# Ministry of Defence
# Defence Standard 02-102

**Issue 1 Publication Date 22 March 2004**

# Requirements for Air-Conditioning and Ventilation

# Part 3

# Specification for Testing and Cleaning Ventilation Trunking

**Category 2**

## AMENDMENTS ISSUED SINCE PUBLICATION

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## Revision Note

This Issue of this Standard has been prepared to incorporate changes to text and presentation. The technical content has been updated in line with current practice.

## Historical Record

NES 102 Pt 3

# DEFENCE STANDARD 02–102 (NES 102)

# REQUIREMENTS FOR AIR CONDITIONING AND VENTILATION DESIGN

## PART 3 ISSUE 1 SEPTEMBER 2002

## SPECIFICATION FOR TESTING AND CLEANING VENTILATION TRUNKING

This Defence Standard is
authorized for use in MOD contracts
by the Defence Procurement Agency and
the Defence Logistics Organization

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## SCOPE

1. This Defence Standard (DEF STAN) 02-102 Part 3 specifies the requirements for inspecting, sampling and cleaning ventilation trunking systems on HM Surface Ships, Submarines and Royal Fleet Auxiliary (RFA) vessels. It refers to the combination of all components required to provide mechanical ventilation or air conditioning.

## 2.FOREWORD

### Sponsorship

a. This Defence Standard is sponsored by the Ministry of Defence (MOD), Warship Support Agency (WSA), Marine Auxiliary, Environmental and Steam Systems (MAES5b2a).

b. The complete Defence Standard 02-102 comprises:

Requirements for Air Conditioning and Ventilation Design:

Part 1: HM Surface Ships;

Part 2: Submarines (now DEF STAN 08–159);

Part 3: Specification for Testing and Cleaning Ventilation Trunking.

c. Any user of this Standard either within MOD or in industry may propose an amendment to it. Proposals for amendments that are not directly applicable to a particular contract are to be made to the publishing authority identified on Page 1, and those directly applicable to a particular contract are to be dealt with using contract procedures.

d. If it is found to be unsuitable for any particular requirement MOD is to be informed in writing of the circumstances.

e. No alteration is to be made to this Standard except by the issue of an authorized amendment.

f. Unless otherwise stated, reference in this Standard to approval, approved, authorized and similar terms, means by the MOD in writing.

g. Any significant amendments that may be made to this Standard at a later date will be indicated by a vertical sideline. Deletions will be indicated by 000 appearing at the end of the line interval.

h. This is the first issue of this Standard.

### Conditions of Release

General

i. This Defence Standard has been devised solely for the use of the MOD, and its contractors in the execution of contracts for the MOD. To the extent permitted by law, the MOD hereby excludes all liability whatsoever and howsoever arising (including but without limitation, liability resulting from negligence) for any loss or damage however caused when the Standard is used for any other purpose.



k. The Crown reserves the right to amend or modify the contents of this Standard without consulting or informing any holder.

MOD Tender or Contract Process

l. This Standard is the property of the Crown. Unless otherwise authorized in writing by the MOD must be returned on completion of the contract, or submission of the tender, in connection with which it is issued.

m. When this Standard is used in connection with a MOD tender or contract, the user is to ensure that he is in possession of the appropriate version of each document, including related documents, relevant to each particular tender or contract. Enquiries in this connection may be made to the authority named in the tender or contract.

n. When Defence Standards are incorporated into MOD contracts, users are responsible for their correct application and for complying with contractual and other statutory requirements. Compliance with a Defence Standard does not of itself confer immunity from legal obligations.

**Categories of Naval Defence Standard**

o. The Category of this Standard has been determined using the following criteria:

(1) Category 1. If not applied may have a *Critical* affect on the following:

Safety of the vessel, its complement or third parties.

Operational performance of the vessel, its systems or equipment.

(2) Category 2. If not applied may have a *Significant* affect on the following:

Safety of the vessel, its complement or third parties.

Operational performance of the vessel, its systems or equipment.

Through life costs and support.

(3) Category 3. If not applied may have a *Minor* affect on the following:

MOD best practice and fleet commonality.

Corporate experience and knowledge.

Current support practice.

**Related Documents**

p. In the tender and procurement processes the related documents listed in each section and Annex A can be obtained as follows:

| | | |
|---|---|---|
| (1) | British Standards | British Standards Institution,<br>389 Chiswick High Road,<br>London, W4 4AL |
| (2) | Defence Standards | Defence Procurement Agency<br>An Executive Agency of the Ministry of Defence<br>UK Defence Standardisation<br>Kentigern House<br>65 Brown Street<br>Glasgow, G2 8EX |
| (3) | Other documents | Tender or Contract Sponsor to advise. |

q. All applications to the MOD for related documents are to quote the relevant MOD Invitation to Tender or Contract number and date, together with the sponsoring Directorate and the Tender or Contract Sponsor.

r. Prime Contractors are responsible for supplying their subcontractors with relevant documentation, including specifications, standards and drawings.

**Health and Safety**

Warning

s. This Defence Standard may call for the use of processes, substances and/or procedures that are injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves either the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use. Where attention is drawn to hazards, those quoted may not necessarily be exhaustive.

t. This Standard has been written and is to be used taking into account the policy stipulated in JSP 430: MOD Ship Safety Management System Handbook.

**Additional Information**

u. (There is no relevant information included.)

## CONTENTS

**Page No**

## 1. GENERAL

Related Documents: There are no related documents within this section.

a. Ventilation trunking systems in HM Surface Ships, Submarines and RFA provide healthy, fresh and clean air within the vessel. Contamination within the trunking system will become a source of odour, and health problems and will impair the efficient working of the system.

## 2. CONTAMINANTS

Related Documents: There are no related documents within this section.

a. Ventilation trunking systems in HM Surface Ships, Submarines and RFA vessels may suffer the following contamination:

(1) Dust: Dry dust (hair, skin, cotton/woollen fibres) generated from people, furnishings and activities in the ventilated space as well as external particulate and pollen;

(2) Micro-organisms: Warm and moist conditions within ventilation trunking can provide an ideal breeding environment for bacteria and fungi;

(3) Grease: Cooking areas will generate a grease laden exhaust which, depending on the efficiency of the grease filters, will be deposited on the surface of the exhaust trunking;

(4) Residues: Activities such as tobacco smoking and some processes may create residues and films in extract trunking;

(5) Sand: Wind-blown sand may be drawn into air intakes;

(6) Process Contamination: Processes on-board Ship may generate contamination such as wood dust, welding fumes and fumes from glues and adhesives.

## 3. CONSTRAINTS

Related Documents: There are no related documents within this section.

### 3.1 Technical Advice

a. The ventilation trunking is scheduled for regular routine maintenance, 100 per cent of a Ship’s system shall be cleaned between Refit Cycles. Technical advice will be available from the Refit Contractor and/or the Design Authority (DA). The Contract Sponsor shall specify to the Cleaning Contractor whether the scope of works is maintenance cleaning or a remedial refit requirement.

b. The Cleaning Contractor must identify to the Contract Sponsor any requirements for technical support. If requested, trained personnel from either the Ship’s Staff or Refit Contractor shall be available throughout the clean during normal working hours to assist the Contractor in the location of on-board equipment, and the supply and connection of services.

**3.2 Timescale**

a. The whole inspection and cleaning process must be carried out in a period of time agreed between the Contractor and the Contract Sponsor as defined by the contract.

**3.3 Working Hours**

a. 24-hour working, if required, is permitted with prior arrangement. However, technical advice from the Ship's Staff or Refit Contractor will not be available outside normal working hours unless by prior arrangement. The availability of some dockside supplies may be limited.

**3.4 Integration with other Activities**

a. The clean will be carried out during a maintenance period with many other activities being undertaken in parallel. The cleaning process shall not cause any obstruction to the free movement of other personnel or equipment in the vessel. However, it is accepted that, in terms of availability of ventilation, and conditions of habitability, the clean may have to take precedence over some other activities.

## 4. PRE–REQUISITES FOR THE VENTILATION HYGIENE PROCESS

Related Documents: DEF STAN 02-53; Form DGSF 129; see also Annex A.

**4.1 Site Inspections**

a. The Contractor shall arrange with the Contract Sponsor to visit the vessel to be cleaned in order to acquaint themselves with the nature of the systems, their intended functions and the working conditions on-board.

b. The Contractor must notify the Ship's Mechanical Engineering Officer (MEO) or designated representative of their presence and involvement before commencing an inspection of the systems on-board a vessel.

c. DEF STAN 02-53 provides guidance for the completion of Form DGSF 129, which lists the shore support services and facilities required by HM Surface Ships and Submarines when they are berthed/docked for maintenance periods or refit.

**4.2 Dockside Facilities**

a. The Contractor shall identify and agree with the Contract Sponsor in advance, any anticipated requirement for dockside facilities such as mains water, electricity, compressed air, etc., or supply his own air compressors, generators and filters, etc.

**4.3 Drawings**

a. The Contractor shall obtain from the Contract Sponsor/MEO or designated representative any system drawings and plant records of the area to be cleaned.

**4.4 System Features**

a. The Contractor shall notify the Contract Sponsor of any features of the system and any related work which it is felt could prevent a successful clean or which could suffer damage as a consequence of the cleaning process.

### 4.5 Scope of Work

a. The Contractor shall agree with the Contract Sponsor the objectives of the cleaning. The scope of work shall be defined by the maintenance requirement and shall also be established following a system survey. The Contractor shall provide a rationale for the scope of work based on photographic, video and/or CCTV evidence as well as microbial analysis. The scope of work shall include a schedule of systems to be cleaned and shall define the level of cleanliness to be achieved as well as any requirement for disinfecting.

## 5. REQUIREMENTS OF THE CONTRACTOR

Related Documents: BS EN ISO 9001; see also Annex A.

### 5.1 Qualifications

a. The Contractor shall demonstrate experience in performing ventilation hygiene contracts. A questionnaire to demonstrate competency is presented in Appendix B of BSRIA ‘Guidance and Standard Specification for Ventilation Hygiene’. Proof of competency shall include any recognised qualifications and affiliations of the Company and/or the staff.

b. The Contractor shall carry quality assurance certification to BS EN ISO 9001 Quality Systems, for the scope of work described in this Standard.

c. The Contractor must demonstrate that their staff have been given appropriate training in the processes and health and safety issues described in this Standard. The MOD reserves the right to request details of training records for individual staff members.

d. The Contractor shall demonstrate that they have access to a UKAS-accredited laboratory for analysis of contaminant samples.

e. Inspection and testing of a complex Local Exhaust Ventilation (LEV) will require a specialist contractor, and the National Certification Scheme for In-service Inspection Bodies (NCSIB) is a voluntary accreditation scheme for LEV examination companies. Contractors accredited under this scheme will provide a high level of competence. If LEV system cleaning and testing is required then an NCSIB accredited contractor shall be employed.

### 5.2 Insurance Requirement

a. MOD Establishment (Dockyard/Ships) and Contractor requirements and liabilities are covered in DEFCON 76, Edition 7/99.

b. The Contract Sponsor shall be satisfied that the Contractor carries adequate insurance for employer’s liability and public liability. Details of proof of suitable insurance cover are given in Appendix B of BSRIA ‘Guidance and Standard Specification for Ventilation Hygiene’.

c. No permission to start work shall be issued until the Contract Sponsor or his professional insurance broker are satisfied that the insurance arrangements meet the requirements as set out in the tender document.

## 6. OUTLINE PROCEDURE

Related Documents: There are no related documents within this section.

### 6.1 Levels of Cleanliness

a. The Contractor shall ensure all ventilation trunking is ‘visually clean’, i.e., all material surfaces are clearly visible and free from loose contaminants. Where a higher level of cleanliness is required this will be defined by the Contract Sponsor in the Contract Documents.

### 6.2 Testing

a. The Contractor shall provide a recognised inspection and test method.

### 6.3 Cleaning Requirement

a. Only dry cleaning systems which are not abrasive shall be used on trunking surfaces. Wet systems may be used in the galley and machinery spaces for removal of grease from exhaust systems.

### 6.4 Tools

a. The Contractor shall provide suitable cleaning tools for cleaning the installation. Choice of tools will be dependent on the size and shape of the ventilation trunking and the type of contamination; all tools used shall be agreed by the MEO or designated representative.

## 7. PROCEDURES

Related Documents: Environment Protection Act 1990; DEF STAN 07-251; DEF STAN 07-252; DEF STAN 02-805 Parts 1 and 2; BR 1326A; COSHH; see also Annex A.

a. The Contractor shall provide relevant information to allow his competency to be assessed. This shall also include copies of insurance policies for approval.

b. A definition of the necessary competence to carry out a thorough examination and testing of LEV is given in HSE publication HS (G)54.

c. The Contractor shall nominate a ‘responsible person’ on his team to be the contact for the Contract Sponsor.

d. Some areas on board the vessel may require special permission for access, and the Contractor shall seek to obtain this permission where necessary. Restricted Area access will require the Contractor’s personnel to be security cleared.

e. The Contractor shall utilise existing access doors to the system where possible. Any penetrations cut by the Contractor shall be re-instated in an air-tight condition. Where pre-manufactured access doors are not used for practical reasons, penetrations shall be sealed using like materials in accordance with DEF STAN 02-805 Parts 1 and 2 and BR 1326A. Any insulation (external or internal) shall be re-instated when penetrations are sealed. If additional access doors are required, the contractor shall ensure their locations are marked on any existing drawings.

f. The Contractor shall make good any incidental damage caused during the inspection or cleaning process. Exhaust trunking for Battery Charging Rooms are painted internally in accordance with DEF STAN 07-251 for HM Surface Ships and DEF STAN 07-252 for Submarines. The Contractor shall ensure that the cleaning process does not damage the painted surfaces.

g. Any ventilation trunking designated as 'watertight' shall not be breached with new openings without written authority from the MAES5b.

h. If a mechanical/remote vacuum cleaning process is being utilised, then all air and air-borne products removed from the system must be passed through a HEPA filter.

i. The Contractor shall clean up after completion and leave the vessel in an as-found condition. This includes the necessary bagging and labelling of waste materials to comply with COSHH and the Environment Protection Act 1990 Duty of Care.

## 8. FAULT REPORTING

Related Documents: There are no related documents within this section.

a. The Contractor shall obtain a contact name and telephone number for the out of hours reporting of urgent faults.

b. The Contractor shall not undertake any remedial action on serious faults without the explicit approval of the Contract Sponsor.

## 9. INSPECTION, SAMPLING AND TESTING

Related Documents: JSP 375 Volumes 1 and 2; COSHH; Control of Asbestos at Work Regulations, 1987; see also Annex A.

a. Before the contract, the Contractor shall agree with the Contract Sponsor a protocol for inspection, sampling and testing as appropriate to the particular system. The Contractor shall be able to explain and support the rationale for the proposed sampling and measurement protocol.

### 9.1 Laboratories

a. Any laboratory used for testing biological samples shall comply with the COSHH Regulations as amended.

b. The laboratory shall be used to identify any hazardous materials.

c. All samples presented for test shall be incubated at 25°C in the dark for four to seven days and the Colony Forming Units (cfu) counted in accordance with CIBSE Recommendations.

### 9.2 Safety

a. Access to ventilation compartments and parts of the ventilation trunking system shall be arranged with the Contract Monitoring Officer (CMO).

b. Personnel are required to wear a hard hat and protective footwear when in the ventilation compartment.

c. Single-person working in Air Handling Unit (AHU) or ventilation compartments shall be avoided and access to fan chambers shall only be allowed when fans are shutdown.

d. Specific risk assessments shall be carried out to deal with hazardous contamination in LEV.

e. The Contract Sponsor shall define any likely or known hazards in accordance with COSHH Regulations and the Contractor has a duty to satisfy himself that hazards are known and accounted for.

f. If asbestos is present, its control and removal is covered under the following:

(1) The Control of Asbestos at Work Regulations, 1987;

(2) JSP 375 The MOD Health and Safety Handbook, Volume 1 3rd edition July 1995;

(3) JSP 375 The MOD Health and Safety Handbook, Volume 2 2nd edition March 1992.

g. Asbestos shall be removed and worked on only by licensed specialist contractors.

h. The Contractor shall comply with the following precautions when inspecting and testing LEV:

(1) Personnel have had instruction and training in the recognition and assessment of hazards;

(2) Ensure that systems of work are in place to ensure health and safety;

(3) Inform workers that the tester is working on the plant;

(4) Put procedures in place to avoid the spread of contamination;

(5) Know where smoke generators could trigger alarms;

(6) Know where a dust lamp could distract other workers.

**9.3 Inspection**

a. The Contractor shall undertake a visual assessment within the system for any contamination, dampness, staining, and mould growth. As a minimum this shall include the condition of the fresh air intakes, AHU, selected in-duct plant and ancillaries such as attenuators, fire dampers, heat exchangers, etc., a selection of trunking including changes of direction, terminations, straight horizontal and vertical trunking; air supply terminals, grilles or diffusers.

**9.4 Sampling**

a. Samples may be taken from the air and/or interior surfaces of the ventilation plant. Air samples will produce an air quality indicator at the time the sample is taken, while a surface condition test will determine the potential for contaminants to be released into the air-stream.

b. The Contractor shall agree with the Contract Sponsor what sampling will be undertaken.

**9.5 Air Sampling**

a. One person who is familiar with the air sampler shall collect all the samples.

**9.5.1 Methodology**

a. The Contractor shall arrange with the Contract Sponsor a suitable time to undertake the sampling.

b. The Contractor shall take samples from at least two spaces served by each AHU or Air Treatment Unit (ATU). One sample shall be taken close to the AHU, and one from near the end of the trunking system (furthest from AHU).

c. The Contractor shall take samples from two locations in each space and record the locations of the samples on a copy of the drawings. The space being sampled shall be empty of human occupants, as this would add to the microbial count.

d. The samples shall be taken to the laboratory with minimum delay (under 24 hours).

e. Any repeat sampling shall be done at the same locations and at the same time of day.

**9.6 Surface Sampling**

a. One person who is familiar with taking samples shall collect all the samples.

b. The Contractor shall obtain drawings from the Contract Sponsor showing the AHU, ATU, ductwork and possible access points to the trunking.

**9.6.1 Methodology**

a. The Contractor shall arrange with the Contract Sponsor a suitable time to undertake the sampling.

b. The Contractor shall take samples from the following locations:

(1) Inner surfaces of trunking within the AHU downstream from the filter;

(2) Both sides of the heating and cooling coils (where fitted and where access allows);

(3) Immediately downstream of the AHU;

(4) Inside air distribution trunking at a minimum of three locations per duct run**,** with no less than one location per 50 linear metres and no less than one point per 100 linear metres for trunking in excess of 300 linear metres.

c. The Contractor shall label each access point to enable repeat sampling.

d. The Contractor shall take samples from the lowest point on the trunking.

e. The Contractor shall take three samples from each location at least 15 cm apart.

f. With small diameter-trunking the use of 55 mm diameter contact plates may not be possible due to the radius of curvature. In such cases the contractor shall use long thin agar samplers or a templated area may be sampled by swabbing.

g. The Contractor shall record descriptive information on the location and conditions found at each sampling point.

h. The samples shall be taken to the laboratory with minimum delay (under 24 hours).

**9.7 Testing**

a. For dry contamination such as dust, the Contractor shall take measurements of the level of contamination by either the Deposit Thickness Test (DTT) or the Vacuum Test (VT) as detailed in HVCA document TR/17. For oval or circular trunking, the DTT method is not appropriate until a suitable instrument becomes available.

**9.8 Microbial Results**

**9.8.1 Air Samples**

a. Fungal and bacterial counts for each location shall be converted to counts cfu/$m^3$ this will give eight counts (four fungal and four bacterial) for each space. If a number of counts are higher than 1000 cfu/$m^3$ then further investigation is required.

**9.8.2 Surface Samples**

a. Fungal and bacterial counts for each location shall be converted to counts per 10 $cm^2$. Three fungal and three bacterial counts shall be available for each sampling point. If a number of counts are higher than 20 cfu per 10 $cm^2$ then cleaning of the trunking is recommended.

**9.8.3 Local Exhaust Ventilation**

a. To examine and test an LEV, the Contractor shall undertake:

(1) A visual check;

(2) Measurement of plant performance and an assessment of control;

(3) An assessment of the performance of the air cleaner or filter where air is recirculated.

b. The Contractor shall make the following visual checks of an LEV:

(1) A thorough external examination of all parts of the system for damage, wear and tear, condition of hoods, slots, canopies, booths, enclosures, trunking and fittings, fans and filter casings and discharge stacks;

(2) If a filter has a shake down cleaning device, its correct operation needs to be checked. This also applies to reverse jet or pulsed jet filter cleaning devices;

(3) An internal examination where necessary and where possible to ascertain the condition of items such as filter fabric and fan belts;

(4) Where filters have built-in pressure gauges, a check on their ability to display the pressure, and on whether the correct operating pressure range is indicated by means of arrows or a written notice;

(5) If a wet scrubber is used, a check of the water flow and the condition of the sump shall be carried out;

(6) Where filters that return air to the workplace are fitted with devices that indicate the concentration of pollutant in the returned air, a visual check shall be carried out to see whether they are functioning;

(7) Use of a smoke cloud released close to the source, or in the case of dust the use of a dust lamp, to visually assess the control of pollutant;

(8) With dust extraction systems, a check on whether any accumulations or deposits of dust are occurring close to the source.

c. The Contractor shall measure the static pressure behind each hood or enclosure, the air velocity at the face of the enclosure or point of emission, air velocity in the trunking and power consumption.

d. If the LEV system re-circulates filtered air the Contractor shall:

(1) Provide a rigorous visual examination of the filter for possible damage and to ensure a good seal in its housing;

(2) Check the pressure drop across the filter;

(3) Arrange for tests of the quality of the air as it leaves the filter;

(4) Test the filters for compliance with published standards, especially HEPA filters.

## 10. FIRE AND SMOKE DAMAGED TRUNKING

Related Documents: There are no related documents within this section.

a. The Contractor shall ensure the system is shutdown before inspecting for heat and smoke damage.

b. The Contractor shall assess the likelihood of smoke cross contamination from one part of the system to another. This may mean resetting and running an undamaged part of the system and then monitoring for a set period.

c. The Contractor shall determine whether the damaged section can be isolated.

d. After ensuring the system is shutdown, the Contractor shall assess the condition of the damaged area and decide if trunking, dampers and other components are reusable without repair or replacement.

e. The Contractor shall report to the MEO the extent of any damage.

f. Before proceeding with remedial work, the Contract Sponsor shall agree the scope of work with his insurance company loss adjuster.

g. The Contractor shall test smoke deposits for corrosiveness or other hazards.

h. The Contractor shall clean internal surfaces to an agreed level and then deodorise the affected trunking.

i. The Contractor shall change filters and test the operation of dampers.

j. The Contractor shall monitor the system for a set period.

## 11. REPORT

Related Documents: There are no related documents within this section.

a. The Contractor shall submit a report to the Contract Sponsor detailing the results of the inspection and sampling. This shall be supported by any photographs or video film taken during the inspection.

## 12. THE CLEANING PROCESS

Related Documents: The Confined Spaces Regulations 1997; see also Annex A.

### 12.1 Safety

a. The Contractor shall comply with the requirements of the Confined Spaces Regulations 1997.

b. The Contractor shall ensure that all operatives wear personal protective clothing and equipment.

c. The Contractor shall ensure that all fans are shutdown and tagged-out prior to commencing work.

d. If hazardous contamination is found, the Contractor shall take measures to prevent exposure (inhalation, ingestion or absorption through the skin) by any personnel. This shall include selecting suitable personal protective equipment to control the risk, using personal protective equipment where needed, and using suitable respiratory protection for access to the insides of filter housings and trunking.

### 12.2 Methodology

a. The Contractor shall arrange with the Contract Sponsor a suitable time to undertake the cleaning process and indicate its planned duration. Any delays to the work shall be notified and discussed with the Contract Sponsor.

b. At any point during the cleaning process the Contractor must be able to reinstate the ventilation to operational condition within 24 hours.

c. Where there is a requirement to clean systems associated with a magazine, the Contractor shall obtain from the MEO or his designated representative, notification that all relevant magazine regulations are complied with.

d. The Contractor shall, prior to commencing work, provide to the Contract Sponsor a method statement that gives a timetable of work and justifies the choice of cleaning method he proposes to achieve the agreed level of cleanliness. Normally, dry

cleaning methods will be used in supply air systems and general extract air systems. Wet methods are needed for kitchen exhaust and similar installations where extract air contains smoke, grease and/or other similar impurities. If wet cleaning methods are used, the Contractor shall check for water-tightness and that the trunking is sloping to prevent retention of cleaning fluids.

e. The Contractor shall carry out the works in a manner that prevents the recontamination of previously cleaned parts or contamination of parts that will not be cleaned, during the remainder of the cleaning process.

f. The Contractor shall remove or protect any HVAC sensors prior to cleaning.

g. Where textile trunking and diffusers are incorporated within a system the textile trunking shall be removed at the transition piece and the hard end blanked off.

h. Where the textile trunking is to be cleaned, it shall be removed and cleaned in accordance with the manufacturers instructions. Any faults/damage to the textile ducting shall be reported to the Contract Sponsor/MEO prior to being reinstated.

i. Where drawings show or a survey indicates that internal acoustic linings are in place, the cleaning process shall not be detrimental to the physical condition of the lining.

j. The system position and setting of any balancing dampers, orifice plates or ventilation valves shall be recorded and reinstated ‘as found’ on completion of the clean.

k. The Contractor shall leave any fire damper in a fully open position.

l. Where vacuum extraction equipment is to be used that exhausts air inside the vessel, the Contractor shall ensure the equipment is fitted with HEPA grade filters as a minimum.

m. If the Contractor encounters hazardous materials during the cleaning process they shall stop work and inform the Contract Sponsor immediately.

n. The Contractor shall provide a particular method statement to remove hazardous contamination in LEV.

## 13. CLEANING EQUIPMENT

Related Documents: BR 1326A; see also Annex A.

### 13.1 General Ventilation Trunking

a. A cleaning system powered by compressed air will be effective in cleaning a range of trunking sizes. Such systems could be either an air wash or compressed air powered mechanical brush, all of which require a volume flow rate of between 70 cfm to 145 cfm (.033 $m^3$/sec to .068 $m^3$/sec) at 7 bar to 8 bar depending on the individual system. The compressed air must be free from oil and condensate contamination.

b. Where compressed air cleaning systems cannot be used, a flexible brush system can be used for smaller trunking up to 500 mm diameter or longest side major axis and manual cleaning for trunking over 500 mm.

c. Manual cleaning is preferred for trunking sizes over 500 mm and where physical access into the trunking is allowed.

### 13.2 Plant Items

a. The Contractor shall be aware of any heating, cooling, or humidifying equipment within the trunking system and ensure no damage occurs.

b. Heater batteries, cooling coils, filters, etc., shall be cleaned by hand-held compressed air tools. The AHU shall be cleaned with a manual brush and hand vacuum. The vacuum shall be placed outside the cleaning area to avoid re-contaminating the AHU. The AHU shall then finally be washed internally with a Ministry approved bactericide. Filter housings shall be cleaned with a manual brush and hand vacuum. Heating and cooling coils shall be cleaned with low pressure (up to 15 bar) compressed air tools, long-bristled brushes, or a low pressure jet washer ensuring adequate drainage is available or can be provided. Ventilation grilles and diffusers shall be removed and hand brushed and hand washed.

c. Where ventilation systems pass through or into screened compartments, e.g., Wireless Transmitter (WT) or Main Communication Office (MCO), or like compartments, the Contractor shall ensure that the trunking screening plates are removed and reinstated after the clean. The MEO or his designated representative will advise on the location of screened compartments.

d. Where found, flameproof gauze, pressure relief valves and fan suction chambers shall be removed and cleaned.

e. Drain plugs where fitted, shall be removed and cleaned as a last action.

### 13.3 Galley Ventilation

a. Where access allows, hand scraping followed by an application of approved solvents shall be used to clean most greasy surfaces. (BR 1326A refers - Solvent's are approved by the Institute of Naval Medicine (INM) or the Sea Technology Group (STG) for Submarines). If chemicals are used to breakdown the deposits the grease must be removed by an appropriate method, which may be either a pressure washing system, steam cleaning or mechanical brushes. If pressure washing or

steam cleaning is used, the watertightness integrity of the trunking must be checked beforehand.

b. The Contractor shall ensure that where a galley exhaust canopy is an integral part of the system, the canopies are left in a visibly clean condition.

c. The standards for Kitchen/Galley Ventilation Systems are specified in HVAC DW/171 ‘Standards for Kitchen Ventilation Systems’.

## 14. VERIFICATION

Related Documents: There are no related documents within this section.

a. The Contractor shall offer the Contract Sponsor the opportunity to witness the verification of cleanliness.

### 14.1 Methodology

a. A visual inspection immediately after the cleaning process that surfaces are visibly clean is the main method for assessing the cleaning performance.

b. The Contractor shall inspect the condition of air filters, sound attenuators, humidifiers, dehumidifiers, dampers and any components for measurement or control in the trunking, to ensure that no damage has occurred and that the cleanliness and operation are as intended.

c. Fire and control dampers shall be set to an ‘as found’ position.

### 14.2 Galley Ventilation

a. For galley ventilation, it is not possible to do a vacuum test and the Contractor shall provide before and after photographs or endoscope inspection as verification of cleaning.

b. The standards for Kitchen/Galley Ventilation Systems are specified in HVAC DW/171 ‘Standards for Kitchen Ventilation Systems’.

### 14.3 Local Exhaust Ventilation

a. The Contractor shall verify the capture effectiveness of a LEV by smoke (HM Surface Ships only) and/or dust lamp tests. But the performance of certain parts of the LEV plant shall be tested by measurements of air velocity, pressure or volume flow rate, such as filter pressure drops, air velocities in trunking, fan volume flow rates and pressure.

### 14.4 Report

a. After the system has been cleaned, the Contractor shall prepare a report for the Contract Sponsor.

b. The report shall comprise the following information:

(1) Description of system;

(2) Brief ‘Scope of Work’;

(3) Cleaning methods used;

(4) Verification results and photographs;

(5) Location of any new access doors;

(6) Report on the system as found;

(7) Certificate of cleaning;

(8) Comments and recommendations.

## 15. WASTE DISPOSAL

Related Documents: There are no related documents within this section.

a. The Contractor shall ensure that any waste material produced from the contract is suitably bagged and labelled and then deposited at an authorised point. The Contract Sponsor or nominated representative is then responsible for the disposal of this waste. (DCI GEN 147/00 Disposal of Hazardous and Special Waste).

b. If hazardous materials are identified, suitable special arrangements for disposal will be agreed and actioned by an approved MOD authority.

## ANNEX A.

### RELATED DOCUMENTS

A1. The following documents and publications are referred to in this Standard:

| | |
|---|---|
| The Confined Spaces Regulations 1997. | |
| COSHH Regulations 1999. | |
| Environment Protection Act 1990. | |
| BS EN ISO 9001 | Quality management systems. Requirements. |
| JSP 375 | Vol 1: Guide to Safety Instructions Relating to Health and Safety at Work Act 1974;<br>Vol 2: Guide to Safety Instructions Relating to Health and Safety at Work Act 1974. |
| JSP 430 | Ship Safety Management System Handbook:<br>Volume 1: Policy and Guidance on MOD Ship and Equipment Safety Management. |
| DEF STAN 02-102 (NES 102 Pt 1)<br>DEF STAN 08–159 (NES 102 Pt 2) | Requirements for Air Conditioning and Ventilation Design:<br>Part 1: HM Surface Ships;<br>Part 2: Submarines. |
| DEF STAN 02-805 (NES 805) | Requirements for Mastic and Sealing Thermal Insulation Material:<br>Part 1: Mastic and Sealing Products, Vapour Barrier Coating;<br>Part 2: Mastic and Sealing Products, Flexible Mastic Sealers. |
| DEF STAN 02-53 (NES 53) | Guide to the Completion of Form DGSF 129 - Shore Support Requirements for Warships. |
| DEF STAN 07-251 (NES 763) | Requirements for the Preparation and Painting of Compartments in HM Surface Ships. |
| DEF STAN 07-252 (NES 774) | Requirements for the Preparation and Painting of Submarines. |
| BR 1326A | Materials toxicity regulations (Submarines) 1998. |

A2. The following other documents and publications are referred to in this Standard:

| | |
|---|---|
| DCI GEN 147/00 | Disposal of hazardous and special waste. |
| BSRIA Guidance and Standard Specification for Ventilation Hygiene FMS1 1997 ISBN 086022 4546. | |
| Health and Safety Executive Maintenance, Examination and Testing of Local Exhaust Ventilation HS(G)54 HSE Books 2nd edition 1998 ISBN 0 7176 14859. | |
| HVCA Cleanliness of Ventilation Systems TR/17 1998 ISBN 0-903783-26-6. | |
| HVAC Standard for Kitchen Ventilation Systems DW/171 1999 ISBN 0-903783-29-0. | |
| CIBSE Hygienic Maintenance of Office Ventilation Systems TM26 2000 ISBN 1 903287 111. | |
| DEFCON 76, Edition 7/99. | |

## ANNEX B.

## ABBREVIATIONS AND DEFINITIONS

B1. For the purpose of this Standard the following abbreviations apply.

| | |
|---|---|
| AHU | Air Handling Unit |
| ATU | Air Treatment Unit |
| CCTV | Closed Circuit Television |
| CIBSE | Chartered Institution of Building Services Engineers |
| cfu | Colony Forming Unit |
| CMO | Contract Monitoring Officer |
| COSHH | Control of Substances Hazardous to Health |
| DEFCON | Defence Contract Condition |
| DEF STAN | Defence Standard |
| DTT | Deposit Thickness Test |
| HEPA | High Efficiency Particulate Arrestance |
| HSE | Health and Safety Executive |
| HVCA | Heating and Ventilating Contractors Association |
| INM | Institute of Naval Medicine |
| LEV | Local Exhaust Ventilation |
| MAES | Marine Auxiliary, Environmental and Steam Systems |
| MCO | Main Communications Office |
| MEO | Mechanical Engineering Officer |
| MOD | Ministry of Defence |
| NES | Naval Engineering Standard |
| NCSIB | National Certification Scheme for In-service Inspection Bodies |
| RFA | Royal Fleet Auxiliary |
| STG | Sea Technology Group |
| UKAS | United Kingdom Accreditation Service |
| VT | Vacuum Test |
| WSA | Warship Support Agency |
| WT | Wireless Transmitter |

B2. For the purpose of this Standard the following abbreviations apply.

| | |
|---|---|
| Access door | A door providing access for maintenance or inspection. |
| Air Handling Unit/Air Treatment Unit | The assembly of air treatment equipment within one casing. It may include filters, fans, humidifier, cooler battery and associated controls. |
| Air diffuser | A supply air terminal device usually placed in the ceiling and composed of divergent deflecting parts. |
| Air filter | A mechanical device for removing particulate contaminants from an air stream. |
| Bacteria | Single-celled microscopic organisms, multiplying rapidly by division. |
| Colony Forming Unit | Biological material that gives rise to a visible colony on an agar plate. |
| Contract Sponsor | The party responsible for initiating the cleaning contract. |
| Contractor | Any person carrying out work on behalf of a client, where that person is not an employee of that client. |
| Fan | A rotary machine for propelling air. |
| Fire damper | A mobile closure within the trunking which is operated automatically or manually and is designed to prevent the passage of fire. |
| Fungi | Plants without chlorophyll, including moulds and mildew that reproduce by spores. |
| Grille | A mesh or lattice entry or termination fitted to ventilation trunking. |
| HEPA Air Filter | High Efficiency Particulate Arrestance filter. |

## ANNEX C.

## PROCUREMENT CHECK LIST

This Standard contains no Procurement Check List information.

## ALPHABETICAL INDEX

(NOTE: Page numbers are given)

*Inside Rear Cover*

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## Contract Requirements

When Defence Standards are incorporated into contracts users are responsible for their correct application and for complying with contractual and statutory requirements. Compliance with a Defence Standard does not in itself confer immunity from legal obligations.

## Revision of Defence Standards

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