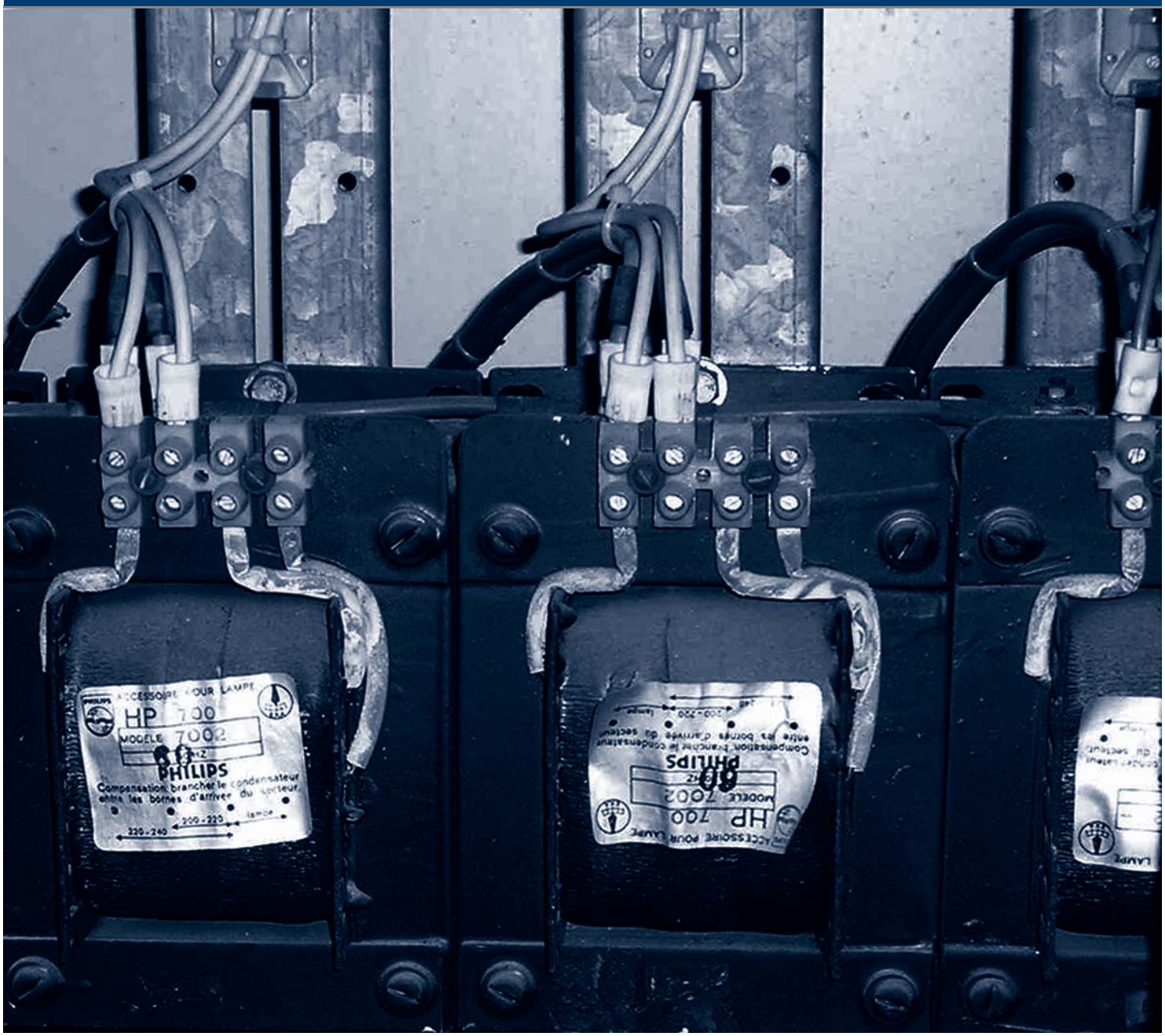
Lloyd's Register Marine

Working together for a safer world

A Guide to the Inventory of Hazardous Materials (IHM)

January 2014



This document is intended to provide guidance on compiling an Inventory of Hazardous Materials, previously known as the Green Passport, for submission to Lloyd's Register.

This Guide will be updated and extended as knowledge develops and as further information is received from bodies such as the International Maritime Organization (IMO). Please check for updated versions before use.

The latest version can be obtained from: **marine-environment@lr.org**

January 2014

Contents

1. Background

From the mid-1980s, the centre of the ship scrapping industry shifted towards Asia, in particular to India, Bangladesh and Pakistan. This industry was, and still is, virtually unregulated and has one of the worst safety records of any industry. It also causes massive environmental pollution.

Initially, there was little awareness or acknowledgement of the appalling working conditions and environmental pollution. However, a concerted campaign by environmental groups has brought about widespread awareness of ship scrapping practices.

Oil pit on breaking beach

In order to address these issues, industry working groups developed the Industry Code of Practice on Ship Recycling. This guidance subsequently fed into discussions at the International Maritime Organization (IMO), which resulted in the IMO Guidelines on Ship Recycling, adopted by member states in December 2003. These voluntary guidelines introduced the concept of a 'Green Passport' Inventory for the first time.

In parallel with this activity, the International Labour Organisation (ILO) developed Guidelines on Safety and Health in Ship Breaking in Asia and Turkey and the Basel Convention published guidance on Environmentally Sound Management of Dismantling of Ships. The pre-existing Basel Convention on the Transboundary Movement of Hazardous Wastes also began to be applied to ships, although it was not originally intended for this purpose.

1.1 The Hong Kong Convention

At the 53rd session of its Marine Environmental Protection Committee (MEPC 53), the IMO decided that the situation required proper regulation through a free standing international instrument and so the drive to develop the Draft IMO Convention for the Safe and Environmentally Sound Recycling of Ships was begun. The timetable for this Convention was extremely ambitious. Following its conception in July 2005, the intention was to have the Convention adopted during the biennium 2008/2009. By holding the Diplomatic Conference in Hong Kong in May 2009 this timetable was achieved.

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, draws upon the existing guidelines that the original Lloyd's Register 'Green Passport' inventory was based on, but it is far larger in terms of scope, and more detailed in application. The Convention introduces many new elements and, of course, includes many enforcement measures that guidelines, by their very nature, cannot have.

While the Convention still relies on the concept of a 'Green Passport', which remains central to most, if not all, operations, the term itself is no longer used. It is now known as the 'Inventory of Hazardous Materials' (IHM), though its intention remains identical. The IHM still covers the whole life of the ship, from construction and operation to preparation for scrapping at the end of the ship's useful life.

This Guide covers Part I of the IHM; Materials contained in ship structure or equipment. Parts II and III, covering operationally generated waste and stores, do not need to be completed until the ship is being prepared for recycling.

As of December 2013, the number of countries who have ratified the Convention stands at one (Norway).

1.2 The EU Ship Recycling Regulation

The EU Regulation on Ship Recycling entered into force on 30 December, 2013. It will apply to ships of at least 500gt flying the flag of an EU member state, and to ships visiting the EU flying the flag of a non-EU member state. The Regulation is mostly aligned with the Hong Kong Convention but some aspects differ.

It requires the establishment of a list of approved ship recycling facilities (the "EU List") which meet the design, construction and operation requirements of the EU but may be anywhere in the world.

Furthermore, the requirements for an IHM are expected to be more onerous than for the Hong Kong Convention's Inventory, specifically concerning accuracy and comprehensiveness. Guidance is expected to be produced by the European Commission on implementation.

The Regulation's initial impact will be limited because most requirements do not come into effect immediately. Some will come into effect at a fixed time while others are conditional on the EU List.

For example, requirements for owners to use approved recycling facilities on the EU List will not become applicable until 6 months after the List includes sufficient capacity. Newbuildings will need an IHM not later than 31 December, 2018, whereas ships going for recycling will need an IHM as soon as any EU List is published; but not before 31 December, 2014. The EU List itself is not expected before 31 December, 2016.

The situation is complicated, to say the least.

Lloyd's Register is working towards ensuring our Inventories and procedures comply with both the EU Regulation but, until the guidance is published, we can't complete this.

Further details on the EU Regulation can be found on Lloyd's Register's ship recycling web pages (**www.lr.org/shiprecycling**).

2. The Lloyds Register Inventory of Hazardous Materials (IHM)

2.1 Purpose

The IHM is intended to comply with Regulation 5 of the Hong Kong Convention. Essentially, the IHM is an inventory of materials present in a ship's structure, systems and equipment that may be hazardous to health or the environment. Prior to recycling, details of additional hazards in stores and wastes are added and the document can then be used to help an authorised recycling facility formulate a safer and more environmentally sound plan for decommissioning the ship.

It is intended to be a reasonable listing of expected or known hazards, at the time of drawing up the Inventory, given in suitable detail for the owner's purposes. It is not a detailed and accurate account of each and every hazardous element on board the ship.

As knowledge, experience and legislation develop the IHM will doubtless also develop. This publication is based on currently available knowledge and practices. It has been published in the spirit of encouraging discussion and enhancing safety and the environment in a new and uncertain field of knowledge.

Different users will have different requirements. Shipowners will primarily be interested in safety and liability in relation to items in normal operational use. A recycling facility is likely to require far more onerous testing of potentially hazardous material. Therefore, future end users – licensed recycling facilities – will need to identify the hazards which need to be included in the IHM and those items for which further information is required. Such items can be usefully developed within the ship-specific Ship Recycling Plan.

Ground protection membrane for recycling of *Tricolor*

Similarly, as safety and environmental legislation develops, areas within the IHM will be subject to greater scrutiny, at which time additional detail may be required. This is why the concepts of maintenance and annual survey are essential to developing an IHM which will retain its usefulness throughout the life of the ship. The Hong Kong Convention requires that the IHM has a 'renewal survey' every five years, and that the Inventory is updated whenever there is a 'significant' change. This is a difficult thing for a shipowner to decide so, for Lloyd's Register classed ships, the IHM will be reviewed as part of the annual survey in order to simplify matters and ensure proper maintenance of the information in the Inventory.

2.2 Responsibility

Lloyd's Register will verify that the resulting IHM complies with the minimum documentation requirements set out in Regulation 5.2 of the Convention. The IMO has released 'Guidelines for the Development of the Inventory of Hazardous Materials', the latest version at the time of writing being MEPC.197(62).

It should be noted that all ships presently under construction are likely to be existing ships when the Convention enters into force. Therefore, Lloyd's Register is not applying the full Convention requirements for newbuildings at the current time as they are not applicable, nor are the consequences fully understood.

Lloyd's Register would encourage shipowners and shipyards to try to comply with the newbuilding requirements as far as possible but cannot insist on this under our own procedures at this moment in time.

This publication attempts, as far as possible, to give a practical guide to the most important elements of the IMO guidelines, while recognising that the IMO work is constantly developing.

2.3 Initial approval

2.3.1 Newbuildings

The Lloyd's Register new construction site team will review and periodically audit the processes that the shipyard has implemented to capture the hazardous materials used to build the ship.

The shipowner's requirement for an IHM should be included on the 'Request for First Entry' Form 2500 which forms the basis of the contract between Lloyd's Register and the owner for a new ship. There is a specific 'tick box' on Form 2500 for this. Alternatively, an individual contract for IHM certification can be entered into, but this should be referred to Lloyd's Register's Statutory Support Group for further information.

New construction

When the Lloyd's Register site office receives a Form 2500 with the IHM box ticked they will start liaising with the shipyard to facilitate the process and will provide supporting materials, including our Dynamic PDF Inventory template, which should be used in conjunction with this publication.

A major issue in the newbuilding process is the control of subcontractors and subcontracted supply. The shipyard will need to know about all the materials that are being provided externally to be placed on the ship. The only way to control this process is through the supply contract, which in almost all cases will be with the shipyard. Therefore, contracts will need to recognise that all relevant materials, locations and quantities have to be identified and the information controlled.

With this in mind, the IMO Guidelines utilise the concept of 'Material Declarations'. These declarations will need to be completed by anyone supplying items, components or materials to go on board the ship for its structure or equipment.

To facilitate this process, Lloyd's Register provides a covering letter which the shipyard can use to explain the use and purpose of the Material Declarations to their subcontractors. An example of this letter along with an example 'Form of Material Declaration' is provided in Appendix IV of this Guide.

The Lloyd's Register site team will undertake spot checks throughout the build process to ensure that the contents of the IHM prepared by the shipyard are an acceptable representation of the items on board. The site team will subsequently issue an approved Inventory and an IHM 'Statement of Compliance' on delivery, both of which should remain on board the ship.

The IHM will need to be maintained by the ship crew, throughout the life of the ship, to ensure continued compliance with Hong Kong Convention requirements.

2.3.2 Existing ships

Regional IHM Approval Teams are responsible for approval of the Inventory and for arranging the verification survey. At the time of writing, these specialist Approval Teams are located in Miami, Piraeus, Singapore and Southampton.

The shipowner prepares the IHM and submits it along with the required supporting documentation, including the 'Visual/Sampling Check Plan', to a specified IHM Approval Team. The Approval Team reviews the Inventory and associated documentation for completeness, and checks hazards that would be expected for ships of a similar age and type have been addressed.

The Approval Team will liaise with the shipowner to ensure the IHM meets the requirements of the Hong Kong Convention and to arrange a suitable time and location for the verification survey. This survey must be sufficient to provide reasonable confidence that the contents of the IHM are an acceptable representation of the items on board the ship.

On completion of the verification survey the attending surveyor will issue an IHM Statement of Compliance to the ship.

2.4 Maintaining the Inventory

The Convention requires that the shipowner maintains the IHM, throughout the life of the ship, with renewal surveys at intervals not greater than five years.

For Lloyd's Register class vessels the IHM is reviewed on an annual basis, during the annual class survey, to ensure that the ship continues to comply with the Convention requirements. This annual review must be sufficient to provide confidence that the ship's crew are updating and maintaining the IHM in accordance with their internal procedures and that the Inventory continues to be an acceptable representation of hazards on board the ship. Any changes made to the approved IHM should be made known to the attending surveyor. When the original Statement of Compliance expires a further five year certificate will be issued by the attending surveyor.

For non-LR class vessels there will be no annual review on board. Instead, an additional survey, either general or partial, according to the circumstances, may be made at the request of the shipowner after a change, replacement or significant repair has taken place, to ensure that the ship continues to comply with the Convention requirements.

Additionally, three months before the Statement of Compliance expiry date, a renewal will be required (consisting of an office-based review and on board renewal survey) before a further five year Statement of Compliance can be issued. The IHM Approval Teams are responsible for co-ordinating maintenance of the Inventory for non-LR class vessels.

It should be noted that after the Convention enters into force, new installations on existing ships will be expected to follow the same procedures as newbuildings – thus, the same covering letter and Material Declaration forms found in Appendix IV of this publication can be used.

3. Compiling the Inventory of Hazardous Materials on board ships

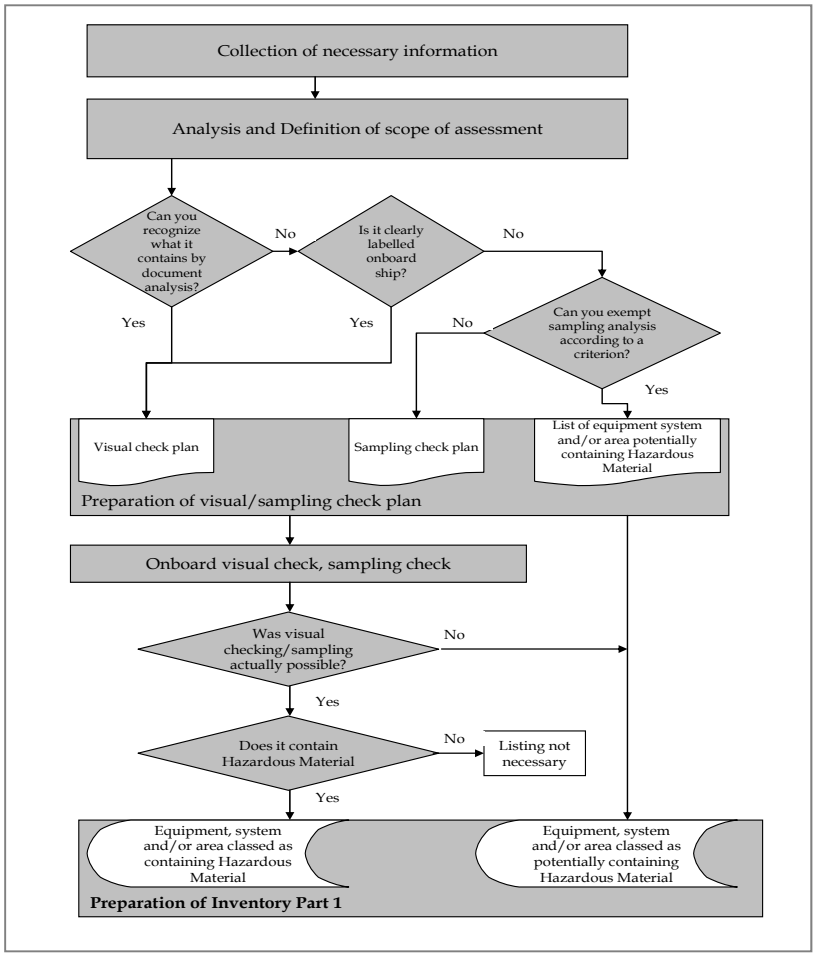
Reference should be made to the latest version of the IMO 'Guidelines for the Development of the Inventory of Hazardous Materials' (MEPC.197(62) at the time of writing).

Many of the items referred to or requested can be found in the ship's onboard documentation and plans. Machinery specifications should show details of items such as gaskets, synthetic bearings, heat insulation, oils, plastics, asbestos and transformer cooling media. Insulation and accommodation plans should show many of the common materials in the ship. Electrical drawings and specifications should show details of wiring and wiring coverings. Additional information may be found in Part 5 of this publication, and in the appendices.

The items themselves may well be labelled; for example, lighting ballasts (for PCB content) and HVAC & refrigeration systems (for refrigerant type). The official IMO guidance states the following:

"4.2.1 Collection of necessary information (Step 1)

The shipowner should identify research, request, and procure all reasonably available documentation regarding the ship. Information that will be useful includes maintenance, conversion, and repair documents; certificates, manuals, ship's plans, drawings, and technical specifications; product information data sheets (such as Material Declarations); and hazardous material inventories or recycling information from sister ships. Potential sources of information could include previous shipowners, the ship builder, historical societies, classification society records, and ship recycling facilities with experience working with similar ships.



4.2.2 Assessment of collected information (Step 2)

The information collected in Step 1 above should be assessed. The assessment should cover all materials listed in Table A of appendix 1; materials listed in Table B should be listed as far as practicable. The results of the assessment should be reflected in the visual/sampling check plan."

The flow diagram above, which is slightly simplified from the IMO guidelines and includes the additional check of examining labels on board the ship, can be followed.

3.1 Starting the process

To support compliance, Lloyd's Register provides a Dynamic PDF eForm for compiling the IHM which should be used in conjunction with this publication. The PDF eForm contains drop down lists and hover help fields, which act as an additional guide during the compilation process.

The Inventory template should be opened with Adobe Free Reader or Adobe Acrobat Standard; version 8.1.3 or higher is required for the IHM template to work in full. Please refer to the latest version of the 'Green Passport (IHM) v2.0 User Guide' for further guidance on opening, saving and using the Inventory.

Lloyd's Register cannot accept other versions of the IHM.

3.2 Completing the Inventory

In cases where testing would be required in order to establish whether a hazard exists shipowners have the option not to test, where it is decided to be impractical to do so, and instead to declare the material a probable or 'presumed' hazard. However, proper safety and environmental hazard management systems (as per the ISM code) must exist for all noted probable, possible, presumed or actual hazards. These hazard management systems are not part of the IHM since they are covered by the ISM code; however, the Inventory will be available to ISM auditors, and may be used as a source of reference during the audit.

3.2.1 Sampling

While the original IMO Guidelines on Ship Recycling did not require sampling to be carried out the Hong Kong Convention does require it, for existing ships. This new requirement is in Regulation 5.2, as follows:

"Existing ships shall comply as far as practicable with paragraph 1…The Hazardous Materials listed in Appendix 1, at least, shall be identified when the Inventory is developed. For existing ships, a plan shall be prepared describing the visual/sampling check by which the Inventory of Hazardous Materials is developed, taking into account the guidelines developed by the Organization."

The requirement for sampling is further amplified in the IMO guidance:

4.2.3 Preparation of visual/sampling check plan (Step 3)

To specify the materials listed in appendix 1 of these Guidelines a visual/sampling check plan should be prepared taking into account the collated information and any appropriate expertise.

The visual/sampling check plan based on the following three lists:

- List of equipment, system and/or area for visual check (any equipment, system and/or area specified regarding the presence of the materials listed in appendix 1 by document analysis should be entered in the List of equipment, system and/or area for visual check);

- List of equipment, system and/or area for sampling check (any equipment, system and/or area which cannot be specified regarding the presence of the materials listed in appendix 1 by document or visual analysis should be entered in the List of equipment, system and/or area as requiring sampling check. A sampling check is the taking of samples to identify the presence or absence of Hazardous Material contained in the equipment, systems, and/or areas, by suitable and generally accepted methods such as laboratory analysis); and

- List of equipment, system and/or area classed as "potentially containing Hazardous Material" (any equipment, system and/or area which cannot be specified regarding the presence of the materials listed in appendix 1 by document analysis may be entered in the List of equipment, system and/or area classed as "potentially containing Hazardous Material" without the sampling check. The prerequisite for this classification is a comprehensible justification as to the Impossibility of conducting sampling without compromising the safety of the ship and its operational efficiency).

Visual/sampling checkpoints should be all points where:

- the presence of materials to be considered for the Inventory Part I as listed in appendix 1 is likely;

- the documentation is not specific; or

- materials of uncertain composition were used.

4.2.4 Onboard visual/sampling check (Step 4)

The onboard visual/sampling check should be carried out in accordance with the visual/sampling check plan. When a sampling check is carried out, samples should be taken and the sample points should be clearly marked on the ship plan and the sample results referenced. Materials of the same kind may be sampled in a representative manner. Such materials are to be checked to ensure that they are of the same kind. The sampling check should be carried out drawing upon expert assistance.

Any uncertainty regarding the presence of Hazardous Materials should be clarified by a visual/sampling check. Checkpoints should be documented in the ship's plan and may be supported by photographs.

If the equipment, system and/or area of the ship are not accessible for a visual check or sampling check, they should be classified as "potentially containing Hazardous Material". The prerequisite for such classification should be the same prerequisite as in section 4.2.3. Any equipment, system and/or area classed as "potentially containing Hazardous Material" may be investigated or subjected to a sampling check at the request of the shipowner during a later survey (e.g., during repair, refit or conversion)."

For example; if you have a room with many diverse items, all of which have a high likelihood of being asbestos, it may be economically more viable to declare them all as asbestos and treat them accordingly. Alternatively, if the ship has a space with a large amount of concrete in it which is highly homogeneous, has a low likelihood of containing asbestos, and would be very expensive to remove as an asbestos waste, then a practical set of tests to provide the required confidence that the material does not contain asbestos would be sensible.

Most importantly, the approach should be transparent and demonstrate the required duty of care. The first step to achieving this is to assume the worst possible hazard, to take all precautions and then to design the sampling regime on this basis.

Asbestos under floor lining under concrete on bridge – a common A-60 flooring arrangement

Shipowners can further enhance the Inventory, and better discharge their liability, by carrying out a limited amount of testing of known materials, in order to satisfy themselves that the available information is accurate and reliable.

Lastly, Lloyd's Register fully expects an authorised recycling facility to be capable of checking the principal hazards itself, or for the ship to have been pre-cleaned by a yard authorised for that hazard.

Each facility should have its own sampling procedures independent of anything which is in the IHM, since the Inventory is only based on 'estimates' and the facility is expected to discharge its responsibility to its own workers in a sensible manner. This is essential when one considers the inaccuracies inherent in any Inventory and the lack of knowledge of what is behind, under, or around anything which may have been sampled.

The knowledge that a facility will 'double check' and the fact that an owner can ask the facility to test materials he has been unable to test (due to time, access, cost or other factors), can also impact on the economic balance of the sampling plan.

Only when the ship is being dismantled can actual, accurate checks of all material be made. Thus, sampling for the Inventory only adds confidence; it can never provide a factual record of all materials on board the ship, and it cannot do the job of checking during dismantling, which must be done by an authorised recycling facility.

In the first instance, therefore, Lloyd's Register would advise an owner to employ the services of a subcontractor with expertise in sampling for hazardous material on board ships to compile the 'Visual/Sampling Check Plan'. The following section introduces a method to identify such service suppliers.

3.2.2 Lloyd's Register Approved Service Suppliers

Appendix 1 of the Convention defines four principal hazardous materials: asbestos; PCBs; TBT anti-fouling; and ozone-depleting substances, such as CFCs and halons. These materials should receive special attention.

The Hong Kong Convention encourages shipowners to employ third party subcontractors who are specialists in these fields to develop sampling plans to test for these materials, to help build better confidence in whether they are present or not and in what locations and quantity.

It is increasingly easy to find 'hazmat experts' advertising IHM compilation and sampling services. However, upon closer inspection, many of these 'experts' have simply attended a three or four day training course with certification granted following an exam on the final day.

Lloyd's Register maintains it is impossible to become an expert within a week and that shipowners should carry out their own additional checks. With this in mind, a procedure to help identify third party subcontractors with the required expertise and experience is set out in Appendix III of this publication.

Lloyd's Register uses similar, more extensive procedures to officially approve service suppliers. We require companies demonstrate their expertise to us, rather than attend a training course. We independently approve their certification, documentation, procedures, personnel, equipment, and laboratory facilities to recognised national and international standards before granting approval.

A list of Lloyd's Register Approved Service Suppliers who can help shipowners to enhance their IHM, or assist with wider asbestos-related issues, is available on Lloyd's Register's Class Direct website (see left hand menu of **www.cdlive.lr.org**), or through your local IHM Approval Team.

3.2.3 Filling in each section

Please refer to the latest version of the 'Green Passport (IHM) v2.0 User Guide' for further guidance on opening, saving and using the Inventory. If you encounter any issues please contact your local Lloyd's Register on-site team or IHM Approval Team, as applicable.

Mandatory sections of the Lloyd's Register IHM

Executive Summary

Enter the Ship Name (or the Yard Number for newbuildings), IMO Number and Company IMO Number in the data entry field on the top right of page 1 of the 'Executive Summary'.

The Inventory Number and Issue Date will be completed by the Lloyd's Register on-site team or IHM Approval Team.

The remaining free-text fields on the Executive Summary will also be completed by Lloyd's Register staff, on the basis of the completed Inventory.

1A. Asbestos

Since 1 July 2002, the installation of materials that contain asbestos was prohibited (with the exception of certain vanes, joints and insulation) under SOLAS Chapter II-1, for all ships.

However, IMO Resolution MSC.282(86) introduced amendments to SOLAS Chapter II-1, Part A-1, Regulation 3-5, prohibiting the new installation of materials containing asbestos, for all ships without exceptions, from 1 January 2011.

The following Maritime Safety Committee Circulars apply (at the time of writing):

- MSC.1/Circ.1426 – Unified Interpretation of SOLAS Regulation II-1/3-5 (June 2012)
- MSC.1/Circ.1379 – Unified Interpretation of SOLAS Regulation II-1/3-5 (December 2010)
- MSC.1/Circ.1374 – Information on Prohibiting the Use of Asbestos Onboard Ships (December 2010)

In order to verify that new installations do not contain asbestos it is required that Recognised Organisations, such as Lloyd's Register, review asbestos-free declarations and supporting documentation for the structure, machinery, electrical installations and equipment covered by the SOLAS Convention. Such documentation, therefore, is to be provided by shipyards, repair yards and equipment manufacturers.

This also applies to the new installation of existing material contained within ship stores, or shipyard for a ship under construction.

For newbuildings, compliance with the SOLAS requirements is to be confirmed throughout the newbuild process; shipbuilders are also required to complete a shipyard declaration of conformity, as supporting evidence.

Prior to January 2011, SOLAS did not prohibit all types of asbestos. Furthermore, there has never been one rigorously enforced law, governing all countries in the world, banning all types of asbestos. Therefore, unless there is reputable, traceable information that proves an item under consideration is free from asbestos, it should be treated as if it is asbestos. This is a safe basis from which to start. The appendices give guidance on what items and materials should be considered.

Does your ship contain asbestos?

If **YES**, enter details in the 'Add Item' section of 1A ensuring you include the Item, Location and the Approximate Quantity. These three fields are always required, to ensure compliance with the Hong Kong Convention.

Alternatively, you can include a factual summary of the asbestos status of the vessel in the 'Summary of asbestos status' free-text field, appending supporting documentation in Appendix A of the IHM.

Acceptable, factual 'Summary of asbestos status' entries may read:

"Several types of asbestos distributed throughout ship; see asbestos register – Appendix A"

"Asbestos containing materials present throughout ship; see visual/sampling report – Appendix A"

Naturally occurring asbestos

If **NO**, can you prove it? Enter details of evidence and include copies in Appendix A of the IHM.

For example, the vessel may have a certificate stating that it is asbestos free, issued by a recognised international company. In this case, confirmation that this certificate is acceptable to Lloyd's Register needs to be made at the approval stage. The vessel will also be required to demonstrate a continuous system of procurement procedures to show that asbestos could not have been introduced on board the ship. If this cannot be demonstrated, then any replacement parts or equipment must be declared 'Presumed asbestos containing material' (PACM).

Third party asbestos certificates may be included in Appendix A of the IHM at the specific request of the shipowner, and under his ongoing responsibility for their validity.

An acceptable, factual 'Summary of asbestos status' entry may read:

"Vessel has asbestos free statement from build. Procurement plan in place to ensure vessel remains free of asbestos containing materials during operation. See Appendix A"

If **UNKNOWN**; declare it. Enter details of all known, unknown and PACM items in the 'Add Item' section of 1A ensuring you include the Item, Location and the Approximate Quantity.

Alternatively, an acceptable factual 'Summary of asbestos status' entry may read:

"Asbestos status unknown; all relevant materials PACM"

This should be taken forward into the sampling plan as explained by the IMO guidance.

It is strongly recommended that a Lloyd's Register Approved Service Supplier is used to assist in assessing the asbestos situation, as previously noted.

A summary of the asbestos situation will be recorded in the Executive Summary by Lloyd's Register staff.

Note: Non-factual, unsupported statements are not permitted on the IHM. For example, unacceptable 'Executive Summary' and 'Summary of asbestos status' entries would include:

"None"

"No asbestos on board ship"

"Ship is free of asbestos".

1B. Ozone Depleting Substances (ODS) – CFCs, Halons etc.

These are gases, such as CFCs and halons. They were legislated against by the Montreal Protocol and their phase out began in the mid-1990s. Until then, CFC gases were very common refrigerants on ships and halon was a very popular fixed fire fighting system.

These gases were also used extensively as blowing agents to produce plastics and plastic foams. Polyurethane, for example, was made using CFC gas, and most cold store insulation and fridge lining was made using CFC gases to produce the insulative foam. There are further details in the appendices.

- The first place to find information is the MARPOL Annex VI certificate, since this will list all the recirculating ODS on board the ship. It will not, however, list the foam and plastics that have been made using ODS.
- Next, check all the labels on all the HVAC, cold store compressors, fridges, cargo control plants, reefer units, freezers, air conditioning units, chillers, drinks machines and ice makers, to double check. The rating plates on the items will normally give the refrigerant – R22, R134a, etc – especially on more recent applications. If there is no plate then CFCs should be assumed. On newer machinery, the 'appliance rating plate' may also give the blowing agent of any insulative foam.
- If your ship is a reefer, liquefied gas ship or similar then all the associated cargo equipment and containment insulation will need to be checked. Membrane-type LNG containment systems use perlite with plywood boxes and these do not contain blowing agents. However, all the cryogenic pipe and system insulation is likely to have at least an inner polyurethane CFC blown core.
- Check if there are plans for the cold stores and the cold store insulation. If there is no information available then, depending on country of build and age, you may suspect the presence of CFC blowing agents. Since there is a substantial amount of insulation, sampling by a Lloyd's Register Approved Service Supplier would be recommended.

Cryogenic Insulation on LNG pipes; probable location for CFC blown insulation

1C. PCBs (materials containing Polychlorinated Biphenyls at levels of 50mg/kg or more)

These families of materials were generally globally phased out by legislation between the mid 1970s and the mid 1980s. If your ship was built after 1992, then it is extremely unlikely that it contains these substances.

In older vessels, these hazards are likely to exist in transformers, fluorescent lighting ballasts, paints, wire insulation, and electric motor start up capacitors. There are some simple checks you should carry out:

- Ask the Chief Engineer to confirm that all power transformers are air cooled. Liquid cooled transformers may carry large quantities of PCBs but these are very rare on board ships. If the Chief reports any liquid cooled transformers, you will need to investigate further. If not, list the transformers and their locations, and state *'Air cooled'*.
- Where liquid cooled transformers are found on a ship, the liquid should be confirmed either from the manufacturer's nameplate or by testing. If the transformer was built before 1992 and no details are known, it should be listed as *'Presumed containing PCBs'*.

– Fluorescent lighting ballasts should be marked, and their markings can be traced. Ask the electrician to check all the different light fittings on the ship and list the different makes and serial numbers of the starting ballasts. There should not be too many, and this should be relatively quick to do. You can check whether the details are on the list provided in Appendix I of this publication. These items were legislated against early, but any built before 1992 should be presumed to contain PCB, unless clearly marked otherwise.

– Check any paint specification. For ships built before 1992 the paint manufacturer may be able to advise; if they cannot state *'Unknown'*. For ships built after 1992 state *'None suspected'*.

– Check the cable list. It may be possible to trace the materials, but it will probably be very difficult. Therefore, for ships built before 1992 state *'Unknown'*. For ships built after 1992 state *'None suspected'*.

This is quite a complicated area, but Lloyd's Register will examine it in some detail. The IHM Approval Team will advise you of any further data requirements. The above is only a general summary; further details are in the appendices.

It is strongly recommended that a Lloyd's Register Approved Service Supplier be used to help assess the PCB situation.

Old ballasts in engine room – the maker's details are still visible

PCBs generally have a threshold value of 50ppm; therefore, values below this do not have to be shown but may be useful in case legislation is tightened in the future, for example.

A factual summary of the PCB situation will be recorded in the Executive Summary by Lloyd's Register staff.

1D. Organotin Compounds (TBT, TPT, TBTO)

Paint on vessel's structure

Although the main item of interest here, according to Appendix 1 of the Convention, is organotin compounds (since, in general, a lot of information is available about paints) this section also covers other available information.

TBT anti-fouling

Almost all vessels will now comply with the Anti-fouling System (AFS) Convention. If this is the case, the certificate will give details of whether the ship uses, or has sealed, TBT anti-fouling. If the certificate records that the TBT paint was fully removed, then state this. If the TBT paint was sealed, then this should be stated and TBT paint declared as present. The AFS Convention Certificate should be copied into Appendix D of the IHM.

If the ship does not have an AFS certificate, then TBT paint must be presumed and declared.

A factual summary of the paint situation and any paints of known elevated hazard will be recorded in the Executive Summary by Lloyd's Register staff.

Additional sections of the IHM

Other paints

Find all the records you can of paints on the ship. This should be fairly easy. Enter them on the form as demonstrated.

The entry in this section could be in the form of a simple summary, with more detailed specification sheets included in Appendix D, which is reserved for this purpose. Any relevant certificates, such as those associated with compliance with the AFS Convention, should also be included in Appendix D of the IHM.

Owners of older ships should be aware of the potential for high levels of lead and cadmium, as well as other hazardous materials in paints.

1E. Plastic and Rubber Materials

Plastics and rubber materials are not presently considered hazardous under normal situations or handling, unless contaminated by other hazards such as asbestos, and do not cause a hazard unless grossly mistreated (if burnt, for example). On account of this, detailed listing and analysis is not required, and simple summaries may be given. A general estimation as shown in the example IHM in Appendix V is fine.

Care should be taken regarding plastics likely to contain asbestos (such as synthetic bearings), especially those used in situations of elevated heat, and these should be checked carefully and the findings should be listed as far as possible.

Stern tube and pintle bearing materials need to be checked. Find any details you can from plans and include them in the Inventory, as per the example IHM provided. If you cannot find plans, your Lloyd's Register memo items should state any synthetic bearings. Enter the details on the form.

Similar considerations exist for insulative material, brake or windlass linings, gaskets, packing and any plastics for high temperature situations.

It is generally recommended that care is taken to identify any flame retardant chemicals used in plastics or rubber materials, since brominated flame retardants or similar may have been used. This is especially applicable if the vessel has any enhanced fire fighting characteristics (either active or passive), such as may be found on passenger ships. However, since the release of such hazards would occur only through gross misuse, or as part of the recycling process, the level of detail and analysis included is left to the owner.

It is generally recommended that good records of PVC use are kept since this material is presently under international scrutiny. However, as there is no globally ratified legislation relating to PVC use at present, this is not essential.

Attention should be paid to any plastic materials that may have been expanded using blowing agents which may have ozone-depleting potential (ODP) and/or global warming potential (GWP); see information relating to blowing agents on page 18 of this guide.

A summary of the plastics and rubber containing material should be included in the Executive Summary by Lloyd's Register staff. Since hazards specific to these materials are not presently of major concern, as opposed to known additives like asbestos or PCBs (which are covered elsewhere), the entry may be limited to a general statement.

1F. Chemicals in Ship's Equipment or Machinery

This area can be used for miscellaneous items such as anti-freeze, engine additives, battery acids, cathodic protection (anodes), and other information you can find on the files.

An important concept in this section and others is the ability to attach lists to the Inventory. Ships maintain lists of many items, especially stores (paint stores, chemical stores, engine treatment stores etc.). Rather than enter this detail into the main body of the IHM it is best to state, for example, "lube oil – see attached list" and place the latest list in the Inventory List section of the appendices. Provided no major changes happen to these lists (a new supplier replaces all old paints with new ones, or all old lube oils with new stock, for example), they do not need to be updated regularly.

1G. Electrical and Electronic Equipment

This section is in addition to the requirements set out in the IMO Guidelines for the Development of the Inventory of Hazardous Materials (MEPC.197(62)) but is included for completeness and to show compliance with major international codes such as the WEEE (Waste Electrical and Electronic Equipment) Code. The disposal of these items is potentially very complicated, thus their inclusion is important.

Most of these items present simple, familiar, generic hazards. The examples in the IHM in Appendix V, and drop-down menus in the Inventory itself, provide guidance on how these items can be included.

Care should be taken over items such as extra batteries or radioactive components. Some items may now be made from totally lead-free components. This is useful information and should be included in the Inventory.

1H. Constructional Materials

This is another new area, not included in the IMO Guidelines, but included here for completeness. The main items are structural steel and plastic or steel pipes. You may have an aluminium superstructure, or stainless steel tanks, plastic ballast pipes, decks made from sandwich plate steel, or an aluminium heli-deck. Any major item can be included. For steel weight, the lightship mass, as recorded in the trim and stability booklet, is an acceptable approximation.

1J. Cadmium and Compounds

Cadmium has historically had many uses. One main use is as a dye for textiles and plastics. It is used to produce yellow or orange and so it may be present in any yellow or orange materials or plastics.

Cadmium is also used on board ships as an alloy in bearings and other components.

1K. Hexavalent Chromium and Compounds

Hexavalent chrome is used in passivating layers, not only as an electroplated layer, but also, in high percentages, in passifying paints.

1L. Lead and Compounds

Lead is a very common additive; solder is a well-known use.

1M. Mercury and Compounds

Mercury is found in switches, ballast gauge systems, thermometers and fluorescent lights.

Fluorescent lights generally contain small amounts of mercury; pre-1988 tubes may contain about 45mg per tube. The US Environmental Protection Agency (EPA) estimates it costs $140 per tube to test whether a tube contains mercury and, generally, it expects tubes to fail. It is therefore recommended that all tubes are declared as containing mercury, unless other information is readily available.

1N. PBBs (Polybrominated Biphenyls)

Polybrominated biphenyls are similar to PCBs. They are used as flame retardants, especially in textiles and plastics.

1P. PBDEs (Polybrominated Diphenyl Ethers)
These, too, are used as flame retardants.

1Q. Polychlorinated Naphthalenes (CL=>3)
More information will be included when the IMO guidelines are finalised.

1R. Radioactive Substances
These items are relatively well understood and several recycling ports are known to require radiation surveys before arrival. The likelihood of genuine risk is thought to be exceptionally low, but it is good to perform some simple checks to show due diligence.

The most common use of radioactive materials is in ionising smoke detectors. These generally use Americium 241. All detector heads should be on the fire plan, and this can easily be checked and included in the Inventory.

Radioactive elements may also be used in tank sounding and ullage devices, radars and radioluminescent (emergency) signs.

Other items that might need consideration include carriage of radioactive materials and cargo, such as drilling mud or spend nuclear fuel. Naturally Occurring Radioactive Materials (radionuclides) may be present in drilling mud or firebricks. Actual contamination is generally highly unlikely, but it is simple to perform checks with a calibrated Geiger-Müller counter, halogen counter or similar. Once again, the services of a recognised expert would be recommended, especially if a heightened risk is associated (with an offshore supply ship or a nuclear fuel carrier, for example).

An ionising smoke detector with its cover off, showing radiation symbol and marking; Am 241 (Americium 241) and 15

1S. Shortchain Chlorinated Paraffins
More information will be included when the IMO guidelines are finalised.

1T. Other Substances Inherent in Ship's Machinery, Equipment or Fittings
This section is comparable to 1F (Chemicals) and should be used similarly.

Other gases
Compressed air for starting or control purposes should be listed here, including the amount and location. Other common gases are oxygen and acetylene, propane and nitrogen. Any accumulators for hydraulic systems or special gases for cargo control or inerting, such as nitrogen, should also be listed.

1U. Tanks
Details of ship's tanks should be copied from the capacity plan, or the trim and stability booklet, and separated into oil and non-oil tanks. Capacity can be in tonnes or cubic metres.

Congratulations! The form is basically complete. Parts II and III of the IHM (covering Operationally Generated Wastes and Stores) do not need to be completed until the final voyage.

4. In-service use

Aside from aiding safer and more environmentally sound recycling, the Inventory can provide additional in-service benefits. The following is a hypothetical demonstration of how an IHM could work in practice.

The owner has examined his IHM and from it identified the principal hazards on board his ship. Among these are three hazards that he has identified as cost-effective to deal with at the due docking survey: halon fire extinguishing; TBT paint; and two outdated fridges with CFC refrigerant of which he was previously unaware.

The halon fire extinguishing has been a problem for his entire fleet, and the IHM has allowed him to identify which ships it is present on, and his potential total liability for replacement.

Accurately knowing the numbers and due dates for docking has allowed him to negotiate a sizeable reduction for replacing the halon systems with a local company on a fleet basis.

Until recently, the owner had planned to seal in his TBT paint, as allowed under the AFS Convention.

However, the Inventory provided a focus on the end of the ship's life and the strong possibility that the TBT paint may need to be removed before recycling.

Potentially, there were considerable long- term savings to be made by having a complete shot blast now to fully remove the TBT and apply a non-TBT paint, rather than sealing in the TBT and having to pay for a full blast before recycling.

During the IHM survey, two fridges were found that used CFC refrigerants.

This was a considerable surprise to the owner, who had an environmental policy stating that CFCs would not be used by the company.

The two fridges were replaced at the docking survey by modern fridges and the risk of the company failing to fulfil its environmental aims was reduced.

The owner's environmental policy identified the fact that these fridges had to be disposed of at a licensed facility. This could now be planned in advance.

5. Some common hazards and definitions

Asbestos

This is probably the most familiar hazard. Asbestos is a small sharp particle which normally causes harm by being inhaled. The particles remain in the lung and frequently cause cancer. Death is slow and painful and may be many years after exposure (typically 20 to 30 years).

Asbestos commonly exists in insulation, brake linings, pipe lagging and other similar items, as detailed in Appendix I of this Guide. During the operation of the ship it can be sealed and considered safe, provided it is not disturbed. Scrapping or repair can cause significant damage to asbestos containing materials and this can release dangerous quantities of the substance into the atmosphere.

Although SOLAS now prohibits the new installation of materials containing asbestos, for all ships without exception, many countries have different asbestos legislation which means it is impossible to make generalisations. There are several different types of asbestos with different levels of hazard but legislation does not always differentiate between them.

Unless specific information appears to the contrary, the ship should be assumed to contain asbestos.

It is recommended that the 'Visual/Sampling Check Plan' which accompanies is prepared by a company expert in this subject who can advise on the types, number of samples and locations etc. Such a company would be expected to have access to a suitably qualified laboratory to perform the analyses of the samples, as is the case for all Lloyd's Register Approved Service Suppliers.

Any unknown material likely to contain asbestos should be treated as 'Presumed Asbestos Containing Material (PACM)' and the Inventory should reflect this.

The IMO publishes Guidelines for Maintenance and Monitoring of On-board Materials Containing Asbestos (MSC/Circ.1045 28 May 2002).

Ballast water

Non-native organisms carried in ballast water have been recognised as an environmental problem relatively recently. The IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments has been adopted but only ratified by 36 countries, representing 29% of world tonnage; this is an insufficient number of member states to meet entry into force requirements (as at end of May 2013).

Bromochloromethane (BCM)

This is a newly developed substance released in 1998 and targeted in 1999 by the Montreal Protocol for immediate phase out, due to its ODP.

Blowing agents

Items such as insulative foam, comfort foam, or any expanded plastic are commonly produced by a process known as foam blowing. A blowing agent is added to the liquid plastic and this effectively boils during the solidification process, releasing tiny bubbles which expand and populate the foam.

Reinforced polyurethane foam (used in the fitting out of an LNG gas ship) is produced in the same way as polyurethane foam; however, chopped strand mat is added to ensure the foam can achieve suitable strength characteristics. For a 135,000m3 gas ship there is approximately 5,000m3 of insulation fitted.

Historically, the CFCs R11 and R12 have been used as blowing agents because of their low boiling point. These substances are well known as having ODP and GWP.

Large quantities of blowing agents can be released during the manufacturing process. Large quantities of blowing agent also remain in the foam matrix. For large vessels with extensive rigid foam insulation, there may be up to 20 tonnes of CFCs.

On account of the Montreal Protocol, CFC R12 was replaced by HCFC R141b, which was 5% less efficient. R141b, which also had ODP and GWP, was subsequently legislated against and was finally banned (2004). As the phase out of HCFC R141b has been known about for a number of years, a number of alternatives have been put forward for consideration.

In the man-made sector, the newly developed HFC blowing agents, such as HFC 245fa and the flammable HFC 365mfc, can be classed as the third generation. These new HFCs have just started to become commercially available in large quantities but are still expensive. However, they do have GWP (although not ODP) and will ultimately be phased out under the Kyoto Protocol.

The fourth generation of blowing agents are the natural substances which are unlikely to be legislated against. Natural substances currently being considered are liquid carbon dioxide (CO2) and some of the gaseous hydrocarbon family such as pentane. Cyclo-pentane and CO2 blown foams are now available, although they are 10-15% less efficient. However, foams made using hydrocarbons are unlikely to be suitable for applications such as LNG ships.

Although national legislation and the Montreal Protocol prohibit the use of CFCs and HCFCs, several countries, including South Korea, have exemptions from the governing protocols which allow their continued use.

If no information is available about expanded foam or insulative foam on the vessel in, for example, cold stores, cargo refrigeration or furniture, it should be presumed to contain substances with ODP and GWP.

Carbon dioxide (CO_2)

This is one of the six greenhouse gases targeted by the Kyoto Protocol.

Cathodic protection

Anodes in ships' ballast tanks contain a high proportion of metals. The vessel should carry details of the cathodic protection used in the ballast tanks to resist corrosion. Most anodes will be zinc or aluminium based and will contain very high percentages of these metals (aluminium anode – 95% Al; Zinc anode – 99% Zn). Copper, silicon, iron, mercury and/or indium may also be present in the anodes.

CFC (Chlorofluorocarbon)

CFC compounds include refrigerants such as R11, R12 and R502. They have both GWP and ODP, as detailed in Appendix II of this Guide. CFCs are chemically inert and have a long life in the atmosphere. The use of CFC is now prohibited.

Electrical wire

Electrical wire is valuable both as an item, and due to the copper content of the conductive core. In order to reclaim the copper it is standard practice to burn the wires on open fires, which may potentially release many harmful substances.

Fire-fighting systems

Ships' fire-fighting systems may contain several hazards. Any halon will have both ODP and GWP and should have been phased out. CO2 and foam may also present hazards. Details of the fire-fighting system should be given.

GWP (Global Warming Potential)

Calculating GWP allows comparison to be made between the warming effects of the different greenhouse gases. It measures the relative warming effect of a gas compared to CO2 over 100 years. CO2 has an index of 1; water 0; methane 21; nitrous oxide 310; HFC up to 3,000; PFC up to 10,000; and sodium hexafluoride 23,900.

HFC (Hydrofluorocarbon)
This group of compounds have GWP but no ODP. Hence, they are not covered by the Montreal Protocol, but are one of the six greenhouse gases identified by the Kyoto Protocol. Although their use is currently allowed, these compounds will ultimately be prohibited.

Kyoto Protocol
This was an agreement reached in 1997 in Kyoto, Japan, at the Third Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC). It was agreed that industrialised nations needed to reduce emissions of six key greenhouse gases by 5.2% from 1990 levels, by the year 2012. The greenhouse gases are: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

Mercury
Elemental mercury is common in instruments for measuring temperature and pressure, and also in switches and fluorescent lights. Mercury can fatally damage the brain and the kidneys. Low levels of exposure in mothers can severely damage babies and children. Inhaled mercury is very toxic and mercury will evaporate slowly; a broken thermometer can contaminate a room to toxic levels.

Methane (CH_4)
This is one of the six greenhouse gases covered by the Kyoto Protocol.

Methyl bromide (CH_3Br)
This is one of the ODS identified by the Montreal Protocol. Methyl bromide is used for fumigating agricultural products including wood, and to kill pests on crops such as strawberries. The United States is presently trying to negotiate an exemption so that it can continue to use methyl bromide to fumigate wood.

MMVF (Man-Made Vitreous Fibres)
These are substances such as glass fibre, rock wool, refractory ceramic fibre, slag wool, and insulation glass wool. In 2001, approximately 9 million tonnes were estimated to be produced in over 100 factories around the world.

Montreal Protocol
The Montreal Protocol on Substances That Deplete the Ozone Layer was a convention signed by many countries in 1987. It set out to greatly reduce the production of materials such as CFCs and halons and has been amended several times since, generally to make the phase out of materials quicker. For instance, CO2 the London Agreement of 1990 agreed the total phase out of CFCs by 2000.

Nitrous oxide (N_2O)
This is one of the six greenhouse gases covered by the Kyoto Protocol. It is used as a performance booster for high performance internal combustion engines, and also in whipped cream dispensers.

Organotins (TBT, TPT, TBTO)
These are a group of compounds where tin is bound to an organic, carbon-containing molecule. TBT (see Tributyl Tin, this section) has been widely used as a biocide in antifouling paints; TPT is Triphenyl Tin; TBTO is Tributyl Tin Oxide.

Ozone-depleting substances (ODS)

ODS are defined in the Montreal Protocol and include CFCs, HCFCs, halons, methyl bromide, carbon tetrachloride and methyl chloroform. Strong UV light in the stratosphere breaks down ODS into either chlorine or bromine, which catalytically destroy ozone. Ozone depletion occurs over the whole planet, but is most marked over Antarctica, although the so called 'hole' is actually very pronounced thinning.

Ozone blocks UVB radiation; the declining ozone layer results in greater exposure to UVB at the earth's surface.

Paint

Paint has historically contained many hazardous substances. In the case of anti-fouling, highly toxic substances (for example, TBT or copper) are routinely added in order to achieve the desired biocidal effects. Any vessel built before 1992 should have paint samples checked for PCBs or the paint should be 'presumed containing PCB'. Zinc, chloride, acrylics, and copper are also commonly found in paints.

Paint applied before 1960 is likely to have a high lead content, and vessels of this age should declare presumed high lead content or test for it.

PBT

PBT stands for 'persistent bioaccumulative and toxic'. It is a generic term for substances with these characteristics.

Polychlorinated biphenyls, PCB

PCBs are a family of chemicals that are good electrical insulators, chemically stable, fire resistant and do not easily give off a vapour. They were therefore seen as excellent components in any electrical system reliant on the above properties.

PCBs have been used as dielectric filler liquids in some types of electrical equipment, such as transformers, switchgear, capacitors and the starter units of fluorescent lights and fractional horsepower motors. PCBs are often referred to as liquid or solid. However, the solid type is actually a highly viscous fluid, or embedded in a solid matrix to make it appear solid.

PCBs are toxic, persistent and bio accumulative. They are virtually insoluble in water, but highly soluble in fat (hence their bio accumulative properties). Under certain combustion conditions they may form highly toxic dioxins.

In the US, small ballasts containing PCBs may be landfilled, with the caveat that later legislation may require cleanup of a site where this has been performed. Some states limit this to 1 pound of PCB per 24 hours, approximately equivalent to between 10 and16 small ballasts. Alternatively, they may be incinerated whole in a PCB incinerator, although this will be expensive and results in the loss of many valuable recyclable products. PCB may also be separated out. Concentrated PCBs need to be permanently removed from the environment; this is normally achieved using a dedicated incinerator.

Perfluorocarbons (PFC)

This is one of the six greenhouse gases covered by the Kyoto Protocol. PFCs include tetrafluoromethane (CF4) and hexafluoroethane (C2F6), which have very high GWPs and long atmospheric lifetimes. They are released as part of the semi conductor manufacturing process.

Persistent organic pollutants (POPs)

These are carbon-containing chemical compounds which are resistant to breakdown and are bio accumulative. Exposure is associated with cancer and neurotoxic, behavioural, reproductive and immunotoxic effects.

PVC

PVC commonly contains more than 50% chlorine and accounts for 30% of world chlorine usage. When it is burned, a complex cocktail of gases is given off including large quantities of hydrogen chloride gas. Dioxins, carbon monoxide and chlorinated furans may also be present.

Refrigerants

Before 1929, highly toxic chemicals such as ammonia and methyl chloride were used in refrigeration systems; however, leaks could be deadly. A new type of chemical called CFC was promoted as the wonder replacement, since it was non-toxic and non-flammable. Usage boomed from the 1930s onwards, with gases such as R11, R12 and R502 becoming familiar. However, in the 1980s it became apparent that CFCs caused serious damage to the ozone layer, as well as affecting global warming.

HCFCs such as R22 (Freon) and R123 were developed as replacements. These substances have a small ODP but significant GWP and are being phased out under the Montreal Protocol and its amendments. The subsequent replacements, the hydrofluorocarbons (HFCs), are not ODSs but have GWP and will ultimately be phased out under the Kyoto Protocol.

Environmental characteristics for many of the refrigerants which may be found on board ship are listed in Appendix II of this Guide.

Sodium hexafluoride (SF6)

This is one of the six greenhouse gases covered by the Kyoto Protocol.

Tri Butyl Tin (TBT)

TBT is an organic compound containing tin. It was first used in the 1960s as an anti-fouling and was highly effective. However, it is an endocrine disrupting chemical which interferes with hormones, and adverse impacts became evident in shellfish from the 1970s. This led to the development and adoption of the International Convention on the Control of Harmful Anti-fouling Systems on Ships in October 2001, which will ultimately lead to the phase out of TBT-based anti-fouling paints.

Appendix 1 – The IMO list of hazards for all ships

This appendix gives the IMO hazards which are to be listed, and which have prohibitions applied. These are mandatory for all existing ships (within a given timescale). Besides the table below, the likely locations and usages of the materials are given as a guide to compiling the Inventory and to sampling requirements. These locations and usages are indicative only and are not exhaustive. They have been derived from several sources including the draft IMO Guidance documents presently under development, as well as ILO, IMO and BC guidance which has already been published.

1.1 The IMO table from the Convention – Appendix 1

This list contains materials which are to be prohibited and/or restricted for installation or use on newbuildings, as well as for replacement or repair while ships are in port, shipyards, repair yards or offshore terminals.

Hazardous material	Definitions	Control measures
Asbestos	Materials containing asbestos	For all ships, new installations of materials which contain asbestos shall be prohibited.
Ozone-depleting substances (ODS)	Ozone-depleting substances mean controlled substances defined in paragraph 4 of article 1 of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, listed in Annexes A,B,C or E to the said Protocol in force at the time of this application or interpretation of this Annex. Ozone-depleting substances that may be found on board ship include, but are not limited to: Halon 1211 Bromochlorodifluoromethane Halon 1301 Bromotrifluoromethane Halon 2402 1,2-Dibromo- 1,1,2,2-tetrafluoroethane (also known as Halon 114B2) CFC-11 Trichlorofluoromethane CFC-12 Dichlorodifluoromethane CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane CFC-114 1,2-Dichloro- 1,1,2,2-tetrafluoroethane CFC-115 Chloropentafluoroethane	New installations which contain ozone-depleting substances shall be prohibited on all ships, except that new installations containing hydrochlorofluorocarbons (HCFCs) are permitted until 1 January, 2020.
Polychlorinated biphenyls (PCB)	"Polychlorinated biphenyls" means aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon-carbon bond) may be replaced by up to ten chlorine atoms.	For all ships, new installation of materials which contain Polychlorinated biphenyls shall be prohibited.
Anti-fouling compounds and systems	Anti-fouling compounds and systems regulated under Annex I to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention) in force at the time of application or interpretation of this Annex.	1. No ship may apply anti-fouling systems containing organotin compounds as a biocide or any other anti-fouling system whose application or use is prohibited by the AFS Convention. 2. No new ships or new installations on ships shall apply or employ anti-fouling compounds or systems in a manner consistent with the AFS Convention.

1.1.1 Likely locations for asbestos

Several vital concepts need to be understood when checking for asbestos:

- In many countries the use of asbestos was not regulated for many years, so there was no requirement to state whether or not it was used. It was also cheap. Furthermore, asbestos not only tends to increase the fire-fighting capabilities of compound materials, but in many cases it assists bonding of compounds and improves strength characteristics. Therefore, it can be expected in any place where its attributes are important, and where its addition may not have been controlled.
- Asbestos can be found underneath layers that do not contain asbestos. For example, for an A-60 floor, the surface may be a levelling compound, while the bottom layer may contain asbestos for its fire-fighting qualities. Likewise, asbestos may not have been added in one area of a floor, but in another area which required extra bulk it may have been added as a bulking compound. This can also apply to walls. A large segment of wall may contain A-60 asbestos, while another area is marked as A-0 – 'comfort insulation' only. However, if asbestos material was available and its properties were likely to be better, it may actually have been used in both places.
- Sampling only tells you the qualities of the area you have sampled. It then allows you to build confidence levels about areas which have not sampled. The required level of confidence can only be assessed on a case-by-case basis against legislative and other requirements.
- All Inventories and sampling are to comply with the Convention, but are for information in accordance with the Convention and its non-mandatory guidelines only. Any recycling facility must apply its own relevant procedures to all materials onboard a ship, for the safety of all its workers and stakeholders.
- All unknown materials likely to contain asbestos must be treated as PCHM, and declared as such.

The 'indicative list' below is taken from Appendix 5 of the IMO Guidelines (MEPC.197(62)), section 2.2.2.1:

Structure and/or equipment	Component
Propeller shafting	Packing with low pressure hydraulic piping flange Packing with casing Clutch Brake lining Synthetic stern tubes
Diesel engine	Packing with pipe flange Lagging material for fuel pipe Lagging material for exhaust pipe Lagging material turbocharger
Turbine engine	Lagging material for casing Packing with flange of piping and valve for steam line, exhaust line and drain line Lagging material for piping and valve of steam line, exhaust line and drain line
Boiler	Insulation in combustion chamber Packing for casing door Lagging material for exhaust pipe Gasket for manhole Gasket for hand hole Gas shield packing for soot blower and other hole Packing with flange of piping and valve for steam line, exhaust line, fuel line and drain line Lagging material for piping and valve of steam line, exhaust line, fuel line and drain line

Structure and/or equipment	Component
Exhaust gas economizer	Packing for casing door Packing with manhole Packing with hand hole Gas shield packing for soot blower Packing with flange of piping and valve for steam line, exhaust line, fuel line and drain line Lagging material for piping and valve of steam line, exhaust line, fuel line and drain line
Incinerator	Packing for casing door Packing with manhole Packing with hand hole Lagging material for exhaust pipe
Auxiliary machinery (pump, compressor, oil purifier, crane)	Packing for casing door and valve Gland packing Brake lining
Heat exchanger	Packing with casing Gland packing for valve Lagging material and insulation
Valve	Gland packing with valve, sheet packing with piping flange Gasket with flange of high pressure and/or high temperature
Pipe, duct	Lagging material and insulation
Tank (fuel tank, hot water tank, condenser), other equipment (fuel strainer, lubricant oil strainer)	Lagging material and insulation
Electric equipment	Insulation material
Airborne asbestos	Wall, ceiling
Ceiling, floor and wall in accommodation area	Ceiling, floor, wall
Fire door	Packing, construction and insulation of the fire door
Inert gas system	Packing for casing, etc.
Air-conditioning system	Sheet packing, lagging material for piping and flexible joint
Miscellaneous	Ropes Thermal insulating materials Fire shields / fire proofing Space / duct insulation Electrical cable materials Brake linings Floor tiles / deck underlay Steam / water / vent flange gaskets Adhesives / mastics / fillers Sound damping Moulded plastic products Sealing putty Shaft / valve packing Electrical bulkhead penetration packing Circuit breaker arc chutes Pipe hangar inserts Weld shop protectors / burn covers Fire-fighting blankets / clothing / equipment Concrete ballast

1.1.2 Ozone-depleting substances (ODS)

The main problem with these substances is that they are generally perceived as only applying to recirculating refrigeration fluids and halon fire extinguishing systems.

These are the easiest uses to identify and can be found on the MARPOL Annex VI certificate. They should also be verified by checking labels on fridges, HVAC, compressors, cooling systems, drinking machines, ice makers, cold cargo control plant, chillers and cold stores and, of course, on portable and fixed halon fire extinguishing systems.

However, it is likely that far more ODS may be present in the blowing agents used in expanded foams.

Examples include:

- all forms of thermal (cold) insulation, such as cold store insulation, cargo thermal (cold) insulation, and cold pipe wrappings (particularly solid insulations for very cold service)
- all cryogenic insulation particularly on liquefied gas ships. Very large quantities – up to 20 tonnes – of ODS (CFC gas, for example) may be present on certain types of LNG ship
- solid insulative plastics such as polyurethane.

An 'indicative list' for ODS can be found in Appendix 5 of the IMO Guidelines (MEPC.197(62)), section 2.2.2.3. A more comprehensive list of commonly used refrigerants and refrigerant blends, including ODS and GWP gases, which might be expected onboard ships follows. R-number descriptors are also listed for easy reference.

List of commonly used refrigerants and refrigerant blends (including blowing agents)

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
CFC	**R-11**	Trichlorofluoromethane	CCl_3F	1	3,800
CFC	**R-12**‡	Dichlorodifluoromethane	CCl_2F_2	1	8,100
CFC	R-13	Chlorotrifluoromethane	$CClF_3$	1	14,000
CFC	R-113	1,1,2-trichloro 1,2,2-trifluoroethane	CCl_2FCClF_2	0.8	4,800
CFC	R-114	1,2-dichloro 1,1,2,2-tetrafluoroethane	$CClF_2CClF_2$	1	9,800
CFC	R-115	Chloropentafluoroethane	$CClF_2CF_3$	0.6	7,200
CFC	R-500	Azeotropic blend of R-12 and R-152a	CCl_2F_2 CHF_2CH_3	0.74	6,000
CFC	**R-502**	Azeotropic blend of R-22 and R-115	$CHClF_2$ $CClF_2CF_3$	0.33	4,400
CFC	R-503	Azeotropic blend of R-23 and R-13	CHF_3 $CClF_3$	0.6	13,100
CFC	**R-11**	Trichlorofluoromethane	CCl_3F	1	3,800

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HCFC	**R-22**	Chlorodifluoromethane	$CHClF_2$	0.055	1,500
HCFC	R-123	2,2-Dichloro 1,1,1-trifluoroethane	CF_3CHCl_2	0.02	90
HCFC	R-124	2-Chloro-1,1,1,2-tetrafluoroethane	CF_3CHClF	0.022	470
HCFC	R-141b·	1,1-Dichloro-1,fluoroethane	CH_3CCl_2F	0.11	600

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HCFC	R-401A	Zeotropic blend R-22/R-152a/R-124 53/13/34	$CHClF_2$ CHF_2CH_3 CF_3CHClF	0.037	970
HCFC	R-401B	Zeotropic blend R-22/R-152a/R-124 61/11/28	$CHClF_2$	0.04	1,060
HCFC	R-402A	Zeotropic blend R-125/R-290/R-22 60/2/38	CHF_2CF_3 CHF_2CH_3 CF_3CHClF	0.021	2,250
HCFC	R-402B	Zeotropic blend R-125/R-290/R-22 38/2/60	CHF_2CF_3 $CH_3CH_2CH_3$ $CHClF_2$	0.033	1,960
HCFC	R-403A	Zeotropic blend R-290/R-22/R-218	$CH_3CH_2CH_3$	0.041	2,520
HCFC	R-403B	Zeotropic blend R-290/R-22/R-218 5/56/39	$CH_3CH_2CH_3$ $CHClF_2$ $CF_3CF_2CF_3$	0.031	3,570
HCFC	R-408A	Zeotropic blend R-125/R-143a/R-22 7/46/47	CHF_2CF_3 CF_3CH_3 $CHClF_2$	0.026	2,650
HCFC	R-409A	Zeotropic blend R-22/R-124/R-142b 60/25/15	$CHClF_2$ CF_3CHClF $CClF_2CH_3$	0.048	1,290
HCFC	R-411B	Zeotropic blend R-1270/R22/R-152[a] 3/94/3	$CH_3CH=CH_2$ $CHClF_2$ CHF_2CH_3	0.052	1,410

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HFC	R-23	Trifluoroethane	CHF_3	0	11,700
HFC	R-32	Difluoromethane	CH_2F_2	0	650
HFC	R-125	Pentafluoroethane	CHF_2CF_3	0	3,800
HFC	**R-134a**	1,1,1,2-Tetrafluoroethane	CH_2FCF_3	0	1,300
HFC	R-143a	1,1,1-Trifluoroethane	CH_3CF_3	0	3,800
HFC	R-152a	1,1-Difluoroethane	CH_3CHF_2	0	140
HFC	R-245fa	1,1,1,3.3-Pentafluropropane	$CF_3CH_2CHF_2$	0	950
HFC	R-365mfc	1,1,1,3.3-Pentaflurobutane	$CF_3CH_2CF_2CH_3$	0	890
HFC	**R-404A**	Zeotropic blend R-125/R-143a/R-134[a] 44/52/4	CHF_2CF_3 CH_3CF_3 CH_2FCF_3	0	3,260
HFC	R-407A	Zeotropic blend R-32/R-125/R-134[a] 20/40/40	CH_2F_2 CHF_2CF_3 CH_2FCF_3	0	1,770

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HFC	R-407B	Zeotropic blend R-32/R-125/R-134[a] 10/70/20	CH_2F_2 CHF_2CF_3 CH_2FCF_3	0	2,280
HFC	**R-407C**	Zeotropic blend R-32/R-125/R-134[a] 23/25/52	CH_2F_2 CHF_2CF_3 CH_2FCF	0	1,520
HFC	R-407D	Zeotropic blend R-32/R-125/R-134[a] 15/15/70	CH_2F_2 CHF_2CF_3 CH_2FCF_3	0	1,420
HFC	R-407E	Zeotropic blend R-32/R-125/R-134a 25/15/60	CH_2F_2 CHF_2CF_3 CH_2FCF_3	0	1,360
HFC	**R-410A**	Zeotropic blend R-32/R-125 50/50	CH_2F_2 CHF_2CF_3	0	1,720
HFC	R-410B	Zeotropic blend R-32/R-125 45/55	CH_2F_2 CHF_2CF_3	0	1,830
HFC	R-413A	Zeotropic blend R-218/R-134a/R-600a 9/88/3	$CF_3CF_2CF_3$ CF_3CH_2F $CH(CH_3)_3$	0	1,770
HFC	R-417A	Zeotropic blend R-125/R-134a/R-600a 46.6/50/3.4	CHF_2CF_3 CH_2FCF_3 $CH(CH_3)_3$	0	1,950
HFC	R-422A	Zeotropic blend R-125/R-134a/R-600a	CHF_2CF_3 CH_2FCF_3 $CH(CH_3)_3$	0	2,530
HFC	R-422D	Zeotropic blend R-125/R-134a/R-600a	CHF_2CF_3 CH_2FCF_3 $CH(CH_3)_3$	0	2,230
HFC	R-427A	Zeotropic blend R-134a/R-125/R-32/R-143a 60/25/15/10	CH_2FCF_3 CHF_2CF_3 CH_2F_2 CH_3CF_3	0	1,830
HFC	**R-507A**	Azeotropic blend R-125/R-143a 50/50	CHF_2CF_3 CH_3CF_3	0	3,300
HFC	R-508B	Azeotropic blend R-23/R-116 46/54	CHF_3 CF_3CF_3	0	11,850

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HC	R-50	Methane	CH_4	0	21
HC	R-170	Ethane	CH_3CH_3	0	3
HC	**R-290**[‡]	Propane	$CH_3CH_2CH_3$	0	3
HC	R-600	Butane	$CH_3CH_2CH_2CH_3$	0	3

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
HC	R-600a·	Isobutane	$CH(CH_3)_3$	0	3
HC	R-601	Pentane	$CH_3CH_2CH_2CH_2CH_3$	0	3
HC	R-601a	Isopentane	$(CH_3)_2CHCH_3$	0	3
HC	R-1150	Ethylene	$CH_2=CH_2$	0	3
HC	R-1270	Propylene	$CH_3CH=CH_2$	0	3

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
Nat Sub	R-718	Water	H_2O	0	0
Nat Sub	R-744	Carbon Dioxide	CO_2	0	1
Nat Sub	**R-717**	Ammonia	NH_3	0	0

Other refrigerants from different families

The GWP_{100} figures for the following refrigerants have yet to be confirmed. However, it is unlikely that any of these refrigerants will be considered for commercial applications.

Family	Refrigerant No.	Name	Formula	ODP	GWP_{100}
Methane	R-30	Dichloromethane	CH_2Cl_2	-	9
Methane	R-40	Chloromethane	CH_3Cl	0	TBC
Ethane	R-116	Hexafluoroethane	CF_3CF_3	0	9,200
Ethane	R-160	Chloroethane	CH_3CH_2Cl	0	9,200
Propane	R-218	Octofluoropropane	$CF_3CF_2CF_3$	0	7,000
Oxygen	R-611	Methyl formate	$HCOOCH_3$	0	TBC
Inorganic	R-764	Sulphur Dioxide	SO_2	0	TBC
Unsat organic	R-1130	1,2-Dichloroethylene	CHCl=CHCl	0	TBC

The above tables are not a complete list of substances which may be used, if other blends are produced meeting the appropriate ODP and GWP limits, they should also be considered.

Notes

1. Refrigerant numbers in bold are, or were, the most commonly used.
2. Not all HCFC blends have been included – many were developed but not marketed.
3. - signifies not known
4. Nat Sub – natural substances (not legislated against)
5. TBC – signifies to be confirmed
6. GWP values are taken from the British Standards document 2008 titled, EN 378-1:2008 'Refrigerating systems and heat pumps – Safety and environmental requirements.
7. Current as of January 2008
8. The use of CFC refrigerants in new refrigeration equipment is globally banned under the Montreal Protocol
9. ‡ - signifies refrigerant used for insulating foam blowing

1.1.3 PCBs

PCBs are hard to quantify. Phase out dates varied round the world and were also dependent on whether they were used in solid or liquid form. Generally, PCB use is not thought to be a high risk for ships built after around 1992. Nor is it thought to be a great risk on ships built before this time, unless your ship belongs in the following categories:

- US built
- related to military or potential military use
- built before 1980
- very large power plant, and/or using liquid cooled power transformers (specialised ships such as passenger ships, or those with very high electrical load such as FPSOs, cable layers, offshore industry related, hybrid / electric propulsion)

However, the following likely usages should be checked: power transformers; lighting ballasts; high-power two-phase motors; capacitors; electrical cables; paints; certain other electrical items such as circuit breakers and insulative plastic mats; plastics in high voltage. An 'indicative list' for PCBs can be found in Appendix 5 of the IMO Guidelines (MEPC.197(62)), section 2.2.2.2.

A high level of confidence that a ship is PCB free may be reached if the following are checked: all transformers (to confirm dry type); all lighting ballasts; a high proportion of two-phase motors and associated large capacitors; principal circuit breakers; representative cables and paints.

However, should any PCBs be found in any of these locations, then all likely materials should be exhaustively sampled. The following list of potential uses is taken from the US EPA Guide:

- cable insulation
- rubber and felt gaskets
- thermal insulation material including fibreglass, felt, foam and cork
- transformers, capacitors and electronic equipment with capacitors and transformers inside
- voltage regulators, switches, reclosers, bushings and electromagnets
- adhesives and tapes
- oil, including electrical equipment and motors, anchor windlasses, hydraulic systems and leaks and spills
- surface contamination of machinery and other solid surfaces
- oil-based paint
- caulking
- rubber isolation mounts
- foundation mounts
- pipe hangars
- light ballasts
- any plasticisers.

Overleaf is a non-exhaustive list of some known PCB-containing ballasts. For any which do not appear on this list, the manufacturer should be contacted.

List of PCB Ballasts

Company	PCB identifier code
Aerovox Incorporated Canada	Two possibilities: (i) Four number code on capacitor label. The first two numbers are year; last two are month (e.g., Jan 1980 = 8001). PCBs are present up to and including June 1978 (7806). (ii) Six digit letter and number code stamped on capacitor. PCBs present if fifth digit is "F".
Advance Ballasts (supplied by Phillips)	Three or four digit number code on the ballast cover. The first one or two numbers indicate the month and the last two numbers are the year. PCBs are present up to and including 1978.
Allanson Division of Jannock Ltd.	Two letter code on ballast plate. The first letter is the month, starting with "A" for January and second letter is the year, starting with "A" for 1969 (e.g., February 1972 = BD). PCBs present up to and including December 1980 (LL).
Canadian General Electric	Two possibilities: (i) Seven letter and number digit code on ballast name plate. PCBs are absent if one of the two final letters is "E" and likely present if it is "T". (ii) Four number code on ballast housing. The first two numbers, when reversed, are the year (e.g., 1976 = 67) and the last two numbers are the month. PCBs are present up to and including March 1978 (8703).
Westinghouse Canada	Same as for Canadian General Electric (above).
Magnatex Polygon	Letter and number code on the ballast. The last four numbers represent the year and the month. PCBs may be present up to and including June 1980 (June 1980 = 8006). PCBs are present in capacitors made in 1978-79 unless there is a green "NO PCB" sticker on the ballast label.
Magnatex Universal Manufacturing (USA)	Three digit letter and number code on ballast cover. The first letter is the month (A = January) and the last two numbers are the year. PCBs are present up to and including December 1978 (L78). PCBs are absent if "N" follows the code.
Phillips Electronics	Coding system changed in 1980. Units made after early 1979 are marked as being free of PCBs. Treat units not marked "PCB free" and those that have digit code ending with 79 or earlier as containing PCBs.
Sola Canada	Three digit letter & number code on ballast label. 1st letter is month (A=Jan); last two numbers are year. PCBs present up to & including Dec 1979 (L79).
Sola Electric (USA)	Eight digit letter and number code on ballast name plate. The first two numbers are the year. Assume PCBs are present up to and including December 1979.
Other Manufacturers	Assume PCBs present if unit not marked "PCB Free" or not clearly dated 1980 or later.
High Intensity Discharge Lamps	Allanson Division of Jannock Ltd. puts "N" before the code if PCBs are absent. Others are usually marked "PCB" or "No PCB". Assume PCBs are present if the label is not marked otherwise. Holophane Canada Inc. puts "BAA" before its three digit code number on capacitors with PCBs. Sola Canada marks PCB capacitors with a code beginning "ACA".

1.1.4 TBT paints

TBT paints are only expected to be found on the external underwater parts of the ship, unless there is a known reason why they are applied elsewhere. Most ships now comply with the AFS Convention which should list the known usage of TBT type anti-fouling on the ship.

Care must be taken when checking the AFS certificate that existing TBT paint has not been sealed under a new coat – if it has, this must be recorded.

Most ships have good records of paints applied to the underwater portion at construction and drydock, and all reputable international paint providers have excellent records of paint type and content.

However, if at any time unknown paints have been applied to the underwater area, then representative samples through the entire thickness of the underwater paint should be taken.

It is strongly recommended that a Lloyd's Register Approved Service Supplier be used to help assess the TBT paint situation, if required.

Appendix II – IMO list of hazards for newbuildings and new installations

The following is a minimum list of items for the Inventory of Hazardous Materials, taken from Appendix 2 of the Convention, and details all the materials to be listed for newbuildings from the date of the Convention's entry into force. This list should also be applied to existing ships as far as practicable.

Minimum list of items for the Inventory of Hazardous Materials

Material name	Threshold level
Any Hazardous Materials listed in Appendix I	
Cadmium and Cadmium Compounds	100 mg/kg
Hexavalent Chromium and Hexavalent Chromium Compounds	1000 mg/kg
Lead and Lead Compounds	1000 mg/kg
Mercury and Mercury Compounds	1000 mg/kg
Polybrominated Biphenyl (PBBs)	1000 mg/kg
Polybrominated Diphenyl Ethers (PBDEs)	1000 mg/kg
Polychlorinated Naphthalenes (more than 3 chlorine atoms)	No threshold level
Radioactive Substances	No threshold level
Certain Shortchain Chlorinated Paraffins (Alkanes, C10-C13, chloro)	1%

Appendix III – Procedures for Approval of Service Suppliers

Firms providing sampling and assessment of hazardous materials on behalf of the owner of a ship (such as samples, tests, surveys or maintenance of systems containing hazardous materials), the results of which are intended for inclusion in the Inventory of Hazardous Materials, should be assessed against the procedures found in the Lloyd's Register publication 'Procedures for Approval of Service Suppliers'.

The latest version of the publication is available from the Approvals Lists section (see left hand menu) of Lloyd's Register's Class Direct website: **www.cdlive.lr.org**

The objective of the Procedures for Approval of Service Suppliers is to set basic standards for the qualification of firms supplying sampling and assessment services to owners regarding hazardous material contents in ships.

The procedures (for 'Service suppliers engaged in visual/sampling checks and testing for hazardous materials, such as asbestos, PCBs, TBTs and CFCs onboard ships') include the following sections:

- Extent of Engagement
- Extent of Approval
- Certification and Documentation
- Procedures
- Supervision
- Operators
- Equipment and Facilities
- Sampling and analysis, protocols and test methods
- Reporting.

Please contact your local Lloyd's Register office for full details.

Appendix IV – Manufacturers and suppliers information lists for newbuildings, and new installations on existing ships

Shipyard / Company Name
Address
Date

To: All Manufacturers and Suppliers of Components and Equipment

Ref.: IMO Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009.

Dear Sir/Madam,

In May 2009, the International Maritime Organization (IMO) adopted the "Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships" at Diplomatic Conference. To facilitate early compliance with this Convention, we need to compile an Inventory of Hazardous Materials (IHM) being used on the ship.

To this end, we kindly request that you complete the attached forms, entering the details for any of the components or equipment supplied by your company which contain any of the materials listed. If your components or equipment contain none of the listed materials, please state 'none' in the 'Remarks' box.

Please note that supply of Table A / Appendix 1 materials is usually prohibited under the various Conventions the ship is contracted to comply with, or may be prohibited for other reasons. The Table B / Appendix 2 materials are simply to be listed as far as is practicable at the present time.

Further details can be found in "IMO Resolution MEPC.197(62), Guidelines for the Development of the Inventory of Hazardous Materials". Alternatively, a summary page with useful links is available on the following website:

http://www.lr.org/sectors/marine/Services/environmental/further-services/shiprecycling/IMS.aspx

We would appreciate your assistance by returning the forms at your earliest convenience.

Yours sincerely,

etc.

Material Declaration

Material Declaration ID number		Date of declaration	
Supplier's Declaration of Conformity ID number			
Company name		Division name	
Address			
Contact person		Telephone number	
Email address		Fax number	

Remarks

Product name	Product number	Delivered unit	Delivered unit	Product information
		Amount	Unit	

This materials information shows the amount of hazardous materials contained in 1 _____ (unit: piece, kg, m, m^2, etc) of the product

Table	Material name		Threshold level	Present above threshold level?	If yes, material mass	If yes, material unit	If yes, information on where it is used
				Yes / No			
Table A (materials listed in Appendix 1 of the Convention)	Asbestos	Asbestos	No threshold level				
	Polychlorinated Biphenyls (PCBs)	Polychlorinated Biphenyls (PCBs)	50 mg/kg				
	Ozone Depleting Substance	Chlorofluorocarbons (CFCs)	No threshold level				
		Halons					
		Other Fully Halogenated CFCs					
		Carbon Tetrachloride					
		1,1,1-Trichloroethane (Methyl Chloroform)					
		Hydrochlorofluoro-carbons					
		Hydrobromofluoro-carbons					
		Methyl Bromide					
		Bromochloromethane					
	Anti-fouling systems containing organotin compounds as a biocide	Tributyl Tins	2500 mg total tin/kg				
		Triphenyl Tins					
		Tributyl Tin Oxide (TBTO)					

Table	Material name	Threshold level	Intentionally added above threshold level?	If yes, substance mass	If yes, substance unit	If yes, information on where it is used
			Yes / No			
Table B (materials listed in Appendix 2 of the Convention)	Cadmium and Cadmium Compounds	100 mg/kg				
	Hexavalent Chromium and Hexavalent Chromium Compounds	1000 mg/kg				
	Lead and Lead Compounds	1000 mg/kg				
	Mercury and Mercury Compounds	1000 mg/kg				
	Polybrominated Biphenyls (PBBs)	1000 mg/kg				
	Polybrominated Dephenyl Ethers (PBDEs)	1000 mg/kg				
	Polychloronaphthalenes (Cl=>3)	No threshold level				
	Radioactive Substances	No threshold level				
	Certain Shortchain Chlorinated Paraffins	1%				

To be completed in accordance with IMO Resolution MEPC.197(62)

Supplier's Declaration of Conformity for Material Declaration management

1) Identification Number: _____

2) Issuer's name: _____

Issuer's address: _____

_____

_____

_____

3) Object(s) of the declaration: _____

_____

_____

4) The object(s) of the declaration described above is in conformity with the following documents:

	Document No.:	Title:	Edition/date of issue:
5)	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

6) Additional information: _____

_____

Signed for and on behalf of:

_____

_____

(Place and date of issue)

7) _____ _____

(Name, function) (Signature)

To be completed in accordance with IMO Resolution MEPC.197(62)

Appendix V – An example Inventory of Hazardous Materials

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Inventory of Hazardous Materials (IHM) Onboard

EXECUTIVE SUMMARY

Ship Name: M/V Example

Inventory Number: 1234567/01

MANDATORY:	
Asbestos	Ship has asbestos free statement from build. Asbestos free procurement plan provided. See Appendix A.
ODS – CFCs, Halons etc.	Refrigerants are R11, R404a and R507a. Fixed fire-fighting is CO2 and Foam. See MARPOL Annex VI extract (Appendix B).
Materials containing PCBs	Ship not certified PCB free; however, PCBs not suspected due to ship's age; see Visual/Sampling Check Plan (Appendix E).
Paint on vessel's structure (TBT, TPT etc.)	Anti-fouling is certified TBT free. See Inventory List 2 and Appendix D.

ADDITIONAL:	
Plastic and rubber materials	Ship has standard inventory of these materials for its type and age. See IHM section 1E for details.
Chemicals in ship's equipment	Ship has standard inventory of these materials for its type and age. See IHM section 1F (and Inventory List 1) for details.
Electrical and electronic equipment	Ship has standard inventory of these materials for its type and age. See IHM section 1G for details.
Constructional materials	Ship is of standard steel construction. See IHM section 1H for details.
Cadmium and compounds	-
Hexavalent chromium and compounds	-
Lead and compounds	Lead acid batteries. See IHM section 1L (and Inventory List 4) for details.
Mercury and compounds	Fluorescent lamps throughout ship. See IHM section 1M for details.
PBBs	-
PBDEs	-
Polychlorinated Naphthalenes (more than 3 chlorine atoms)	-
Radioactive substances	Smoke detectors are installed in all accommodation areas. See IHM section 1R for details.
Shortchain chlorinated paraffins	-
Other substances	Fixed fire-fighting is CO2. See IHM section 1T for details.
Tanks	Full capacities provided. See IHM section 1U for details.

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Inventory of Hazardous Materials (IHM) Onboard

EXECUTIVE SUMMARY (Cont.)

Ship Name: M/V Example

Inventory Number: 1234567/01

IMO Number:	1234567	Surveyor signature:	**Surveyor name:** A N Other
Issue Date:	1 January 2014		**Surveyor to:** Lloyd's Register Group Limited
Company IMO Number:	654321		

A member of the Lloyd's Register Group

Note: This document is intended for compliance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Regulation 5.2 for Existing Ships.

PART 1; POTENTIALLY HAZARDOUS MATERIALS IN THE SHIP'S STRUCTURE AND EQUIPMENT

Mandatory – materials listed in Appendix 1 of the Convention

1A. Asbestos (Note: All asbestos containing materials (ACMs) or presumed asbestos containing materials (PACMs) should be listed here.)

Summary of asbestos status. (Supporting documents should be included in Appendix A.)
This summary is an alternative to completing the Part 1A table below.

Ship has an asbestos free statement from the shipbuilder.

Procurement plan in place to ensure asbestos containing materials are not brought onboard.

Asbestos Free Statement and copy of Procurement Plan in Appendix A.

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1B. Ozone Depleting Substances (ODS) – CFCs, Halons etc

Supporting documents should be included in Appendix B.

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	R404A	Galley fridges			120kg	GWP		
	R507A	Topping up cylinders			98kg	GWP		
	R507A	HVAC system			992kg	GWP		
	R11	Cold store insulation			50m2	ODS / GWP		
	R404A	Domestic refrigerators			9kg	GWP		

** Must be completed for compliance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Regulation 5.2 for Existing Ships.*

1C. Materials Containing PCBs (Polychlorinated Biphenyls) at levels of 50mg/kg or more.

Supporting documents should be included in Appendix C.

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Electric cable	Throughout ship	Not marked		Unknown: See Appendix C and Visual/sampling Check Plan (Appendix E) for details	Not known	Vessel does not have PCB free certificate from build	
	Fluorescent lighting ballasts	Throughout ship	KOC		Six pieces: See Appendix C for details		Vessel does not have PCB free certificate from build	
	Transformers	Engine room, Switchboard rooms, Transformer rooms	KOC		See Appendix C for details		Vessel does not have PCB free certificate from build	

1D. Paint on Vessel's Structure – Organotin Compounds (TBT, TPT, TBTO)

Supporting documents should be included in Appendix D

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Epoxy finish	Deckhouse outside (deck)	INT		100kg		595 m2 (125 mic)	
	Epoxy anti abrasive KNA	Fore peak tank	INT		12740kg		589 m2 (50 mic)	
	Alkyd finish	Engine room & sterring gear room (deck)	INT		40kg		598 m2 (50 mic)	
	Ceramic zinc primer	Deckhouse (insu)	INT		90kg		2341 m2 (25 mic)	
	SPC A/F (tin free)	Flat bottom	INT		760kg		4211 m2 (125 mic)	
	SPC A/F (tin free)	Side bottom	INT		775kg		4385 m2 (125 mic)	
	Polyurethene finish	Topsides	INT		220kg		4211 m2 (50 mic)	
	Epoxy primer	Flat bottom	INT		880kg		2779 m2 (150 mic)	
	Epoxy primer	Side bottom	INT		920kg		4385 m2 (125 mic)	

** Must be completed for compliance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Regulation 5.2 for Existing Ships.*

1D. Paint on Vessel's Structure – Organotin Compounds (TBT, TPT, TBTO) (Cont.)								
	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Epoxy primer	Exposed upper deck	INT		1720kg		9384 m2 (125) mic	

** Must be completed for compliance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Regulation 5.2 for Existing Ships.*

Additional – materials listed in Appendix 2 of the Convention and other materials

1E. Plastic and Rubber Materials

Engine Room / Machinery Room - Pintle & stern tube bearings

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Pintle & stern tube bearings	Upper rudder pintle			Not available		Phenolic resin bearing	
	Pintle & stern tube bearings	Lower rudder pintle			Not available		Phenolic resin bearing	
	Pintle & stern tube bearings	Stern tube bearing			185kg (fwd)		Cast iron with white metal bearings	
	Pintle & stern tube bearings	Stern tube bearing			515kg (aft)		Cast iron with white metal bearings	

Engine Room / Machinery Room - Other plastic and rubber materials.

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Miscellaneous plastic, PVC, PTFE, Silicate board, Thermoplastics, Stryofoam, Ethylene propylene rubber, and Other unknown plastics and rubber materials	Throughout engine/ machinery rooms: gaskets, name plates, pads, wiring coverings, duct and pipe insulation, communications equipment, monitors, switches, sensors etc.			10000 kg			

In Accommodation

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	PVC, FRP, Butyl rubber, Silicone sheet, Synthetic latex, Vinyl, Visco elastic, Silicon, Neoprene, Styrofoam, GRP, Phenolic resin, NBR, Polyesters and Ethylene propylene	Handrails, gratings, wiring, gaskets, communication and telecommunication equipment, bath tubs and sinks, interior coverings, decorations, name plates, valve seats, furniture, underlays, walls etc.			41000kg			

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On Deck

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	GRP	Lifeboat	Fmer		4150kg			
	GRP	Rescue Boat	Fmer		1700kg			
	PTCFC hoses, PVC, FRP, Butyl rubber, Silicone sheet, Synthetic latex, Vinyl, Visco elastic, Silicon, Neoprene, Styrofoam, GRP, Phenolic resin, NBR, Polyesters, Ethylene propylene, and Other unknown plastics and rubber materials	Gaskets throughout vessel, pipeline sliding pads, liferaft and liferaft canopies, cargo containment systems, fire hoses, covers, dome radar scanners, seals an O'rings, mooring tails, lifting strops, lifebuoys, mooring ropes, wiring coverings and other insulations			38000kg			

Throughout vessel

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Miscellaneous plastic	Trash cans, computer casings, navigation and radio equipment, public address speakers, light switches and fittings, antenna, UMS panel, CCR, ECR, cabinets, 20L foam tanks, meters, awnings and cover signage, EEBDS and ELSA harnesses			18000kg			

1F. Chemicals in Ship's Equipment or Machinery

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Engine coolants	Engine room (ME, GE and Aux)			50308L			

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1F. Chemicals in Ship's Equipment or Machinery: (Cont.)

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Antifreeze fluids	Engine room & machinery spaces			See Inventory List 1			
	Anti-seize compounds	Engine room & machinery spaces			137kg			
	Hydraulic oil	Mooring, control and lifting systems, hydraulic rooms, valves and control systems			See Inventory List 1			
	Engine additives	Engine room & machinery spaces			See Inventory List 1			
	Boiler/water treatment	Engine room & machinery spaces			See Inventory List 1			
	Light oils	Engine room & machinery spaces			2149L			
	Lube oils	Engine room (ME, GE and Aux)			42234L			

1G. Electrical and Electronic Equipment

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Communication equipment	Bridge and other navigation stations	El Co.		4000kg			
	Switchboards / distribution boards	Throughout ship and cargo spaces	El Co.		2000kg			
	Generating equipment / alternators	Engine room, Emergency generator room	El Co.		11000kg			
	Transformers / converters / rectifiers	Transformer room	El Co.		3500kg			
	Printed circuit boards	Throughout electrical & electronic equipment	El Co.		Unknown		Approximate quantity to be confirmed at later date	
	Control equipment	Bridge and other navigation stations, Throughout ship	El Co.		11000kg			

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1H. Constructional Materials

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Ni - Br - Al	Propeller			20274kg		4 fixed blades	
	Steel pipe	Generally, Pipes			182000kg			
	Constructional steel	Generally, Pipes, Hull and fittings, Superstructure			9500 tons			
	Aluminium anodes	High sea chest Fr 38-42, 47-49 port, Sea chest Fr 12-24, 46-48 stbd			7 * 9.6kg		fe max 0.1% si max 0.1% cu max 0.005% zn 2.5 to 5.5% al remainder	

1J. Cadmium and Compounds

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1K. Hexavalent Chromium and Compounds

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1L. Lead and Compounds

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Lead acid batteries	Engine room and machinery spaces			See Inventory List 4			

1M. Mercury and Compounds

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Fluorescent lamps	Throughout ship	DElec. Co.		16kg			
	Liquid mercury	Throughout ship, Manometers, Measuring instruments, Switches, Deck, Accommodation			8kg			

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1N. PBBs

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1P. PBDEs

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1Q. Polychlorinated Naphthalenes (more than 3 chlorine atoms)

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1R. Radioactive Substances

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Ionising smoke detector	Accommodation, Bridge, Throughout ship	S'co Ltd.		130 units	AM241		

1S. Shortchain Chlorinated Paraffins

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System

1T. Other Substances Inherent in Ship's Machinery, Equipment or Fittings

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	CO2 (fixed)	Throughout ship	ABC Co.		Unknown		Approximate quantity to be determined at later date	

1U. Tanks

Oil tanks - Insert specific tank number/position using Location text entry box below.

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Cargo oil	Cargo and slop tanks			127533 m3		Full capacity	
	Oily bilge	Bilge hold and sep bilge tank			90 m3		Full capacity	
	Lubricating oil	Main LO sett. tank and GE LO stor. tank			43m3		Full capacity	

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1U. Tanks: [Oil tanks - Insert specific tank number/position using Location text entry box below.] (Cont.)

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Lubricating oil	No.1 and no.2 main LO tank and cylinder oil storage tank			130 m3		Full capacity	
	Diesel oil	DO storage and service tanks			165 m3		Full capacity	
	Fuel oil	HFO service tank anNo.1 and No.2 settling tanks			3543m3		Full capacity	

Non-oil tanks

	Item*	Location*	Manufacturer trade name/designation	Relevant standard/ certificate	Approximate Quantity*	Hazard Type	Remarks	Equipment/System
	Fresh water tanks	No.1 and No.2 DW (P) and FW (S), CW tanks			549 m3		Full capacity	
	Ballast water	Fore peak tank, No.1-7 ballast tanks (P&S)			45945 m3		Full capacity	

Note: This Inventory is not to be used by a recycling facility or other third party stakeholder unless details of operationally generated wastes and stores (representing parts 2 and 3 of the Inventory of Hazardous Materials) have been completed and a final survey held, as required by the Convention.

** If completing section 2 of the inventory these fields must be completed for compliance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Regulation 5.2 for Existing Ships.*

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Appendices and Inventory Lists

Supporting documentation, as available, to be submitted with this form.

Appendices

Inc: Yes	**Appendix A:**	**Asbestos (asbestos free certificate, asbestos register, asbestos free procurement plan)**	
Inc: Yes	**Appendix B:**	**ODS details (Marpol Annex VI extract)**	
Inc: No	**Appendix C:**	**Polychlorinated Biphenyls (PCB survey)**	
Inc: Yes	**Appendix D:**	**Paint (AFS convention certificate)**	
Inc: Yes	**Appendix E:**	**Other**	Visual / Sampling Check Plan

Inventory Lists

Inc: Yes	**List 1:**	**Chemical inventory**	
Inc: Yes	**List 2:**	**Paint stock inventory**	
Inc: Yes	**List 3:**	**Lube oil/grease inventory**	
Inc: Yes	**List 4:**	**Battery list**	
Inc: Yes	**List 5:**	**Refrigerant list**	
Inc: No	**List 6:**	**Other**	

References

1) IMO: SR/CONF/45 (Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009).

2) IMO: Resolution MEPC.197(62) (2011 Guidelines for the Development of the Inventory of Hazardous Materials)

3) ICS: Industry Code of Practice on Ship Recycling; 2001

4) Basel Convention: Technical Guidelines for the Environmentally Sound Management of the Full and Partial Dismantling of Ships: 2002

5) ILO: Safety and Health in Shipbreaking: Guidelines for Asian countries and Turkey; Adopted in 2004

6) United States Environmental Protection Agency: A Guide for Scrappers; Tips for Regulatory Compliance. EPA 315-B-00-001. Summer 2000

7) Lloyd's Register: Ship Recycling Practice and Regulation Today (June 2011)

8) Lloyd's Register: Asbestos on Ships; how to manage it safely (March 2013)

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For further information please contact us at:
marine-environment@lr.org

For further information about our ship recycling services please visit:
www.lr.org/shiprecycling

www.lr.org