



Maritime and Coastguard Agency

MGN 352 (M+F)

The Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007

Notice to all Ship and Fishing Vessel Owners, Operators and Managers and other employers of seafarers; Masters, Officers and Ratings of Merchant Ships; and Skippers and Crew of Fishing Vessels, Small Commercially Operated Vessels and Yachts with Paid Crew.

This notice should be read in conjunction with the Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007, the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 and Marine Guidance Note MGN 20 (M+F).

PLEASE NOTE:-

Where this document provides guidance on the law it should not be regarded as definitive. The way the law applies to any particular case can vary according to circumstances - for example, from vessel to vessel and you should consider seeking independent legal advice if you are unsure of your own legal position.

Summary

This Marine Guidance Note provides guidance on the requirements for the protection of workers from the risks related to exposure to noise at work arising from the implementation in the United Kingdom of European Commission Directive 2003/10/EC by the Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007 which come into force on 23 February 2008.

1. Introduction

- 1.1. The Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007 (SI 2007/3075) (the "Noise Regulations") implement EC Directive 2003/10/EC which introduced requirements for the protection of workers from the risks related to exposure to noise at work. The Noise Regulations build on the Merchant Shipping and Fishing (Health and Safety at Work) Regulations 1997 (SI 1997/2962), as amended, (the "General Duties" Regulations), by requiring that risk assessment under the General Duties Regulations considers the risks to workers of exposure to noise.
- 1.2. The Noise Regulations come into force on 23 February 2008 except regulations 7(4) and (5) which do not come into force for sea-going ships until 6 April 2011 to allow time for compliance with those provisions to be achieved. This derogation is only intended to allow time for compliance to be achieved and should not be regarded as justifying delaying compliance until that time where compliance can be achieved earlier.

- 1.3. In relation to noise arising from the provision of music and entertainment on ships, these Regulations do not come into force until 6 April 2008 to allow time for a code of conduct to be drawn up which sets down guidelines to help workers and employers in the music and entertainment sectors meet the requirements of these Regulations. Until such time as the code is produced, existing levels of protection are to be retained. Further guidance on the code of conduct for the music and entertainment industry will be issued in due course.
- 1.4. The Health and Safety Executive have implemented the Noise Directive for land-based workers and the Merchant Shipping and Fishing Vessels (Control of Noise) Regulations 2007 complete the United Kingdom's implementation of this Directive by extending its coverage to seafarers and other workers on ships, fishing vessels and other marine craft including those on inland waters and yachts with paid crew.
- 1.5. The first part of this Marine Guidance Note provides a summary of the main provisions of the Noise Regulations. Annex 1 provides further guidance on the application of the Noise Regulations.

Main provisions of the Noise Regulations

2. Application (Regulation 4)

- 2.1 Regulation 4(2) provides for a limited derogation from the requirements of the Noise Regulations for vessels being used in the course of public service activities or activities for the purpose of civil protection services where because of characteristics peculiar to those activities full compliance with the Noise Regulations is not possible.
- 2.2 For the purposes of the derogation referred to in paragraph 2.1 above the Regulations define "civil protection services" as including the fire and rescue and ambulance services and search and rescue services provided by any other person. This derogation will also apply to any vessel engaged in search and rescue activities when answering a distress call or when requested to do so by HM Coastguard or the appropriate authority of another state.
- 2.3 Similarly for the purposes of the derogation referred to in paragraph 2.1 above the Regulations define "public service activities" as including the activities of the armed forces, HM Coastguard, HM Revenue and Customs, immigration officers, police, prison officers and the security and intelligence services. This derogation will also apply to any vessel engaged in matters relating to national security whether or not it is directly operated by or under the control of the security services. This derogation does not apply to ferries whether operated by a public body or not.
- 2.4 The derogations referred to in paragraphs 2.2 and 2.3 above only apply to the specific provision, or part thereof, where compliance is not possible because of the activity being carried out and only for the length of time when compliance is not possible. All other provisions are to be complied with in full and even for those provisions where full compliance is not possible the employer must ensure that the health and safety of workers who are or who are likely to be exposed to risks from noise as a result is protected so far as is reasonably practicable.

3. Noise Exposure Action Values and Limit Values (Regulation 5)

- 3.1. The Noise Regulations set lower and upper exposure action values and exposure limit values as follows:

(i) lower exposure action values -

- (a) a daily or weekly personal noise exposure of 80dB (A-weighted); and
- (b) a peak sound pressure of 135 dB(C-weighted)

(ii) upper exposure action values:-

- (a) a daily or weekly personal noise exposure of 85dB (A-weighted); and
- (b) a peak sound pressure of 137 dB(C-weighted)

(iii) exposure limit values -

- (a) a daily or weekly personal noise exposure of 87dB (A-weighted); and
- (b) a peak sound pressure of 140 dB(C-weighted)

The two exposure action values are levels of 'daily or weekly personal exposure to noise'. These depend on the noise levels in the working area and how long people are exposed to the noise. The exposure action values take account of noise exposure over the whole working day or shift:

- 3.2. When applying the lower and upper exposure action values, no account is to be taken of attenuation provided by individual hearing protectors worn by the worker. In the case of exposure limit values; account may be taken of attenuation provided by individual hearing protectors worn by the worker.

4. Assessment of Risks (Regulation 6)

4.1. The employer's risk assessment should

- determine whether the exposure action values and the exposure limit values are exceeded;
- identify the workers at risk from hearing damage (so an action plan to control noise exposure can be prepared);
- determine the daily/weekly personal noise exposure of workers;
- identify additional information to comply with the legislation, e.g. whether noise control measures or hearing protection are needed, and, if so, where and what type.
- keep a record of the noise assessment;
- regularly review the noise assessment whenever there is a change in the work being undertaken or when new equipment is introduced which may alter noise levels. It is however good practice to review the assessment every two years, as noise levels can change over time as, for example, machinery wears out or working practices change; and
- use the assessment to develop an action plan for introducing noise control measures.

5. Elimination or Control of Exposure to Noise (Regulation 7)

- 5.1. The employer is required to ensure that the risks arising from exposure to noise identified by the risk assessment are either eliminated or reduced as far as reasonably practicable. If the risk assessment show that the upper exposure action values are exceeded, the employer must establish and implement a programme of measures to reduce the exposure to noise. The measurement of the noise levels in such circumstances must not take account of the wearing of personal hearing protectors.
- 5.2. The exposure limit value is an absolute limit and workers must not work where noise exposure exceeds this level. In applying the absolute limit, employers may take account of the effective reduction provided by any individual hearing protectors worn by the worker. If despite the measures required to be taken by the Noise Regulations exposures above the exposure limit values are detected, the employer must:
- (a) take immediate action to reduce the exposure to below the exposure limit values;
 - (b) identify the reasons why overexposure has occurred; and
 - (c) amend the protection and prevention measures in order to avoid any recurrence.

6. Hearing Protection (Regulation 8)

- 6.1. Personal hearing protectors are to be made available to any worker who is likely to be exposed to noise above a lower exposure action value. In so far as possible, employers should ensure that workers exposed to noise at or above the upper exposure action value wear their hearing protectors, and that areas where such protectors should be worn are clearly demarcated and signed.
- 6.2. Hearing protection should conform to the requirements of the Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (SI 1999/2205) and Merchant Shipping Notice - MSN 1731 and signs should conform to the requirements of the Merchant Shipping and Fishing Vessels (Safety Signs and Signals) Regulations 2001 (SI 2001/3444) and Merchant Shipping Notice - MSN 1763. (A specimen of the sign relating to the use of hearing protectors is shown at Annex 2). In determining whether exposure action values are exceeded account may not be taken of any reduction provided by any individual hearing protectors worn by the worker.
- 6.3. It should be noted that the noise attenuation effects of "ear muff" type personal hearing protectors may be reduced if the worker wearing them is also wearing glasses. In such circumstances the employer may wish to consider whether other forms of hearing protection might be more appropriate.

7. Worker information and training (Regulation 9)

- 7.1. Employers are also responsible for providing workers with sufficient information and training to ensure that they are aware of potential risks to health from exposure to noise. Such information and training is to include:-
- the nature of such risks;
 - details of the measures taken in order to eliminate or reduce to a minimum the risks from noise;
 - the exposure limit values and the exposure action values;
 - the results of the risk assessment carried out;

- the correct use of hearing protectors - including use when wearing glasses;
- the circumstances in which workers are entitled to health surveillance under these Regulations;
- safe working practices to minimise exposure to mechanical vibration;
- how to detect and report signs of injury; and
- the importance of detecting and reporting signs of injury.

8. Health Surveillance and Record Keeping (Regulation 10)

- 8.1. If the risk assessment identifies a risk from exposure to noise, the employer is required to provide health surveillance.
- 8.2. Regulation 22 specifically prohibits any costs, incurred as a result of compliance with any provision of the Noise Regulations, being charged to any worker.

9. Consultation with workers (Regulation 11)

- 9.1 There must be consultation with workers and their representatives on matters covered by the Noise Regulations and in particular on
- (a) the assessment of risks;
 - (b) measures taken to eliminate or reduce risks arising from exposure to noise; and
 - (c) the choice of individual hearing protectors to be provided by the employer.

10. Persons on whom duties are imposed (Regulation 12)

- 10.1 It is the duty of every employer, and any other person on whom a duty is imposed by the Noise Regulations to comply with the relevant provisions of those Regulations.
- 10.2. Where any duty under the Noise Regulations is imposed on individuals who do not have responsibility for the operation of the ship, such duty is extended to “any person who does have control of the matter to which the Regulation in question relates”, which may be a particular employer or employers or some other party.
- 10.3. In addition to the responsibility placed on the employer(s) there is a responsibility placed on “every worker to which the Regulations apply” to make full and proper use of all protective equipment provided by the employer, and to give effect to all instruction and training with which the worker has been provided.

11. Exemptions (Regulation 13)

- 11.1 There is very limited scope for the Secretary of State (in practice MCA) to grant exemptions from compliance with the requirements of regulations 7(4) and (5) and 8(1) and (2) of the Noise Regulations, following consultation with the employer, workers or their representatives, and medical bodies as appropriate.
- 11.2 Applications for the issue of an exemption certificate will need to provide detailed justification of the need for the exemption and set out the specific circumstances that would render compliance with the requirements of regulations 7(4), 7(5), 8(1) or 8(2), as appropriate, more hazardous than not using personal hearing protectors.
- 11.3 Any exemptions issued will be ship specific, in writing and limited to a maximum period of 4 years. However they may be withdrawn at any time if they are no longer justified.

12. Offences and penalties (Regulations 14 - 16)

12.1. Regulations 14 to 16 are the enforcement provisions; any contravention of the Noise Regulations is an offence. There is also provision for corporate offences and where any proceedings are instituted for an offence under the Noise Vibrations which consists of a failure to comply with a duty or requirement to do something so far as is reasonably practicable, it will be for the defendant to prove that compliance with that duty or requirement was not reasonably practicable.

13. Calculation of Daily and Weekly Personal Noise Exposure Levels and Peak Sound Pressure Levels

13.1. Annex 3 sets out the formulae to be used for the calculation of daily and weekly personal noise exposure levels and peak sound pressure levels. This information is primarily included for use by consultants or other persons who need to ascertain the various levels to which workers are likely to be exposed. Spreadsheet based models which combine operator work patterns with measured area noise levels to yield information on operator noise exposure levels may also assist in identifying workers at greatest risk to be identified and to show which machinery areas are dominant in creating this risk.

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GUIDANCE ON THE APPLICATION OF THE CONTROL OF NOISE REGULATIONS

This note gives general guidance on the implementation of the Regulations. Further guidance on dealing with noise on merchant vessels is included in the Code of Safe Working Practices for Merchant Seamen.

How to determine if there is a Noise Problem on a Ship

1. This will depend on how loud the noise is and how long people are exposed to it. As a simple guide there *may* be a problem if:

- workers have to shout to be clearly heard by someone 2 metres away;
- workers', or other persons' ears are still ringing after leaving the workplace;
- workers use equipment which causes loud explosive noises such as cartridge-operated tools or guns;
- workers are exposed to high level impact noise from hammering on metal benches; chipping machines or metal endplates on the decks of Ro-Ro vessel ramps;
- there is machinery such as diesel engines, generators etc running in a confined space such as a ship's engine room;
- workers, not engaged in the provision of entertainment (e.g. waiters), have to enter or remain in noisy areas such as discos, nightclubs etc on cruise ships whilst carrying out their duties.

Examples of noise levels in different locations, with examples of typical dB(A) levels are given in Note A to this Annex. Note B to this Annex provides information on daily exposure to different sound levels and recommended maximum limits for different areas on board ship

Noise assessment

2. If the risk assessment indicates that any worker is likely to be exposed to noise exceeding the lower exposure action values in the preceding paragraph, the employer must arrange for a competent person to assess the actual level of noise exposure. A competent person should know how to carry out a noise assessment in the particular circumstances of the workplace - the ability to do the job properly and to know their limits is more important than formal qualifications. The aim of the noise assessment is to:

- identify the workers at risk from hearing damage (so an action plan to control noise exposure can be prepared);
- determine the daily/weekly personal noise exposure of workers;
- identify additional considerations necessary for complying with the legislation, eg whether noise control measures or hearing protection are needed, and, if so, where and what type.

The employer should:

- keep a record of the noise assessment;

- regularly review the noise assessment whenever there is a change in the work being undertaken or when new equipment is introduced which may alter noise levels. It is however good practice to review the assessment every two years, as noise levels can change over time as, for example, machinery wears out or working practices change;
- use the assessment to develop an action plan for introducing noise control measures.

3. Where workers are likely to be exposed to the upper exposure action value employers must, so far as is reasonably practicable, reduce their exposure to noise in ways other than by providing hearing protection. The noise assessment should identify the sources of noise in the workplace, and suggest ways of reducing noise exposure. This information should then be used to:

- tackle the immediate risk, e.g. by providing hearing protection (NOTE - this is only a short term stop-gap measure while other controls are being investigated and developed);
- identify which steps are reasonably practicable to reduce the noise exposure of workers by engineering or organisational means;
- establish priorities for action (e.g. consider where there could be immediate benefits, what changes may need to be phased in over a longer period of time and the number of people exposed to the noise in each case);
- appoint someone on the vessel to be responsible for ensuring that action is taken, monitoring the programme and reassessing noise exposures after any changes in the workplace.

4. There are many ways of reducing noise and noise exposure and no single technique will be appropriate for every situation. Employers should therefore firstly think about how to remove the risk caused by noise altogether. If that is not possible, they should do all they can to control the noise at source, before considering redesigning the workplace, reorganising working patterns and taking measures to protect individual workers. In this context employers may wish to consider the following in the order shown:

- Use a different, quieter process or quieter equipment, e.g.:
 - consider whether the work be done in some other quieter way;
 - consider replacing whatever is causing the noise with something that is less noisy;
 - introduce a low-noise purchasing policy for machinery and equipment.
- Introduce engineering controls:
 - avoid metal-on-metal impacts, e.g. line chutes with abrasion resistant rubber, and reduce drop heights;
 - vibrating machine panels can be a source of noise - add material to reduce vibration ('damping');
 - isolate vibrating machinery or components from their surroundings, e.g. with anti-vibration mounts or flexible couplings;
 - fit silencers to air exhausts and blowing nozzles.

- Modify the paths by which the noise travels through the air to the people exposed, e.g.:
 - erect enclosures around machines to reduce the amount of noise emitted into the workplace or environment;
 - use barriers and screens to block the direct path of sound;
 - position noise sources further away from workers.
- Design and lay out the workplace for low noise emission, e.g.:
 - segregate noisy machinery and processes from quieter areas;
 - design the workflow to keep noisy machinery out of areas where people spend most of their time.
- Limit the time spent in noisy areas - every halving of the time spent in a noisy area will reduce noise exposure by 3 dB (A).

Proper and regular maintenance of machinery and equipment is essential as it will deteriorate with age and can become noisier. Listen out for changes in noise levels - it may be time to replace worn or faulty parts.

How to Choose Quieter Equipment and Machinery;

5. Introducing a positive purchasing policy could be the single most cost effective long-term measure that an employer can take to reduce noise at work. Choosing quieter equipment and machinery from the start can save the cost of introducing noise-reduction measures once it is installed, as well as removing or reducing the risk of litigation in respect of work induced hearing loss. Such a policy could include the following:

- Considering at an early stage the effect that new or replacement machinery will have on the existing noise levels in the workplace - setting a target to reduce the noise levels if possible.
- Ensuring the specification for all new machinery includes a realistic noise output level, and that tenderers and suppliers are aware of their legal duties.
- Asking the suppliers about noise levels under all operating conditions, as well as standard test conditions. Agreeing a common format for the data so you can compare information.
- Endeavouring to purchase only from suppliers who can demonstrate a low-noise design, with noise control as a standard part of the machine, not as a costly optional extra.
- Documenting the decision process, to help show that the legal duties to reduce workplace noise have been met.

Use of noise output data will only ever be a guide as many factors affect the noise levels experienced by workers, but it will assist in the purchase of quieter machines.

Different Methods of Hearing Protection

6 Hearing protection should be considered only as a last resort to control noise exposure. It should be used either:

- as a short-term measure until other controls to reduce the noise exposure have been introduced; or
- where all reasonably practicable measures have been taken and a risk to hearing remains.

The main types of hearing protection are:

- earmuffs, which completely cover the ear - however the effectiveness of earmuffs may be reduced if the wearer is also wearing glasses;
- earplugs, which are inserted in the ear canal; and
- semi-inserts (also called 'canal caps'), which cover the entrance to the ear canal.

Employers should use the results from their noise assessment and information from hearing protection suppliers to make the best choice of hearing protection. It must:

- reduce employees' noise exposure to below 85 dB(A);
- be suitable for the employees' working environment - consider comfort and hygiene; and
- be compatible with other protective equipment used by the employee (eg hard hats, dust mask and eye protection).

Wherever possible, workers should be provided with a suitable range of effective hearing protection so they can choose the one that suits them best. Some employees may prefer a particular type, or may not be able to use some types of hearing protection because of the risk of ear infections.

Maintenance

7. Employers should ensure that hearing protection works effectively and check that:

- its overall condition is still good and it is clean;
- earmuff seals are undamaged;
- the tension of the headbands is not reduced;
- there are no unofficial modifications; and
- compressible earplugs are soft, pliable and clean.

Supervision

8. Employers should ensure that workers use hearing protection when required to. In this context employers may want to:

- include the need to wear hearing protection in their safety policy and put someone in authority in overall charge of issuing it and making sure replacement hearing protection is readily available;
- carry out spot checks to see that the rules are being followed and that hearing protection is being used properly. If employees persistently fail to use protectors properly you should follow your normal company disciplinary procedures; and

- ensure that all managers and supervisors set a good example and wear hearing protection at all times when in ear protection zones.

Information, instruction and training

9 Where workers are likely to be exposed at or above any of the exposure limit values employers are required to provide information, instruction and training including:

- the likely noise exposure and the risk to hearing this noise creates;
- where and how people can obtain hearing protectors;
- how to report defects in hearing protectors and noise control equipment;
- the worker's duties under the Noise Regulations;
- what the worker should do to minimise the risk, such as the proper way to use hearing protectors and other noise control equipment, how to look after them and store them, and where to use hearing protectors.

Employers should make sure that this information is given in a way the worker can understand (for example it might be necessary to make special arrangements if the employee does not understand English or has only a limited knowledge of it).

Health effects of exposure to noise at work

10. Hearing loss can be temporary or permanent. Temporary deafness is often experienced after leaving a noisy place. Although hearing recovers within a few hours, this should not be ignored. It is a sign that continued exposure to the noise could cause permanent damage. Permanent hearing damage can be caused immediately by sudden, extremely loud, explosive noises, e.g. from guns or cartridge-operated machines. But hearing loss is usually gradual due to prolonged exposure to noise. Tinnitus (ringing, whistling, buzzing or humming in the ears) may also occur. It should be borne in mind however that it is not just older persons who can have their hearing damaged by noise - Young persons are equally susceptible

Health Surveillance

11. Under the Noise Regulations workers exposed to noise levels that are, or could be, a risk to health must be provided with appropriate health surveillance.

The aim of health surveillance is to:

- warn employers when workers might be suffering from early signs of hearing damage;
- give employers an opportunity to take steps to reduce risk; and
- act as a means of checking that control measures are working.

Health surveillance usually means:

- regular hearing checks in controlled conditions to measure the sensitivity of hearing over a range of sound frequencies;
- informing employees about the results of their hearing checks;

- keeping records;
- encouraging workers to seek further advice from a doctor where hearing damage is suspected.

12. It is good practice for employers to arrange regular hearing checks on all workers whose daily personal noise exposure exceeds the second action level, and to encourage them to attend their appointments. Analysis of the results of the health surveillance for groups of workers with different levels of noise exposure can provide an insight into how well the hearing conservation programme is working. The results should be used to target noise reduction, education and compliance practices more accurately. Such information should also be made available to workers and safety representatives.

EXAMPLES OF TYPICAL dB(A) LEVELS

Examples of noise levels in different locations are given below in order to enable personnel to appreciate when and where a potentially harmful noise exposure may exist:

120 dB(A)	60 metres from a jet aircraft taking off. Between 2 running 1800 rpm diesel generators.
110 dB(A)	1 metre from a riveting machine. In a small ship engine room with 900 rpm diesel main engines and 1550 rpm diesel generator
105 dB(A)	1 metre from cylinder tops of a slow speed (120 rpm) main diesel engine.
100 dB(A)	Between 2 running diesel generators (600 rpm)
95 dB(A)	In a slow speed (120 rpm) diesel main engine room at the after end on the floor plate level or in an open side flat.
90 dB(A)	Noisy factory, machine shop, quieter parts of ships' engine rooms.
80 dB(A)	15 metres from a pneumatic drill.
70 dB(A)	Noisy domestic machinery (vacuum cleaner at 3 metres).
60 dB(A)	Inside large public building (e.g. supermarket).
50 dB(A)	Inside a house in a suburban area during daytime.
40 dB(A)	Quiet city area outdoors at night. Library whisper at 1 metre.
25-30 dB(A)	Countryside at night with no wind. Quiet church.
0	Threshold of hearing of young persons of normal hearing.

These levels are only illustrative and noise levels can vary between similar locations. This is especially true of engine rooms as engine noise can vary considerably with the type of installation.

DAILY EXPOSURE TO DIFFERENT SOUND LEVELS

Annex 1 Note B

In the circumstances that occur on board ship, where personnel move from one place to another and the length of time spent in each place may vary, they may be exposed to different levels of noise throughout the day. The following figures give a guide to the acceptable maximum daily noise doses for unprotected ears, based on dB(A) sound energy received.

less than 80 dB(A)	no limit (24 hours)
82 dB(A)	for 16 hours
85 dB(A)	for 8 hours
90 dB(A)	for 2 hours
95 dB(A)	for 50 minutes
100 dB(A)	for 15 minutes
105 dB(A)	for 5 minutes
110 dB(A)	for 1 minute

As an alternative illustration and equivalent to the above figures, the maximum daily noise dose for unprotected ears is halved for each increase of 3 dB(A).

Recommended maximum limits for different areas on board ship

The limits below should be regarded as maximum levels, rather than desirable levels, and as appropriate take account of the attenuation (noise reduction) that can be achieved with ear protectors.

Area	Recommended Limit
Machinery spaces – general	90 dB(A)
Machinery spaces – unmanned	110 dB(A)
Machinery control rooms	75 dB(A)
Wheelhouse/bridge/chart room/radar room	65 dB(A)
Bridge wings	70 dB(A)
Radio room/communications centre	60 dB(A)
Galleys, serveries, pantries	75 dB(A)
Normally unoccupied spaces	90 dB(A)
Sleeping cabins, Day cabins, hospital	60 dB(A)
Offices, Conferences rooms etc	65 dB(A)
Mess rooms, recreation rooms recreation areas	65 dB(A)
Open deck areas	75 dB(A)
Corridors, changing rooms, bathrooms, lockers and similar spaces	80 dB(A)
Ship's whistle	110 dB(A)

USE OF SAFETY SIGNS



In any area of the ship where a worker is likely to be exposed to noise at or above an upper exposure action value the employer should ensure that the area is demarcated and identified by means of the ear protection sign, in accordance with the Merchant Shipping and Fishing Vessels (Safety Signs and Signals) Regulations 2001, as detailed below.

Sign with symbol: The background colour should be blue and the symbol should be white and placed centrally on the background. Blue should cover at least 50% of the area of the sign. The diameter should be 150 mm or 300 mm.

Supplementary sign: This should be rectangular. The background colour should be white with black letters or alternatively the background may be the same colour blue as the sign with the symbol and have white letters. The height of the letters should be a minimum of 20 mm.

A downloadable copy of the ear protection sign, which can be used in an emergency until a proper sign can be obtained, can be found on the MCA website at:-

http://www.mcga.gov.uk/c4mca/mcga-seafarer_information/mcga-dqs_st_shs_seafarer_information-medical/ds-shs-safety_signs.htm

<p>Sign with Symbol:</p>	
<p>Supplementary sign:</p>	

Further guidance in respect of the use of safety signs on merchant vessels is included in the Code of Safe Working Practices for Merchant Seamen.

PART 1

Daily Personal Noise Exposure Levels

1. The daily personal noise exposure level, $L_{EP,d}$, which corresponds to $L_{EX,8h}$ defined in international standard ISO 1999: 1990 clause 3.6, is expressed in decibels and is ascertained using the formula:

$$L_{EP,d} = L_{Aeq,T_e} + 10 \log_{10} \left(\frac{T_e}{T_0} \right)$$

where—

T_e is the duration of the person's working day, in seconds;

T_0 is 28,800 seconds (8 hours); and

L_{Aeq,T_e} is the equivalent continuous A-weighted sound pressure level, as defined in ISO 1999: 1990 clause 3.5, in decibels, that represents the sound the person is exposed to during the working day.

2. If the work is such that the daily exposure consists of two or more periods with different sound levels, the daily personal noise exposure level ($L_{EP,d}$) for the combination of periods is ascertained using the formula:

$$L_{EP,d} = 10 \log_{10} \left[\frac{1}{T_0} \sum_{i=1}^{i=n} \left(T_i 10^{0.1(L_{Aeq,T_i})} \right) \right]$$

where—

n is the number of individual periods in the working day;

T_i is the duration of period i ;

$(L_{Aeq,T_i})_i$ is the equivalent continuous A-weighted sound pressure level that represents the sound the person is exposed to during period i ; and

$\sum_{i=1}^{i=n} T_i$ is equal to T_e , the duration of the person's working day, in seconds.

PART 2

Weekly Personal Noise Exposure Levels

The weekly personal noise exposure, $L_{EP,w}$, which corresponds to $\overline{L}_{EX,8h}$ defined in international standard ISO 1999: 1990 clause 3.6 (note 2) for a nominal week of five working days, is expressed in decibels and is ascertained using the formula:

$$L_{EP,w} = 10 \log_{10} \left[\frac{1}{5} \sum_{i=1}^{i=m} 10^{0.1(L_{EP,d})_i} \right]$$

where—

m is the number of working days on which the person is exposed to noise during a week; and

$(L_{EP,d})_i$ is the $L_{EP,d}$ for working day i .

PART 3

Peak Sound Pressure Level

Peak sound pressure level, L_{Cpeak} , is expressed in decibels and is ascertained using the formula:

$$L_{Cpeak} = 20 \log_{10} \left[\frac{p_{Cpeak}}{p_0} \right]$$

where—

p_{Cpeak} is the maximum value of the C-weighted sound pressure, in Pascals (Pa), to which a person is exposed during the working day; and

p_0 is 20 μ Pa.