtained from the following sources:

ANSI/ASHRAE	ANSI 1819 L Street, NW, 6th Fl. Washington, DC, 20036 USA www.ansi.org +1 202-293-8020
British Standard	BSI 389 Chiswick High Road London, W4 4AL United Kingdom www.bsi-global.com +44 (0) 20 8996 9001
IEC	IEC 300 West Adams Street, Suite 1210 Chicago, IL 60606-5114-2208 USA www.iec.org +1 312-559-4100
IESNA	IESNA 120 Wall Street Floor 17 New York, NY, 10005 USA www.iesna.org +1 212-248-5000
ILO	ILO 4 Route des Morillons CH-1211 Geneva 22 Switzerland www.ilo.org +41 22 799 6111

Appendix 5 Associated Documentation

IMO	IMO 4 Albert Embankment London SE1 7SR United Kingdom www.imo.org +44 (0) 20 7735 7611
ISO	ISO 1, rue de Varembé, Case postale 56 CH-1211 Geneva 20, Switzerland www.iso.org + 41 22 749 01 11
NEBB	NEBB 8575 Grovemont Circle Gaithersburg, MD 20877 USA www.NEBB.org +1 301-977-3698