

**ASBESTOS MATERIALS SURVEY
FOR
CANADIAN COAST GUARD SERVICES**

VESSEL NAME: CCGS LIMNOS

VESSEL NO.: 328088



Prepared for:

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Pinchin LeBlanc Environmental Ltd Project No. 01-6116

April 19th, 2006

EXECUTIVE SUMMARY

Pinchin LeBlanc Environmental Ltd. was retained by the Department of Fisheries and Oceans to perform asbestos surveys for asbestos-containing materials within selected Canadian Coast Guard Services (CCGS) vessels throughout Canada. To accomplish the task of surveying vessels on a national scale, PLEL utilized the Pinchin Group of companies. A total of thirty (30) selected vessels were included within the survey program. This report will provide the findings for the following vessel;

VESSEL NAME: CCGS Limnos

VESSEL NO.: 328088

VESSEL DESC.: Coastal Research & Survey

The following friable asbestos-containing materials were identified within the vessel:

- Parging cement fittings located in the Utility Locker (Location 16), and
- “Mag-Block” door filler located in the Showers and Washroom (Location 20).

The following non-friable asbestos containing materials were identified within the vessel:

- Vinyl floor tiles present in the Wheelhouse (Location 01), Cabin 3 (Location 02), Corridor of the Forecastle Deck (Location 03), and Cabin 10 (Location 26) contain asbestos, and
- Drywall wall panels located in the Engine Room (Location 29).

No areas where damaged asbestos-containing materials were noted during the survey.

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	SURVEY AND ASSESSMENT CRITERIA.....	2
2.1	SURVEY INFORMATION	2
2.2	SURVEY METHODOLOGY.....	2
2.3	SURVEY SCOPE.....	2
2.3.1	<i>Friable Materials</i>	2
2.3.2	<i>Non-Friable Materials</i>	3
2.3.3	<i>Sampling Strategy</i>	4
2.3.4	<i>Analytical Methods</i>	4
2.3.5	<i>Field Data Collection</i>	4
2.3.6	<i>Limitations of Survey</i>	5
3.0	DISCUSSION OF ASBESTOS-CONTAINING MATERIALS	6
3.1	SPRAYED OR TROWELLED FIREPROOFING OR THERMAL INSULATION.....	6
3.2	TEXTURE FINISHES.....	6
3.3	PIPING INSULATION.....	6
3.4	VENTILATION TRUNKING INSULATION.....	7
3.5	HIGH TEMPERATURE MACHINERY INSULATION.....	7
3.5.1	<i>Main Propulsion</i>	7
3.5.2	<i>Generators</i>	7
3.6	BULKHEADS AND DECKHEADS.....	7
3.7	DECK COVERING MATERIALS.....	7
3.7.1	<i>Vinyl Sheet Flooring</i>	7
3.7.2	<i>Vinyl Floor Tiles</i>	7
3.8	ASBESTOS CEMENT PRODUCTS.....	8
3.9	OTHER ASBESTOS-CONTAINING MATERIALS	8
3.10	SUSPECT ASBESTOS-CONTAINING MATERIALS	8
4.0	CONCLUSIONS.....	8
5.0	RECOMMENDATIONS.....	8
5.1	OVERALL RECOMMENDATIONS.....	8
5.2	SPECIFIC RECOMMENDATIONS.....	9

APPENDICES

APPENDIX I	RESULTS OF BULK SAMPLE ANALYSIS FOR ASBESTOS
APPENDIX II	SURVEY DATA
APPENDIX II-A	GUIDE TO SURVEY SHEETS
APPENDIX II-B	LOCATION AND SAMPLE TABLE
APPENDIX II-C	ASBESTOS DATA REPORT
APPENDIX II-D	ALL DATA REPORT
APPENDIX III	ASBESTOS ASSESSMENT MATRIX
APPENDIX IV	ASBESTOS MANAGEMENT PLAN

1.0 INTRODUCTION

Pinchin LeBlanc Environmental Ltd. (PLEL) was retained by the Department of Fisheries and Oceans to perform asbestos surveys for asbestos-containing materials (ACM) within selected Canadian Coast Guard Services (CCGS) vessels throughout Canada. To accomplish the task of surveying vessels on a national scale, PLEL utilized the Pinchin Group of companies. A total of thirty (30) vessels were included within the survey program. The surveys have been conducted to address inaccurate or unavailable information regarding the presence of asbestos of CCGS vessels. This report will provide the findings for the following vessel;

VESSEL NAME: CCGS Limnos
VESSEL NO.: 328088
VESSEL DESC.: Coastal Research & Survey

The survey included both friable¹ and non-friable² ACM as well as suspect ACM. Both Federal and Provincial regulations and guidelines distinguish between friable and non-friable materials. All provincial regulations regarding asbestos materials distinguish between friable and non-friable materials when assigning appropriate work practices.

The most common friable ACM used in the past are surfacing materials (usually sprayed fireproofing, texture, decorative or acoustic plaster) and thermal insulations. Asbestos-containing manufactured materials include deck covering materials, deckhead and bulkhead panels, gasket materials, asbestos cement pipe or board, and asbestos textiles. Depending on the formulation these may be friable or non-friable. Note that though a product may be considered non-friable when new, if the product releases fine dust due to deterioration or during removal, the free dust is considered friable. For example, lay-in acoustic ceiling tiles may release significant dust at the time of major removal.

1 The term friable is applied to a material that can be readily reduced to dust or powder by hand or moderate pressure. Friable ACM has a much greater potential to release airborne asbestos fibres when disturbed. The most common friable ACM used in the past are sprayed or trowelled materials (for fireproofing or thermal insulation), texture plaster (decorative or acoustic), and mechanical insulations.

2 Common non-friable ACM include vinyl floor tiles, ceiling tiles, gasket materials, asbestos cement pipe or board (transite), and asbestos textiles. Although a product may be considered non-friable when new, if the product releases fine dust due to deterioration or during removal, the free dust is considered friable. For example, most lay-in or glued on acoustic ceiling tiles release significant dust during removal of large quantities of these tiles.

2.0 SURVEY AND ASSESSMENT CRITERIA

2.1 Survey Information

The vessel was located in Burlington, ON and therefore the regional Pinchin Group office conducting the fieldwork was Pinchin Environmental Ltd. (Pinchin). The fieldwork was performed by Mr. Bob Young of Pinchin on March 31st, 2006.

2.2 Survey Methodology

The collection of information was on a room-by-room basis and the approximate quantities of the ACM were noted where appropriate. In order to determine the location of the ACM and develop recommendations of the work required, the surveyor entered each room, cabin, or space where practical. Representative views were made above accessible suspended ceiling systems. Access above and within solid bulkheads and deckheads was made through existing hatches or panels. Where required, intrusive inspections were made within cavities particularly in areas where mechanical equipment was suspected to be present. The intrusive investigations involved the removal of existing bulkhead panels or deckhead panels to assess the conditions within. The survey did not include demolition of floors, ceilings or walls or other demolition to check on conditions behind.

The surveyor assigned a unique location number to each area or individual room surveyed. Where a room name was available, it was recorded along with the assigned location number (Location XX). The information from the field data collection sheets, was entered into the Pinchin Group's *Hazardous Materials Inventory System* computer database. The computer generated print-outs are included as Appendix II of this report.

2.3 Survey Scope

2.3.1 Friable Materials

The survey included the following asbestos and non-asbestos materials:

- ◆ Sprayed Materials including:
 - fireproofing
 - thermal insulation (not including mechanical)
 - texture finishes (for acoustic or decorative purposes)

(NOTE: Although usually installed by spray application the materials above may also have been installed by roller or trowel).

- ◆ Mechanical Insulation on:
 - boiler and breeching,
 - generators and exhausts,
 - ventilation trunking,
 - piping,
 - tanks and equipment
- ◆ Deckhead Tiles (suspended ceiling tiles)
 - Suspended ceiling tiles are included, as they may become friable on handling.

2.3.2 Non-Friable Materials

The survey also included the identification for the following non-friable materials:

- ◆ Deckhead and bulkhead panels
- ◆ Textiles
- ◆ Asbestos cement boards
- ◆ Firestop material
- ◆ Vinyl floor tiles and vinyl sheet flooring
- ◆ Drywall joint compound
- ◆ Plaster (walls and ceilings)
- ◆ Other (gaskets and door packings)

Some of these products (i.e. asbestos cement boards) were visually identified as asbestos containing. For the remaining materials, due to the inconsistent use of asbestos, any materials which were not sampled or visually confirmed as non-asbestos are identified in this report as suspect material (SM).

No identification was made of asbestos products used in the vessel operations (i.e. kitchens or manufacturing operations), or curricula (i.e. laboratories or trade shops). No testing of dust within supply or return ducts was performed.

2.3.3 Sampling Strategy

Asbestos samples were collected in accordance with the National Institute for Occupational Safety and Health (NIOSH) method 9002. The collection of samples was performed in sufficient frequency to obtain a general pattern of asbestos use within the vessel. It is known that inconsistencies within construction or later repair or refit may result in deviation from the general pattern however without sampling of every wall, foot of pipe, pipe fitting, HVAC unit, ductwork, etc., it is not possible to individually characterize every asbestos material present. Therefore the surveyor relies on visual identification of similar materials with asbestos content based on representative bulk samples. While our experience is that this methodology is reliable and practical, it should be noted that the possibility remains that visually similar materials may have different asbestos content.

2.3.4 Analytical Methods

During the survey, materials suspected of containing asbestos were identified visually, based on the surveyor's knowledge of the historic use of asbestos-containing products. Where these materials had not been previously sampled, visual identifications were supported by collection and analysis of a limited number of bulk samples. For this confirmation a total of seven (7) samples were collected and analyzed at the International Asbestos Testing Laboratories (IATL).

The bulk samples are analyzed using a combination of dispersion staining and polarized light microscopy. The analytical method follows the Ontario Ministry of Labour Code for the Determination of Asbestos from Bulk Samples, August 1985 and U.S. EPA Method 600/R-93/116 dated July 1993. IATL is certified under the National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis of bulk samples (Laboratory Number 1165). The analytical certificates are presented in Appendix I.

Materials which when analysed are reported as containing <0.5% of asbestos by dry weight are considered to be non-asbestos under Provincial Regulations.

2.3.5 Field Data Collection

In each of the inspection locations the surveyor completed a field data collection sheet. On the field data sheet, the absence or presence of asbestos-containing materials was recorded in the following components.

- Floor (decks)
- Ceiling (deckheads)
- Wall (bulkheads)
- Piping
- Structure
- Duct
- Mechanical Equipment
- Other

The computer generated field data sheets found in Appendix II provide an easy reference for maintenance workers in the event of work in a particular room or area. The information, as presented on these sheets, lists all materials present as either asbestos-containing or not. The sheets list both the “condition” and “accessibility” of the asbestos material. These terms are defined in Appendix III.

The quantities shown are approximations, based on visual examination. Quantities were not provided on a consistent or reliable basis. For the quantities shown no measured take-off was performed and these quantities should not be utilized for cost estimating or budgeting purposes. Furthermore, (particularly for pipe insulation) it must also be realized that without removing all deckhead panels, bulkhead panels, etc. that not all asbestos materials present in the vessel were visually inspected or noted.

Appendix II also provides the “Guide to Survey Sheets” along with summaries of the numerical or alphabetical codes used.

2.3.6 Limitations of Survey

A number of limitations are described throughout this report. The intent of the limitations is to clearly identify to the user of this report that some limitations exist as to the possible thoroughness of a survey. Some of these limitations have been specifically identified above.

As per industry standards the field observations, measurements, and analysis are considered sufficient in detail and scope to form a reasonable basis for an asbestos hazard assessment of this property. PLEL warrants that the findings and conclusions contained herein have been promulgated in accordance with generally accepted asbestos inventory methods, for the site referenced in this report.

These evaluation methods have been developed to provide the client with information regarding apparent indications of existing or potentially hazardous conditions relating to the property and are necessarily limited to the conditions observed and information available at the time of the site visit and research. There is a distinct possibility that conditions may exist which could not be reasonably identified within the scope of the assessment or which were not apparent during the site visit. PLEL believes that the information collected during the survey period concerning the property is reliable. However, PLEL cannot warrant or guarantee that the information provided is absolutely complete or accurate beyond the current asbestos consulting industry standards. No other warranties are implied or expressed.

3.0 DISCUSSION OF ASBESTOS-CONTAINING MATERIALS

A summary of the findings for the ACM survey are discussed below under the following headings:

- 3.1 Sprayed or Trowelled Fireproofing or Thermal Insulation
- 3.2 Texture Finishes (for acoustic or decorative purposes)
- 3.3 Piping Insulation
- 3.4 Ventilation Trunking Insulation
- 3.5 High Temperature Machinery Insulation
- 3.6 Bulkheads and Deckheads
- 3.7 Deck Covering Material (i.e. Flooring products)
- 3.8 Door, Hatch, Scuttle Insulation and Packings
- 3.9 Other Asbestos-Containing Materials
- 3.10 Suspect Asbestos Materials

The sample numbers (Sample AXX) referenced below refer to the bulk analysis reports presented in Appendix I.

The location numbers (Location XX) are cross-referenced to the Location Table found in Appendix II-B and referred to on the Survey Data Sheets in Appendix II. The information below provides a summary of information contained in the Survey Data Sheets. Refer to Appendix II for detailed information on the observations made at each of the survey locations.

3.1 Sprayed or Trowelled Fireproofing or Thermal Insulation

No sprayed or trowelled fireproofing is present in the vessel.

3.2 Texture Finishes

No textured finish surfaces were observed in the vessel.

3.3 Piping Insulation

Piping within the vessel was observed to be insulated with fibreglass, "Armaflex", parging cement, or not insulated. The parging cement insulation was sampled in the Utility Locker of the Below Main Deck (Location 16) and contains 20% chrysotile asbestos (Sample A04). For detailed information such as quantities, locations and conditions refer to the Survey Data in Appendix II.

3.4 Ventilation Trunking Insulation

Ducting in the vessel was observed to be insulated with fibreglass, "Armaflex", paper, or not insulated.

3.5 High Temperature Machinery Insulation

3.5.1 Main Propulsion

The engines, located in the Engine Room (Location 29), are not insulated. The main propulsion exhausts (uptakes) are insulated with non-asbestos fibreglass insulation.

3.5.2 Generators

The main generators, located in the Engine Room (Location 29), are not insulated. The generator exhausts are insulated with a non-asbestos fibreglass insulation similar to that on the propulsion exhausts.

3.6 Bulkheads and Deckheads

Typical insulation of bulkheads and deckheads consist of non-asbestos fibreglass insulation. A sample of this material was collected in the Wheelhouse (Location 01), which did not detect the presence of asbestos (Sample A02).

One (1) type of acoustic deckhead (ceiling) tile is present in the vessel, which does not contain asbestos (Sample A06).

3.7 Deck Covering Materials

3.7.1 Vinyl Sheet Flooring

No vinyl sheet flooring was observed to be present in the vessel.

3.7.2 Vinyl Floor Tiles

Two (2) types of vinyl floor tiles were observed to be present in the vessel, both types contain asbestos. The following is summary of the vinyl floor tiles observed throughout the vessel:

- Vinyl floor tiles, FT-01, 9"x9" in size and beige with white flecks were sampled in the Wheelhouse of the Bridge Deck (Location 01) and contain 7.1% chrysotile asbestos (Sample 01). For locations, quantities and conditions refer to the Survey Data sheets in Appendix II.
- Vinyl floor tiles, FT-02, 9"x9" in size and brown with brown flecks were sampled in the Corridor of the Forecastle Deck (Location 03) and contain 6.1% chrysotile

asbestos (Sample A03). For locations, quantities and conditions refer to the Survey Data sheets in Appendix II.

3.8 Asbestos Cement Products

No asbestos cement products were observed in the vessel.

3.9 Other Asbestos-Containing Materials

During the collection of vinyl floor tiles, a sample of the tar adhesive was also collected. This adhesive does not contain asbestos (Sample A03).

The door in the Showers and Washroom (Location 20) contains a "Mag-Block" filler. A sample of this material was collected and contains 15% amosite asbestos (Sample A05).

Green wall panels located in the Engine Room (Location 29) are constructed of drywall. A sample of this material was collected and contains 30% chrysotile and 50% amosite asbestos (Sample A07).

3.10 Suspect Asbestos-Containing Materials

In addition to the ACM described in the sections above, a number of other materials may be present in the vessel that can potentially contain asbestos. These materials are grouped under the heading of Suspect Asbestos-Containing Materials (the need for demolition/dismantling equipment and the lack of access limit our ability to determine the asbestos content).

Materials which are not accessible and/or can not be sampled without demolition, dismantling or causing irreparable damage include: components or wiring within motors, lights, high voltage wiring, mechanical packing and gaskets, and materials located inside electrical fixtures, light fixtures, switch gear or transformers.

4.0 CONCLUSIONS

5.0 RECOMMENDATIONS

5.1 Overall Recommendations

As asbestos materials have been identified in the vessel, an Asbestos Management Program is to be implemented immediately. The Asbestos Management Program for this vessel is located in Appendix IV. A copy of this survey in its entirety including the Asbestos Management Program is to be kept on the vessel.

5.2 Specific Recommendations

All ACM must be removed from affected areas prior to refits and modernization programs. In addition we recommend from practical considerations that all friable asbestos be removed before significant disturbance brought about by maintenance or alteration. Disturbance of ACM must follow the appropriate asbestos precautions for the classification of work being performed.

Sample suspect materials prior to disturbance. Include materials that are currently concealed by bulkheads and ceiling systems (when these systems are affected by the work).

In all cases of significant disturbance, develop plans and specifications as required to detail the scope of work and procedures required for handling asbestos removal.

No areas of asbestos-containing materials noted in FAIR or POOR condition noted during the survey.

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APPENDIX I

RESULTS OF BULK SAMPLE ANALYSIS FOR ASBESTOS

APPENDIX II
SURVEY DATA

APPENDIX II-A
GUIDE TO SURVEY SHEETS

GUIDE TO THE ASBESTOS SURVEY SHEETS ASBESTOS MATERIALS SURVEY

The following Appendices contain printouts from Hazardous Materials Inventory System (HMIS) computer database. The appendices include information that the majority of our clients find useful.

Each Appendix is discussed below:

<p>Appendix II-B Locations Report</p>	<p>The Locations Report provides a list of all functional areas (rooms) of the vessel where the surveyor recorded information. The information recorded includes the, unique Location Number, location by floor or room number, name of the areas (if available), whether the room was accessible, the square foot area of the room (optional), the date of the survey, surveyor's name and notes specific to the location</p>
<p>Appendix II-B Asbestos Samples Report</p>	<p>The Asbestos Samples Report provides information on the materials, where they were sampled, and the results of the samples collected and analyzed during the survey. If the sample contains two distinct layers the results are reported separately. The sample numbers are referenced on the Asbestos Only Report.</p>
<p>Appendix II-C Asbestos Only Report</p>	<p>The Asbestos Only Report, is one of a multitude of customized reports available via the HMIS database. The Asbestos Only Report provides information regarding materials that have been determined to contain asbestos, either through sample analysis or based on the observations and knowledge of the surveyor.</p>
<p>Appendix II-D All Data Report</p>	<p>The All Data Report, provides information regarding all materials that have been surveyed, either through sample analysis or based on the observations and knowledge of the surveyor. This report provides both asbestos-containing as well as non-asbestos materials.</p>

APPENDIX II-B
LOCATION AND SAMPLE TABLE

APPENDIX II-C
ASBESTOS DATA REPORT

APPENDIX II-D
ALL DATA REPORT

APPENDIX III

ASBESTOS ASSESSMENT MATRIX

1.0 EVALUATION CRITERIA AND BASIS OF RECOMMENDATIONS FOR ASBESTOS-CONTAINING MATERIALS

This reassessment provides accurate information regarding the location, condition and accessibility of the ACM used in the construction of the vessel. In order to make recommendations for compliance with current regulations, PLEL developed the following ACM evaluation criteria based on the conclusion of previous published studies, particularly the "Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario" and our experience with structures containing ACM. The same criterion that was initially employed has been utilized for the reassessment.

1.1 Evaluation of Condition

1.1.1 Spray Applied Fireproofing, Insulation and Texture Finishes

To evaluate the condition of ACM spray applied as fireproofing, non-mechanical thermal insulation, or texture, decorative or acoustic finishes, the following criteria is applied:

GOOD Surface of material shows no significant signs of damage, deterioration or delamination. Up to 1 percent visible damage to surface is allowed within range of **GOOD**. Evaluation of sprayed fireproofing requires the surveyor to be familiar with the irregular surface texture typical of fireproofing as installed. **GOOD** condition includes unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed, and encapsulated fireproofing or texture finishes where the encapsulation has been applied after the damage or fallout occurred.

POOR Sprayed materials show signs of damage, delamination or deterioration. More than 1 percent damage to surface of ACM spray.

In observation areas where damage exists, in isolated locations, both **GOOD** and **POOR** condition may be applicable. The extent or percentage of each condition will be recorded on the room-by-room survey form. **FAIR** condition is not utilized in the evaluation of the fireproofing, non-mechanical insulation, or texture coat finishes.

The evaluation of ACM spray applied as fireproofing, non-mechanical thermal insulation, or texture, decorative or acoustic finishes which are present above ceilings, may be limited by the number of observations made, and by building components such as ducts or full height bulkheads that obstruct the above ceiling observations. Persons entering the ceiling are advised to be watchful for ACM **DEBRIS** prior to accessing or working above ceilings in areas of buildings with ACM regardless of the reported condition.

1.1.2 Mechanical Insulation

The evaluation of the condition of mechanical insulation (on surface of boilers, breeching, exhausts, ductwork, piping, tanks, equipment etc.) utilizes the following criteria:

- GOOD** Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes conditions where the jacketing has minor damage (ie., scuffs or stains), but the jacketing is not penetrated.
- FAIR** Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that had never been jacketed. Insulation is exposed but not showing surface disintegration. The extent of missing insulation ranges from minor to none. Damage can be repaired.
- POOR** Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired.

The evaluation of mechanical insulation may be limited by the number of observations made and vessel components such as ducts or bulkheads that obstruct observations. It is not possible to observe each foot of mechanical insulation from all angles. Persons working in proximity to mechanical insulation or entering ceilings with mechanical insulation are advised to be watchful of ACM **DEBRIS** regardless of the reported condition.

1.1.3 Non-friable and Potentially Friable Materials

The condition of non-friable ACM, such as plaster finishes containing asbestos, and manufactured products such as acoustic ceiling tiles and asbestos cement products (transite), all of which have the potential to become friable when handled are evaluated as follows:

- GOOD** No significant damage. Material may be cracked or broken but is stable and not likely to become friable upon casual contact.
- POOR** Material is severely damaged. Loose **DEBRIS** is present or binder has disintegrated to the point where contact will cause the material to become friable.

The evaluation of the condition of non-friable and potentially friable materials does not utilize a **FAIR** condition rating.

If the ACM is damaged but stable, and there is no friable **DEBRIS** present, the condition is rated as **GOOD**.

1.2 **Evaluation of Accessibility**

The accessibility of materials known or suspected of being ACM is rated according to the following criteria:

- ACCESS (A)** Areas of the vessel within reach (from deck level) of all general occupants. Includes areas such as storage areas where activities of the general occupants may result in disturbance of ACM not normally within reach from deck level.
- ACCESS (B)** Frequently entered maintenance and service areas of the vessel within reach of staff, without the need for a ladder (less frequently accessed than Access A areas). Includes:
- areas within reach from a fixed ladder or catwalk, ie. tops of equipment, mezzanines.
 - frequently entered pipe chases, stack towers, tunnels and service areas.
- ACCESS (C)** Areas of the vessel above 8'-0" where use of a ladder is required to reach the ACM (less frequently accessed than Access B areas).
- Refers to ACM materials that are exposed to view, from the floor or ladder, without the removal or opening of other vessel components such as deckheads/bulkheads, or service access doors or hatches. Does not include infrequently accessed service areas of the vessel.
- ACCESS (D)** Areas of the vessel behind inaccessible solid deckhead and/or bulkhead systems, or mechanical equipment etc. where demolition or removal of the deckhead/bulkhead or equipment etc. is required to reach the ACM. Evaluation of condition and extent of ACM is limited or impossible, depending on the surveyor's ability to visually examine materials in ACCESS D.

1.3 Evaluation of ACM DEBRIS

1.3.1 DEBRIS From Friable ACM

The presence of fallen ACM is noted separately from the presumed friable ACM source (sprayed fireproofing, thermal insulation, texture, decorative or acoustic finishes or mechanical insulation) and is referred to as **DEBRIS**.

1.3.2 DEBRIS From Damaged Non-Friable ACM

The presence of fallen ACM from damaged non-friable ACM is also reported separately from the non-friable ACM source. Only fallen non-friable ACM that has become friable is reported as **DEBRIS**.

The identification of the exact location or presence of **DEBRIS** on the top of deckhead panels is limited by the number of observations made and the presence of vessel components such as ducts or compartment bulkheads that obstruct observations. Workers are advised to be watchful for the presence of **DEBRIS** prior to accessing or working in proximity to mechanical insulation or above deckheads in areas of the vessel with ACM regardless of the reported presence or absence of **DEBRIS**.

1.4 Evaluation of SUSPECT MATERIALS

The evaluation of **SUSPECT MATERIALS** (SM), which are materials and products that may randomly contain asbestos but were not tested, is based on the assumption that these unsampled SUSPECT MATERIALS are asbestos-containing.

A number of potentially ACM's that are difficult to identify may be present in some areas. These materials are grouped under the heading of Suspect Asbestos-Containing Materials (the need for demolition/dismantling equipment and the lack of access limit our ability to determine the asbestos content).

Several areas of equipment base insulating materials are concealed with cladding, and every effort has been made to collect representative samples of base insulating materials. It is possible however that certain asbestos-containing base insulation is present behind solid cladding. A level of destructive testing prior to activities that may expose such materials is a standing recommendation.

1.5 Action Matrix and Definitions

PLEL's evaluation of viability of a specific asbestos control options is based on the consideration of the ACM's condition and accessibility. The logic used is that damaged ACM located in an area frequently accessed by all vessel occupants is of a higher priority than damaged ACM located in an infrequently accessed service area.

Under current regulations and guidelines, the owner is required to control all disturbance of ACM. A number of abatement options, such as repair, removal, enclosure, or encapsulation are available to comply with the regulatory requirements.

The following factors are also considered in making site-specific recommendations for compliance with the provincial regulations:

- i) ACM in **POOR** condition is not routinely repairable.
 - o If an abatement action is necessary, removal is the recommended action (enclosure is a viable option in unusual circumstances).
- ii) Mechanical insulation in **FAIR** condition can be repaired or removed based on the following general recommendations applied on a case by case basis (Note: Either repair or removal are legally acceptable options for the treatment of ACM found in **FAIR** condition):
 - o Repair ACM mechanical insulation found in **FAIR** condition in **ACCESS (B)** or **ACCESS (C)** areas.
 - o Remove ACM mechanical insulation found in **FAIR** condition in **ACCESS (B)** and **ACCESS (C)** areas, where future damage to the ACM is likely to occur.
 - o Remove ACM mechanical insulation found in **FAIR** condition with **ACCESS (A)** to eliminate the potential for re-damaging ACM by all vessel users.
- iii) ACM in **GOOD** condition present in **ACCESS (A)** at a minimum is subject to

surveillance, as long as it is not disturbed by future renovation, maintenance or demolition. PLEL recommends pro-active removal of the ACM in **ACCESS (A)** where damage is possible by ongoing occupant activity (accidental or intentional). This recommendation exceeds current regulatory requirements.

- iv) Non-friable or manufactured products are considered in the action matrix as follows:
 - o Non-friable and manufactured products reported in **POOR** condition or friable **DEBRIS** resulting from the deterioration of non-friable ACM are treated as friable materials and the appropriate action, depending on accessibility, is determined from the Action Matrix for friable ACM.
 - o For non-friable or manufactured products reported in **GOOD** condition, Action 7 (surveillance) is recommended regardless of Accessibility.
 - o For non-friable or manufactured products **FAIR** condition is not utilized.
- v) Remove all ACM from a particular area where small quantities of asbestos are present and removal will negate the need for the use of the Asbestos Management Program in that area.

With these principles in mind, the following Action Matrix Tables establish the recommended asbestos control action. Note that factors not included in the above discussion, such as an owner's policy decision to remove material, knowledge of upcoming maintenance, etc., may result in a recommendation that differs from this table. The **ACTIONS** are defined in full following the tables.

1.6 Action Matrix Tables

1.6.1 FRIABLE ACM

ACCESS	CONDITION			DEBRIS	SUSPECT MATERIAL
	GOOD	FAIR	POOR		
(A)	ACTION 5/7 ¹	ACTION 5/6 ²	ACTION 3	ACTION 1	ACTION 8
(B)	ACTION 7	ACTION 6/5 ³	ACTION 3	ACTION 1	ACTION 8
(C) Exposed	ACTION 7	ACTION 6	ACTION 4	ACTION 2	ACTION 8
(C) Concealed	ACTION 7	ACTION 7	ACTION 4	ACTION 2	ACTION 8
(D)	ACTION 7	ACTION 7	ACTION 7	ACTION 7	ACTION 8

¹ If material in **ACCESS (A)/GOOD** condition is not removed **ACTION 7** is required.

² If material in **ACCESS(A)/FAIR** condition is not removed **ACTION 6** is required.

³ Remove ACM in **ACCESS (B)/FAIR** condition if ACM is likely to be disturbed.

1.6.2 NON-FRIABLE AND POTENTIALLY FRIABLE ACM

ACCESS	CONDITION		DEBRIS	SUSPECT MATERIAL
	GOOD	POOR		
(A)	ACTION 7	ACTION 3 ⁴	ACTION 1	ACTION 8
(B)	ACTION 7	ACTION 3 ⁴	ACTION 1	ACTION 8
(C) Exposed	ACTION 7	ACTION 4 ⁴	ACTION 2	ACTION 8
(C) Concealed	ACTION 7	ACTION 4 ⁴	ACTION 2	ACTION 8
(D)	ACTION 7	ACTION 7 ⁴	ACTION 7	ACTION 8

⁴ Non-friable and potentially friable ACM found in **POOR** condition and friable **DEBRIS** (from a non-friable ACM source) shall be treated as friable ACM.

1.7 Action Definitions

The following definitions relate to the Action Matrix Tables presented above, and as calculated by PLEL's Hazardous Materials Information System (HMIS). The corresponding Action is presented alongside the quantity in the Re-Assessment Survey Data sheets in Appendix I.

ACTION 1 Immediate Clean-Up of DEBRIS that is Likely to Be Disturbed

Restrict access that is likely to cause a disturbance of the ACM **DEBRIS** and clean up ACM **DEBRIS** immediately. Utilize correct asbestos procedures. This action is required for compliance with regulatory requirements. The surveyor will immediately notify the owner of this condition.

ACTION 2 Type 2 Precautions for Entry into Areas with ACM DEBRIS

At locations where ACM **DEBRIS** can be isolated in lieu of removal or cleaned up, use appropriate means to limit entry to the area. Restrict access to the area to persons utilizing Type 2 asbestos precautions. The precautions will be required until the ACM **DEBRIS** has been cleaned up, and the source of the **DEBRIS** has been stabilized or removed.

ACTION 3 ACM Removal Required for Compliance

Remove ACM for compliance with regulatory requirements. Utilize asbestos procedures appropriate to the scope of the removal work.

ACTION 4 Type 2 Precautions for Access into Areas Where ACM is Present and Likely to be Disturbed by Access

Use Type 2 asbestos precautions when entry or access into an area is likely to disturb the ACM. **ACTION 4** must be used until the ACM is removed (Use ACTION 1 or 2 if **DEBRIS** is present).

ACTION 5 Proactive ACM Removal

Remove ACM in lieu of repair, or at locations where the presence of asbestos in **GOOD** condition is not desirable.

ACTION 6 ACM Repair

Repair ACM found in **FAIR** condition, and not likely to be damaged again or disturbed by normal use of the area or room. Upon completion of the repair work treat ACM as material in **GOOD** condition and implement **ACTION 7**. If ACM is likely to be damaged or disturbed, during normal use of the area or room, implement **ACTION 5**.

ACTION 7 Asbestos Management Program with Routine Surveillance

Implement an Asbestos Management Program, including routine surveillance of ACM. Trained workers or contractors must use appropriate asbestos precautions (Type 1, Type 2 or Type 3) during disturbance of the remaining ACM.

ACTION 8 Suspect Material

Implement the Asbestos Management Program for materials that historically contained asbestos but cannot, or have not, been sufficiently tested for asbestos content. These materials are identified as **SUSPECT MATERIALS**. **SUSPECT MATERIALS** may include the following:

- All concealed equipment base insulating material(s)
- All inaccessible insulations on operating equipment

SUSPECT MATERIALS are to be treated as ACM and subject to the Action Matrix, until bulk sampling confirms the absence of asbestos. Bulk sampling, of **SUSPECT MATERIALS**, is recommended prior to the start of renovation, demolition, or maintenance work that will result in a significant disturbance of the **SUSPECT MATERIAL**.

APPENDIX IV

ASBESTOS MANAGEMENT PLAN



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne

AMIS NO

Asbestos Management Plan



Canadian Coast Guard

Published under the Authority of:

Integrated Technical Services Directorate
Fisheries and Oceans Canada
Canadian Coast Guard
Ottawa, Ontario

K1A 0E6

AMIS NO
Asbestos Management

Second DRAFT – March 2006

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Available on CCG Intranet site at:
<http://ccg-gcc.ncr.dfo-mpo.gc.ca>

Disponible en français : **Gestion de l'amiante**

Document template : English
Print Format: Double Sided
Last revision: Sept 01, 2004
Compatibility: Word 97 & 2002 (XP)



Printed on recycled paper

Document Control

Record of Amendments

#	Date	Description	Initials
2	March 2006	Second Edition	

Approvals

Office of Primary Interest (OPI)	S. Ahmed	Approved: _____
		Date: _____
Manager, Engineering & Maintenance H/M/E	A. DaCosta	Approved: _____
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		Date: _____

TABLE OF CONTENTS

DOCUMENT MANAGEMENT	IV
1. Authority	iv
2. Responsibility	iv
3. Inquiries and/or Revision Requests	iv
FORWARD	V
CHAPTER 1 REGULATORY REQUIREMENTS AND BACKGROUND INFORMATION	1
1.1 REGULATORY REQUIREMENTS	1
1.2 BACKGROUND INFORMATION	1
1.3 GLOSSARY OF TERMS AND ACRONYMS	1
CHAPTER 2 MAJOR ELEMENTS OF THE ASBESTOS MANAGEMENT PROGRAM	4
CHAPTER 3 RESPONSIBILITIES ONBOARD CCG SHIPS	6
3.1 PROGRAM INITIATION	6
3.2 CONTROL OF EMERGENCY AND SCHEDULED WORK	6
3.3 PROGRAM MAINTENANCE AND ADMINISTRATION	7
CHAPTER 4 EMERGENCY PROCEDURES AND CONTACTS	8
CHAPTER 5 ASBESTOS INVENTORY SURVEY AND ASSESSMENT	9
5.1 ASBESTOS SURVERY	9
5.2 SUSPECT MATERIALS	9
5.3 BULK SAMPLE COLLECTION PROCEDURES	9
5.4 BULK ANALYSIS	10
5.5 RE-ASSESSMENT OF FRIABLE MATERIALS	10
5.6 DOCUMENTATION OF SURVEY REPORT	10
5.7 AIR MONITORING AS ASBESTOS HAZARD ASSESSMENT	10
CHAPTER 6 NOTIFICATION	11
6.1 NOTIFICATION	11
CHAPTER 7	12
7.1 CLASSIFICATION OF SCHEDULED WORK	12
7.1.1 <i>TYPE 1 WORK</i>	12
7.1.2 <i>Type 2 Work</i>	13
7.1.3 <i>GLOVE BAG WORK</i>	13
7.1.4 <i>TYPE 3 WORK</i>	13
CHAPTER 8 INSPECTION AND MONITORING OF ASBESTOS WORK	14
8.1 VISUAL INSPECTION	14
8.2 AIR MONITORING	14
8.3 TYPE 1 – INSPECTION AND AIR MONITORING	15
8.3.1 <i>INSPECTION OF TYPE 1 WORK</i>	15
8.3.2 <i>AIR MONITORING OF TYPE 1 WORK</i>	15
8.4 TYPE 2 AND GLOVE BAG REMOVAL – INSPECTION AND AIR MONITORING	15
8.4.1 <i>INSPECTION OF TYPE 2 WORK</i>	15
8.4.2 <i>AIR MONITORING OF TYPE 2 WORK</i>	15
8.5 TYPE 3 – INSPECTION AND AIR MONITORING	16
8.5.1 <i>INSPECTION OF TYPE 3 WORK</i>	16

8.5.2	AIR MONITORING OF TYPE 3 WORK.....	16
CHAPTER 9	WORKER TRAINING.....	17
CHAPTER 10	FACILITIES AND WASTE DISPOSAL	18
10.1	EQUIPMENT AND SUPPLIES	18
10.2	WASTE DISPOSAL.....	18
CHAPTER 11	HAZARD INVESTIGATION	19
11.1	HAZARD INVESTIGATION	19
CHAPTER 12	DOCUMENTATION	20
12.1	CHANGE OVER NOTES.....	20
CHAPTER 13	ASBESTOS ABATEMENT STRATEGY	21
CHAPTER 14	ASBESTOS MANAGEMENT	22
14.1	BACKGROUND	22
14.2	CANADIAN COAST GUARD ASBESTOS POLICY	23
14.3	ASBESTOS MANAGEMENT PLAN	23
14.4	ACM REMEDIAL ACTIVITY	24
14.5	TRAINING	24
14.6	TOOLS AND PROTECTIVE CLOTHING	24
14.7	SURVEILLANCE	25

APPENDICES

APPENDIX A:	EVALUATION AND RECOMMENDATIONS FOR CONTROL OF ASBESTOS CONTAINING MATERIALS (ACM)
APPENDIX B:	BULK SAMPLE COLLECTION PROCEDURES
APPENDIX C:	EMERGENCY REACTION IN THE EVENT OF A SUSPECTED ASBESTOS SPILL & PROCEDURES FOR ASBESTOS REVIEW PRIOR TO MAINTENANCE OR CONTRACTED WORK
APPENDIX D:	WORK PRACTICES - EMERGENCY WORK
APPENDIX E:	TYPE 1 WORK PROCEDURES
APPENDIX F:	TYPE 2 WORK PROCEDURES
APPENDIX G:	GLOVE BAG REMOVAL PROCEDURES
APPENDIX H:	RESPIRATOR FITTING, INSPECTION,CLEANING AND DISINFECTION
APPENDIX I:	ASBESTOS WORK RECORD AND WORK PERMIT FORMS
APPENDIX J:	WORKER TRAINING RECORD
APPENDIX K:	CONTRACTOR NOTIFICATION
APPENDIX L:	REASSESSMENT FORM
APPENDIX M:	EQUIPMENT FOR ASBESTOS MANAGEMENT PROGRAM
APPENDIX N:	BACKGROUND INFORMATION ON ASBESTOS MATERIALS IN VESSELS AND HEALTH HAZARDS
APPENDIX O:	ASBESTOS MATERIALS SURVEY - CCGS VESSELS

DOCUMENT MANAGEMENT

1. Authority

This document is issued by the Director General Integrated Technical Support, CCG's National Technical Authority under delegation from the Deputy Minister Fisheries and Oceans and the Commissioner of the Canadian Coast Guard.

2. Responsibility

- a) Engineering & Maintenance is responsible for:
 - the creation and promulgation of the document; and
 - the identification of an Office of Primary Interest (OPI) who is responsible for the coordination and the content of the document.
- b) The OPI is responsible for:
 - the validity and accuracy of the content;
 - the availability of this information;
 - the update as needed;
 - the periodical revision; and
 - the follow-up of all requests, comments and/or suggestions received to the originator.

3. Inquiries and/or Revision Requests

All inquiries regarding this document, including suggestions for revision and requests for interpretation shall be address to the OPI:

Position Title: Staff Officer, Environment
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All requests should:

- be clear and concise; and
- reference the specific Chapter, Section, Figure or Table

FORWARD

ASBESTOS MANAGEMENT PROGRAM Policy Statement

It is the Canadian Coast Guard's policy that ships crew be trained and prepared in asbestos awareness and common regulatory asbestos abatement procedures in the event of emergency repairs, general maintenance and installations that require working in asbestos environments when operating at sea. It is the Canadian Coast Guards intention that any disturbance to asbestos containing materials brought on by renovation, proactive abatement and general maintenance, no mater the quantity, size, condition, or friability, should be conducted by a qualified asbestos abatement contractor and in compliance with the appropriate Asbestos Regulations when possible. Shipboard personnel will only be required (with the appropriate training) to conduct emergency related asbestos abatement operations at sea. It is also CCG's policy that the designated ship board asbestos coordinators and the Ship Board Management Team, in conjunction with the Vessel support projects officer and the Operational Services Safety Officer will fully implement this program to ensure the health and safety of the crew aboard the vessel. The coordinator (s) of this plan are the Chief Engineers and the Senior Engineers of the vessel. Furthermore, it is the intention of the CCG that an asbestos abatement plan will be developed and implemented for the vessel.

1. Purpose

This document provides information, procedures, and work practices for the Asbestos Management Program (AMP). It is an active AMP intended for locations with asbestos or suspect asbestos. The program is a management system exclusively for the CCGS control of all vessel maintenance, alteration, repair or other activities that may disturb asbestos. The program includes on-going annual re-assessment of asbestos materials. If the assessment indicates continuing disturbance or deterioration of asbestos containing material, such material will be repaired, encapsulated or removed.

2. Scope

Canadian Coast Guard employees will not undertake asbestos-related work other than as required in an emergency or is absolutely necessary. Significant disturbance to asbestos containing

material is not encouraged by ships crew at any time, only as advised by the Ship Board Asbestos Coordinators.

Renovations will be preceded by an evaluation to identify all asbestos (including material currently suspected of containing asbestos) in the project area and to assess the need to remove the asbestos materials. Renovations that will or might disturb friable or non-friable asbestos will be preceded by removal of the asbestos.

The document includes procedures for emergency response to the discovery of suspected asbestos as well as work practices for minor Type 1, moderate Type 2 and high risk Type 3 work. The document has been prepared to allow sections appropriate for specific work practices to be separated and provided to the contractor performing the work. The document also includes policies for inspection of work, air monitoring and worker training.

CHAPTER 1 REGULATORY REQUIREMENTS AND BACKGROUND INFORMATION

1.1 REGULATORY REQUIREMENTS

The Asbestos Management Program is implemented in response to the following regulations and guidelines in effect as of March 2006.

- The Canadian Coast Guard Fleet Safety Manual, Section 7.0: *Development of Plans for Shipboard Operations*. Subsection 7.D.5: *Controlling Asbestos-containing Materials*. Version Two. Document No. 7d05V2a117.
- Health Canada, Occupational Health Assessment Guide, Appendix 2; Hazardous Exposure. January 2002.
- Canada Labour Code, Occupational Safety and Health Regulations Subsection 124; *Duties of Employer*. Part X; *Hazardous Substances*. May 1999
- Marine Occupational Safety and Health Regulations.
- CCG Vessels Life Cycle Procedures Manual, Second Edition – June 1999 Chapter 14; Asbestos Management,
- Applicable provincial regulations respecting asbestos as currently in force.
- Current Regulations respecting Asbestos Waste Disposal (refer to Provincial Regulations and or Policy Directives with respect to disposal of Asbestos Waste).
- Transportation of Dangerous Goods Act, 1992 (TDGA, 1992), S.C, 1992, c. 34 including Transportation of Dangerous Goods Regulations SOR/85/77 and subsequent amendments.

1.2 BACKGROUND INFORMATION

Refer to Appendix N for background information on asbestos in vessel materials and health hazards.

1.3 GLOSSARY OF TERMS AND ACRONYMS

ACM	Asbestos-containing material
Amosite	A type of asbestos mineral.
Asbestos	Six different fibrous minerals that occur naturally in the environment which have been mined for use in a wide range of

Regulatory Requirements and Background Information

	products including vessel materials and heat-resistant products.
Cellulose	A fibrous material obtained largely from wood. Manufactured into paper.
Chrysotile	The type of asbestos mineral most commonly used in vessel construction.
Crocidolite	The least common of the commercially utilized asbestos types.
Friable Material	Material that (when dry) can be crumbled pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
DOEL	Department of Environment & Labour
Transite	A hard manufactured product made of a mixture of cement and silica reinforced with asbestos.
Type 1 Asbestos Work	Also known as <u>Low Risk Work</u> . Includes the following operations: <ul style="list-style-type: none"> – Access into deck head panels and Hatches for visual assessment. – Clean up of minor amounts of ACM fallout – Any task where only minimum disturbance is anticipated – Cable pulls where minor disturbance is required – Small isolated clean ups. – installation or removal of manufactured asbestos products such as vinyl tiles, gaskets, seals, packings, friction, friction products or asbestos – cement products and acoustic tiles; – cutting and shaping of asbestos products with hand tools; – cutting, grinding or abrading an asbestos product with a power tool equipped with a dust collection device and HEPA filter; – drilling a manufactured asbestos product; – Scaled down work of this nature may be granted from the Occupational Health & Safety Inspections Branch
Type 2 Asbestos Work	Also known as <u>Medium Risk Work</u> . Includes the following operations: <ul style="list-style-type: none"> – Cable pulls or equipment installation is to require significant

Regulatory Requirements and Background Information

removal and clean up.

- minor removal or disturbance of friable asbestos-containing material (minor removal is defined by most provincial regulations – (limited to wet removal of less than 10 square feet or an equivalent amount of pipe insulation);
- enclosure of friable material containing asbestos;
- work with asbestos not classified as Type 1 or Type 3.

Type 3 Asbestos Work Also known as High Risk Work . Includes the following operations:

- removal of more than 10 square feet of friable asbestos-containing material;
- spray application of a sealant to friable asbestos-containing material;
- cleaning or removal of air-handling equipment in a vessel that has sprayed fireproofing containing asbestos;
- repair, alteration or demolition of a kiln or furnace made, in part, of asbestos-containing refractory materials;
- cutting, grinding or abrading an asbestos product with a power tool not equipped with a dust collection device and HEPA filter;
- repair, alteration or demolition of a vessel in which asbestos products were manufactured.

US EPA

United States Environmental Protection Agency

CHAPTER 2 MAJOR ELEMENTS OF THE ASBESTOS MANAGEMENT PROGRAM

- 1) An asbestos survey has been performed to detect and evaluate asbestos containing materials. Asbestos coordinators from each rotation have been designated to ensure that the guidelines and recommendations outlined in the Asbestos Assessment Survey and subsequent management plan are enforced to protect the Health and safety of the ships crew.
- 2) The Ship Board Health and Safety Committee shall regularly monitor the asbestos abatement management and procedures as they relate to the health and safety of the ships crew.
- 3) Removal or repair of all deteriorated asbestos containing materials identified in the survey and subsequent re-assessments is to be performed.
- 4) Staff and contractors who might disturb asbestos containing materials will be notified of its presence, prior to performing work in the vicinity of these materials.
- 5) Emergency response and notification procedures have been established and are provided in this document.
- 6) Procedures are set for routine vessel maintenance or renovation, which may require minor disturbance or minor removal of asbestos. Outside asbestos contractors will perform all scheduled asbestos work where possible.
- 7) Maintenance or renovation work will be monitored to ensure compliance with established vessel procedures and regulations.
- 8) CCG staff will not disturb asbestos other than on work necessary for the routine operation of the ship or on an emergency basis. Staff who may be required to disturb asbestos materials on board the vessel will be trained and provided with necessary equipment and supplies.
- 9) Prior to major renovations, asbestos materials (friable and non-friable) affected by the project will be removed.
- 10) Records of asbestos work will be maintained on site. (See Appendix I)

Major Elements of the Asbestos Management Program

- 11) Specific work procedures for planned or scheduled asbestos work or disturbance will be prepared and monitored by an Asbestos Abatement Consultant in conjunction with the designated on board Asbestos coordinators to ensure compliance with established procedures.

CHAPTER 3 RESPONSIBILITIES ONBOARD CCG SHIPS

3.1 PROGRAM INITIATION

The Asbestos Coordinator (AC), Chief and/or Senior Engineer or their designate has the following responsibilities.

- Arrange through the Fleet Training Officer and/or Fleet Safety Officer for awareness and procedures training for ship board staff and supervisors who may actively disturb asbestos in emergency work, may respond to spills or damage or may inspect asbestos abatement work (use certificate of worker training given in Appendix J). Training is to include the care and use of respiratory protection. (See Appendix H).
- Ensure ship board personnel and supervisors are aware of the locations of all asbestos materials.
- Notify the Commanding Officer and the Health and Safety Committee of all industrial hygiene investigations including asbestos surveys and testing.
- Provide to the Health and Safety Committee all information regarding asbestos management activities.

3.2 CONTROL OF EMERGENCY AND SCHEDULED WORK

The AC or their designate has the following responsibilities.

- Respond to reports of asbestos debris, or deteriorated or damaged asbestos containing materials (see Section 5.0).
- Dispose of asbestos containing materials in compliance of local municipal, provincial and federal regulations.
- AC or their designate has the following responsibilities for work under their control.
- Arrange for pre-refit surveys to check for asbestos-containing materials in concealed locations, such as wall cavities, and pipe racks and in untested suspect asbestos containing materials, prior to start of work in areas or locations identified during the asbestos survey as not being accessible during the survey.
- Arrange for any Type 1, Type 2 or Type 3 asbestos related work by outside Asbestos Abatement Contractors when practical/accessible.
- Notify contractors who may disturb asbestos materials (use acknowledgement form given in Appendix J).

- Ensure contractor supervisors and workers are trained as required by provincial regulations.
- Update asbestos survey files to reflect asbestos related repairs, clean up and removal projects.
- Supervise and monitor routine asbestos related work.

3.3 PROGRAM MAINTENANCE AND ADMINISTRATION

The AC or their designate has the following responsibilities.

- Arrange for annual re-assessment to document the condition of asbestos containing materials aboard the vessel and include deficiencies on the annual refit specification as required.
- Maintain documents relating to Asbestos Management Program, including Asbestos Work Records, copies of asbestos waste manifests, correspondence with regulatory agencies, etc.
- Maintain asbestos survey reports and update to reflect removal and reassessment of asbestos containing materials aboard the vessel on a continual basis.
- Request through the Fleet Training Officer and Fleet Safety Officer for asbestos awareness/abatement training for new employees, and refresher training for long term ship personnel.

Trained personnel have the following responsibilities:

- Be aware of the locations and types of asbestos containing materials in the vessel.
- Report damaged asbestos-containing materials to their supervisor who will in turn notify the AC or their designate. Isolate the area and keep non-essential staff and visitors away.
- Avoid unnecessary contact with or disturbance of asbestos containing materials.

CHAPTER 4 EMERGENCY PROCEDURES AND CONTACTS

Ships officers and crew may encounter damaged or dislodged material that may be suspected of being asbestos containing. This may occur in areas where asbestos has been identified in surveys or in areas not included in the survey (due to limited accessibility, above deck head and bulkhead panels etc.). If damaged or dislodged material is present and has not been disturbed, immediately stop all work, until removal or clean up of the ACM in the space is performed. If debris is found in accessible areas or if debris above deck head panels has been disturbed, it is important that the exposure of all ship board personnel to airborne asbestos be minimized by isolating the work area. Follow procedures for notification and area isolation provided in Appendix C.

Asbestos related emergency work practices may also be required to deal with plumbing problems, lack of heat, or electrical problems that require immediate action. These work practices are presented in Appendix D.

All emergency situations are to be reported to the AC as soon as possible.

CHAPTER 5 ASBESTOS INVENTORY SURVEY AND ASSESSMENT

5.1 ASBESTOS SURVEY

Refer to the Asbestos Materials Survey for more detailed information on the original survey scope. This survey is maintained by the AC. The limitations of the survey must be carefully noted and some additional testing may be necessary prior to renovation or maintenance activity. Typical limitations include:

- Marine Panels and vinyl floor tiles were generally tested in limited numbers during the original survey. Additional testing of materials to be disturbed by work will be required or these materials must be considered as asbestos-containing.
- Survey did not include any destructive or intrusive testing. Materials enclosed by bulkheads or solid finishes will require testing. The possible presence of undetected and inaccessible ACM in specific locations is indicated in the survey reports (Appendix N) by indicating the presence of suspect unidentified material.

5.2 SUSPECT MATERIALS

The following materials must be sampled prior to disturbance during renovation or demolition work or must be assumed to be asbestos-containing.

- Textile insulation on internal wiring
- Other materials which were identified or show inconsistency in construction use and as not sampled in the survey

These materials should be sampled only at locations where renovation work will cause disturbance. The collection of samples at the specific areas scheduled for renovation will ensure that the samples accurately reflect the materials in that specific location.

It is important to note that these suspect materials (unless tested) have not been included in the Asbestos survey report.

5.3 BULK SAMPLE COLLECTION PROCEDURES

In the future, if further bulk samples are necessary, the AC or their designate will arrange collection of the samples for analysis. A procedure for sample collection is given in Appendix B.

5.4 BULK ANALYSIS

Bulk samples will be analysed by methods acceptable to the appropriate provincial regulatory body and Health Canada recommendations.

Testing and reporting of materials shall be in accordance with provincial and federal standards.

5.5 RE-ASSESSMENT OF FRIABLE MATERIALS

The AC or their designate will arrange for re-assessments of all asbestos containing materials. The re-assessment will encompass factors originally noted, and concentrate on signs of deterioration, delamination or disturbance. The frequency of re-assessment will be yearly and may be more frequent if the area is subject to change of use or frequent maintenance activity.

The yearly re-assessments will use the hazard assessment criteria given in Appendix A or as provided in the survey. The reassessment forms are provided in Appendix L.

5.6 DOCUMENTATION OF SURVEY REPORT

The AC will keep copies of the survey report and reassessments. Copies of the Management Program and re-assessment reports will be tabled and discussed at shipboard health and safety meetings.

5.7 AIR MONITORING AS ASBESTOS HAZARD ASSESSMENT

Air monitoring will not be used as the primary resource for the assessment of hazard from asbestos materials. The Phase Contrast Microscopy (PCM) method recognized by provincial jurisdictions does not differentiate asbestos fibres from any other type of fibre. Therefore the result is not related to the presence or absence of asbestos. Also, due to the limited resolution of the optical microscope, the small diameter asbestos fibres, which may be present, cannot be detected. The use of PCM measurements will be limited to monitoring the performance of asbestos related project when warranted.

If air monitoring is required to assess a potential asbestos hazard on a day-to day basis, the only acceptable method will be Transmission Electron Microscopy (TEM). The TEM method does not have the technical limitations of the PCM method. TEM monitoring will be performed according to the US EPA Level II method.

CHAPTER 6 NOTIFICATION

6.1 NOTIFICATION

Contractors who undertake work aboard the vessel will be notified of the presence of ACM and its location and be given the notification form in Appendix K.

The AC will include notice of asbestos materials in tender calls for individual projects that may cause an asbestos disturbance.

CHAPTER 7 ASBESTOS WORK PRACTICES

The following sections and Appendices E, F, and G describe the standard operating procedures adopted for asbestos-related work.

These procedures are provided as a standard for all asbestos related work. Non-scheduled (emergency) asbestos related work will be undertaken by shipboard personnel who have specific asbestos related training. All scheduled asbestos-related work will be undertaken by contractors with appropriate training as required by provincial/federal regulations. Contractors will be required to sign the Contractor Notification and Acknowledgement Form (Appendix K).

7.1 CLASSIFICATION OF SCHEDULED WORK

Provincial Departments of Environment and Labour Regulations and Federal Government recommend that certain asbestos related precautions be taken depending on the type of disturbance, the material being disturbed, and the extent of work to be conducted. For the purposes of this document the procedures to be followed are put into three classifications, TYPE 1, TYPE 2, or TYPE 3. The operations are defined in the *Glossary of Terms and Acronyms*.

The following is the general classification of work for materials known to exist on some CCGS ships. Some additional operations not specifically defined in the regulation have been added to the following procedures. Where no specific federal/provincial standards exist CCG has adopted procedures based on due diligence (largely based on Industry Standards or other provincial codes or regulations).

7.1.1 TYPE 1 WORK

Installation or removal of manufactured asbestos products such as vinyl tiles, gaskets, seals, packings, friction products (brakes, clutches) or asbestos – cement products.

- Cutting and shaping of asbestos containing products with hand tools.
- Cutting, grinding or abrading an asbestos containing product with a power tool equipped with a dust collection device and HEPA filter.
- Clean up of minor amounts of fallen non-friable asbestos material debris with HEPA Vacuums

The procedures for Type 1 work are provided in Appendix E.

7.1.2 Type 2 Work

- Entry into any deck head or bulkhead space, cable trays or other areas in which friable asbestos-containing debris is present.
- Clean up of minor asbestos-containing debris from mechanical insulations or sprayed fireproofing.
- Enclosure (Rigid Barrier) of friable material containing asbestos.
- Repair (such as application of tape or sealant or other covering) of any extent of asbestos mechanical insulation.
- Removal of any extent of asbestos-containing vinyl sheet flooring. Note: If power tools such as grinders are required to remove all paper backing from the substrate Type 3 procedures must be utilized.
- Removal of minor amounts of friable asbestos-containing materials including mechanical insulation. (Minor removal is defined as less than 10 linear or 10 square feet).
- Removal of minor amounts of non-friable asbestos-containing materials including, Plasters. (Minor removal is defined as less than 10 linear or 10 square feet).

The procedures for Type 2 work are provided in Appendix F.

7.1.3 GLOVE BAG WORK

Glove Bag removal of friable ACM from piping systems may be classed as Type 2 depending on the quantity being removed. The procedures for these operations are provided in Appendix G.

7.1.4 TYPE 3 WORK

- Major removal of friable asbestos-containing material (i.e. texture coat, mechanical insulation and sprayed fireproofing).
- The use of power tools not equipped with a dust collection device equipped with a HEPA filter to cut, grind or abrade a manufactured asbestos product.
- Spray application of a sealant to friable material containing asbestos.

Shipboard crew will not undertake Type 3 work in any situation. This work will be contracted out to contractors experienced and certified in asbestos control. Site-specific asbestos related work procedures (specifications) will be prepared by an outside consulting firm for each Type 3 project.

CHAPTER 8 INSPECTION AND MONITORING OF ASBESTOS WORK

8.1 VISUAL INSPECTION

The procedures provided in Appendices E, F, and G are suitable for the performance of most work on non-friable and friable asbestos. The AC or their designate will be responsible for ensuring these procedures are followed. The primary method of ensuring compliance for Type 1, Type 2, Type 3 and Glove Bag use is visual inspection of the site and work practices. The procedures outlined in the Appendices are to be enforced by the AC during the work.

8.2 AIR MONITORING

As required by Health Canada CCG will contract for air monitoring to meet the regulations. Air monitoring is useful to provide proof of compliance with the specified work practices and proper engineering controls are in place.

Air monitoring and analysis during active asbestos removal may be performed by the following method.

- Phase Contrast Microscopy (PCM)

PCM air samples may or may not be analysed by the consultant performing the sample collection. PCM air samples must be submitted for analysis to a laboratory participating in a recognized quality control program such as the A.I.H.A – A.A.R. Program or the Quality Control Program of the I.R.S.S.T. (Institute de Recherché en Santé et en Sécurité du Travail du Quebec).

The clearance for all asbestos work where clearance monitoring is performed, and for samples collected outside the asbestos work area will be <0.05 fibre/ml or lower if required by provincial regulation and Health Canada. This level has been established as 50% of the current Occupational Exposure Limit (OEL) or Time Weighted Average Exposure Value (TWAEV) established by the American Conference of Governmental Industrial Hygienists (ACGIH). Accurate determination of a lower concentration may be affected by the presence of low levels of non-asbestos fibrous dust in vessel environments.

8.3 TYPE 1 – INSPECTION AND AIR MONITORING

8.3.1 INSPECTION OF TYPE 1 WORK

Type 1 work is normally inspected by the AC or their designate.

8.3.2 AIR MONITORING OF TYPE 1 WORK

Past asbestos related activities, with respect to the disturbance of these non-friable materials, has shown to be negligible. These activities in the past have been conducted with the appropriate engineering controls and personal protective equipment. Based on this data, air monitoring during the disturbance of non-friable materials is to be conducted whenever practical or when the work situation (s) permits.

8.4 TYPE 2 AND GLOVE BAG REMOVAL – INSPECTION AND AIR MONITORING

8.4.1 INSPECTION OF TYPE 2 WORK

Type 2 removal should only be implemented if an emergency situation warrants. The removal or disturbance of significant amounts of ACM should only be conducted by trained shipboard personnel to rectify an emergency situation if the vessel is at sea.

An outside Asbestos Consultant will inspect Type 2 work. Upon completion of inspection and air monitoring by the Consultant, the Type 2 enclosure will be dismantled. Daily inspection and air monitoring are required during Type 2 and Glove bag work for scheduled asbestos related work.

8.4.2 AIR MONITORING OF TYPE 2 WORK

PCM air monitoring will be conducted daily during Type 2 work. Air monitoring will be conducted in occupied areas adjacent to the Type 2 enclosure during contaminated work. Worker exposure air monitoring will also be conducted.

PCM air monitoring will be used for air clearance on Type 2 enclosures. Clearance level of <0.05 fibre/ml must be achieved prior to teardown of the enclosure.

Air monitoring will be conducted during scheduled asbestos related work following Type 2 abatement procedures

8.5 TYPE 3 – INSPECTION AND AIR MONITORING

8.5.1 INSPECTION OF TYPE 3 WORK

An outside Asbestos Consultant will inspect Type 3 work. Full time on-site inspection is required by CCGS policy. Upon completion of AC or their designate inspection and air monitoring by the consultant the Type 3 enclosure will remain in place. The may inspect the Type 3 work area for final cleanliness prior to the enclosure being dismantled. The following Milestone Inspections will normally be undertaken on all Type 3 sites:

- a) Clean Site Preparation – An inspection of preparation and set-up prior to contaminated work.
- b) Contaminated Perimeter Preparation – Inspection of the perimeter (final seal) of the asbestos work area.
- c) Pre-Bulk Removal Inspection – An inspection prior to major or bulk removal work in order to ensure all enclosures are in place and all preparations complete.
- d) Visual Clearance Inspection – An inspection upon completion of abatement work in order to confirm cleanliness of site prior to application of lockdown agent.
- e) Clearance Air Monitoring – Air monitoring conducted after application and drying of lockdown agent in order to confirm airborne fibre levels are within acceptable limits prior to removal of plastic.
- f) Teardown or Dismantling Inspection – An inspection which may be conducted with the Consultant and AC after removal of polyethylene prior to dismantling perimeter and decontamination facility.

In addition, Progress Inspections will be performed between Milestones C and D. These inspections will include both visual inspections and air monitoring.

8.5.2 AIR MONITORING OF TYPE 3 WORK

PCM air monitoring will be conducted during the Bulk Removal inspection. The air monitoring will be conducted in occupied areas adjacent to the Type 3 Work Area to ensure no leakage from the enclosure. Worker exposure air monitoring will also be conducted.

PCM air monitoring will be used for clearance air monitoring on Type 3 Work Areas. The air sample will be relied upon to allow clean access to the site for the Teardown Inspection. Clearance levels of <0.05 fibre/ml or less if required by provincial regulations must be achieved prior to teardown of the enclosure.

CHAPTER 9 WORKER TRAINING

Asbestos related worker training for CCGS personnel shall be co-ordinated by the AC. Once CCGS personnel have been trained the AC will arrange for follow-up training at least annually or as required. Annual fit testing of respirators must also be arranged for all CCGS personnel requiring respirator use.

Shipboard personnel who may be directly exposed to asbestos on an emergency basis must receive Asbestos Awareness training. Awareness training will be provided to new staff as needed.

CHAPTER 10 FACILITIES AND WASTE DISPOSAL

10.1 EQUIPMENT AND SUPPLIES

Ships that have asbestos-containing materials will carry supplies and equipment necessary for asbestos work and protection of crew aboard the vessel. All non-emergency work likely to disturb asbestos will be performed by an independent contractor. Appendix M gives a list of common asbestos equipment for reference.

10.2 WASTE DISPOSAL

Disposal of asbestos waste collected as a result of asbestos related work by ships crew will be the responsibility of the AC. Disposal of asbestos waste collected as a result of asbestos related work by outside contractors will be the responsibility of the contractor and will be performed in accordance with applicable provincial regulation. Copies of waybills for disposal of asbestos materials are to be forwarded to the AC to maintain a copy of all waybills on file with the Asbestos Management Program document.

CHAPTER 11 HAZARD INVESTIGATION

11.1 HAZARD INVESTIGATION

Compliance with applicable Occupational Safety and Health Regulations. In the event that a potential hazard has been identified that may have resulted in a hazardous exposure to airborne asbestos to ships crew, the AC shall conduct a hazard investigation. The investigation must consider the potential hazard, and must conclude as to whether the hazardous material could be present as an airborne contaminant. If so, a control plan must be instituted. The control plan must include:

- record of where the asbestos materials are or were located
- description of the asbestos materials that were disturbed
- description of the procedures used to cleanup or repair damaged asbestos containing materials
- written procedures to prevent any future hazard
- consideration of medical surveillance for workers who may have been exposed to airborne asbestos
- asbestos related awareness training for the employees if they had not had any previous asbestos related training

Results of the investigation should be communicated to the ships crew at the next occupational health and safety meeting.

CHAPTER 12 DOCUMENTATION

12.1 CHANGE OVER NOTES

Where applicable, Chief Engineers/Asbestos Coordinators (AC) shall indicate on their changeover notes the general condition of ACM, including any repairs, incidents or removal conducted during the shift.

CHAPTER 13 ASBESTOS ABATEMENT STRATEGY

It is the intention of the CCG to pro-actively remove and/or manage asbestos containing materials aboard the ships. In order to achieve this objective several variables have to be taken into consideration. These include but are not limited to:

- Annual assessment completed by an outside consultant.
- Scheduled annual refit work.
- Concealed ACM discovered during normal ship operations.

It is incumbent on chief engineers/asbestos coordinators in consultation with vessel support, fleet safety officer, and the consultant to review and prioritise asbestos abatement work.

CHAPTER 14 ASBESTOS MANAGEMENT

The purpose of this chapter is to provide information and guidance on the management of Asbestos Containing Material (ACM) in Canadian Coast Guard Vessels.

14.1 BACKGROUND

For many years asbestos has been recognised as a health hazard for workers employed in its production, processing or use. Of specific concern is exposure to airborne asbestos particles which, if ingested into the lungs, can lead to a variety of life-threatening diseases. Asbestos Containing Material (ACM) is generally classified in one of two groups; friable and non-friable. A friable material is one which when dry can be crumbled, pulverised or powdered by hand pressure, in the process releasing microscopic particles into the atmosphere. Friable Asbestos Containing Material (ACM) poses a major health hazard although some non-friable material can also release airborne particles when sawed, sanded or damaged.

The mere presence of Asbestos Containing Material (ACM) in a living or working environment has been shown by scientific study not to pose a hazard. The hazard posed by airborne asbestos occurs when Asbestos Containing Material (ACM) is in poor condition and continues to deteriorate, when Asbestos Containing Material (ACM) is disturbed during maintenance activities or by normal use, or when Asbestos Containing Material (ACM) is disturbed during major structural modifications.

Both friable and non-friable forms were widely used in vessel construction and outfitting until the early 1980's. Examples of friable asbestos include machinery and pipe insulation, some types of ceiling tiles and fire blankets. Examples of non-friable Asbestos Containing Material (ACM) include vinyl asbestos deck tiles, gasket material and clutch linings and pads.

Asbestos Containing Material (ACM) is known to exist in both forms in several CCG vessels, all of which were built prior to 1983 and have not undergone recent major upgrade or modernisation.

All Asbestos Containing Material (ACM) in these vessels were identified and catalogued during detailed asbestos survey conducted during 1992. This information, which included a usage description, location, amount, and assessed condition of the material found in each instance, plus recommendations for remedial action where applicable, was compiled in a separate report for each vessel and is held in a central databank at CCG Headquarters. The report is one component of the Asbestos Management Plan developed for and issued to each vessel concerned.

14.2 CANADIAN COAST GUARD ASBESTOS POLICY

Current policy with respect to the use and maintenance of Asbestos Containing Material (ACM) in CCG vessels is as follows:

- Asbestos Containing Material (ACM) is not permitted in the building or outfitting of new construction vessels.
- All Asbestos Containing Material (ACM) is to be removed and replaced with suitable alternatives in those vessels undergoing major modernisation programs.
- An Asbestos Management Plan is to be implemented in all vessels in which Asbestos Containing Material (ACM) remains in some form.
- Asbestos Containing Material (ACM) remedial action is classified into three types as described in the Asbestos Management Plan. Vessels' crew members will normally only undertake Type I, and at the discretion of the Superintendent Vessel Support, undertake Type II asbestos related work. Type III work will always be contracted out to suitably qualified firms

14.3 ASBESTOS MANAGEMENT PLAN

The Asbestos Management Plan provides, in addition to a complete listing of the Asbestos Containing Material (ACM) in the vessel, guidance and information for crew members on asbestos use, hazards, work procedures and personal protection. While it does provide some information on asbestos work practices, it is not meant in itself to provide sufficient information to allow crew members to undertake corrective action on deteriorated Asbestos Containing Material (ACM) or to remove Asbestos Containing Material (ACM) for access to equipment or confined spaces. The capability can only be achieved through practical instruction from personnel qualified in this field.

The Plan outlines the four elements necessary for maintaining a safe working and living environment in those vessels in which Asbestos Containing Material (ACM) continues to exist.

They are:

- Remedial activity to repair and/or replace all deteriorated Asbestos Containing Material (ACM)
- Training for selected crew members on basic Asbestos Containing Material (ACM) work procedures.
- Provision of approved tools and protective clothing.
- A continuing Asbestos Containing Material (ACM) surveillance program

If not already done so, it is recommended that each vessel which still has Asbestos Containing Material (ACM's) aboard appoint an Asbestos Co-ordinator, normally the Chief Engineer Officer, to implement the Management Plan.

14.4 ACM REMEDIAL ACTIVITY

The repair and/or replacement of all deteriorated Asbestos Containing Material (ACM) founded during or subsequent to previous surveys is necessary in order to preserve a safe environment on board vessel. When any remedial activity is carried out, the asbestos survey is to be amended and this information forwarded to the Region for onward transmission to Headquarters.

14.5 TRAINING

Training in Type I and II asbestos work practices is to be arranged by the Region for selected crew members. This training will be provided by a contractor approved by the pertinent provincial labour department and will be provided for at least two officers and two crew members from the engineering department and, if friable Asbestos Containing Material (ACM) is present in locations outside of engineering spaces, to a like number of deck department personnel.

14.6 TOOLS AND PROTECTIVE CLOTHING

A suitable outfit of approved tools, safety equipment and protective equipment is to be procured and issued by the Region. These will be used by trained crew members to carry out asbestos-related work when deteriorated Asbestos Containing Material (ACM) is to be repaired or where

Asbestos Containing Material (ACM) must be disturbed for access to equipment or structure. The following is a typical listing of the items required:

Full Face Respirator	Securing Straps	Disposal Bags
HEPA Respirator Filters (purple)	Wetting Agent Kit	Water Sprayer
Irritant Smoke Kit	Disposable Coveralls	Glove Bags

14.7 SURVEILLANCE

In order to assist vessels' crews and Regional technical staffs in the identification of deteriorated Asbestos Containing Material (ACM) and in the maintenance of an up-to-date database of the amount and condition of all Asbestos Containing Material (ACM) remaining in the Fleet, a formal surveillance program has been established. A qualified surveyor will visit each vessel annually (although the frequency may in time be extended) and sight each previously identified instance of Asbestos Containing Material (ACM). The surveillance program will be co-ordinated by Headquarters. The Original Asbestos Management Plan Asbestos Containing Material (ACM) report will be updated with the vessel, Region and Headquarters each receiving a revised copy and a listing of any outstanding necessary remedial action.

APPENDIX A EVALUATING THE CONDITION & ACCESS OF ACM AND ACTION MATRIX FOR THE CONTROL OF ACM

Once the location of any asbestos-containing materials is determined it is then necessary to have a basis from which its condition and general accessibility can be measured. This in turn provides a baseline from which recommendations can be developed to establish and maintain a safe workplace while ensuring compliance with existing regulations and guidelines.

As the condition and general accessibility of asbestos can vary widely from location to location, the following system of evaluation shall be used to ensure a consistent approach to the evaluation and rating of asbestos-containing materials.

1.0 EVALUATION OF CONDITION

1.1 Sprayed Fireproofing, Thermal or Textured Finishes

Evaluating the condition of spray or trowel applied fireproofing, thermal insulation, texture coats, decorative or acoustic finishes shall be based on the following definitions: Note that FAIR is not an applicable condition for rating sprayed fireproofing, thermal or textured finishes material.

GOOD	Surface of material shows no signs of damage, deterioration or delamination. (Includes unencapsulated sprayed fireproofing, sprayed insulation and sprayed or texture coats where no delamination or damage is observed. Also includes encapsulated materials where the encapsulation was installed after the damage or fallout occurred). Up to 1% visible damage to surface of material is allowed within range of GOOD.
POOR	Sprayed materials show signs of damage, delamination or deterioration. More than 1% damage to surface of the material. Areas of spray where damage exists in isolated locations, may be listed as both GOOD and POOR condition for the same room. In this circumstance the extent of the POOR area is recorded separate from that rated as being in GOOD condition.

1.2 Mechanical Insulation

The condition of mechanical insulation (on boilers, breaching, ductwork, piping, tanks, equipment, etc.) shall be evaluated according to the following criteria:

GOOD	Insulation is jacketed and has no sign of deterioration. No friable insulation is exposed. Includes conditions where the jacketing has minor damage (i.e. scuffs or stains), but jacket is not punctured or penetrated.
FAIR	Minor penetrating damage to jacketed insulation (cuts, tears, deterioration or delamination) or undamaged insulation that is not jacketed. Insulation is exposed but is not showing surface disintegration. Extent of missing insulation ranges from minor to none. Damage can be readily repaired.
POOR	Original insulation jacket is missing, damaged, deteriorated or delaminated. Friable insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired.

1.3 Non-Friable and Potentially Friable Materials

For non-friable ACM such as asbestos cement products (transite), and manufactured products that have the potential to become friable when handled, such as acoustic ceiling tiles or sheet vinyl flooring, the condition of these materials shall be evaluated as follows. Note that FAIR is not an applicable condition for rating non-friable materials.

GOOD	No significant damage is present. Material may be cracked or broken but is stable and not likely to become friable upon casual contact.
POOR	Material is severely damaged. Loose debris is present or binder has disintegrated to the point where contact will cause the material to become friable.

1.4 Evaluation of ACM Debris

The presence of fallen ACM debris, whether as a result of delamination, deterioration or damage to sprayed fireproofing, thermal insulation, textured surfaces, decorative or acoustic finishes or mechanical insulation shall be noted separately from the presumed source of ACM and is merely referred to as DEBRIS.

2.0 EVALUATION OF ACCESSIBILITY

The accessibility of ACM shall be rated according to the following criteria:

ACCESS (A)	Common areas of the vessel within reach (from floor level) of all vessel users. Includes areas where occupant activities may result in disturbance of ACM not normally within reach (i.e. gymnasiums, warehouses, etc.).
ACCESS (B)	Frequently entered maintenance areas of the vessel within reach, without use of a ladder, by maintenance staff. Includes areas within reach from a fixed ladder or catwalk, i.e. tops of equipment or mezzanines (as well as regularly entered pipe chases and tunnels).
ACCESS (C) EXPOSED	Areas of the vessel above 8'-0" where use of a ladder is required to reach the ACM. Only refers to ACM materials that are exposed to view from the floor or ladder, without the removal or opening of other vessel components such as ceiling tiles, service access door or hatches. Does not include infrequently accessed service areas of the vessel.
ACCESS (C) CONCEALED	Areas of the vessel which require the removal of a vessel component, including lay-in ceilings and access panels into solid ceiling systems, includes rarely entered crawlspaces, attic spaces, etc.. Observations may be limited to the extent visible from the access points.
ACCESS (D)	Areas of the vessel behind inaccessible solid ceiling systems, walls or mechanical equipment, etc. where demolition of the ceiling, wall or equipment, etc. is required to reach the ACM. Evaluation of condition and extent of ACM is limited or impossible, depending on the surveyor's ability to visually examine materials in ACCESS D.

3.0 ROUTINE MAINTENANCE & BUILDING OPERATIONS

- 3.1 In the absence of any major maintenance activities, renovations or demolition that may lead to widespread disturbance of asbestos containing materials, the following factors shall be given due consideration in the formulation of site-specific recommendations. These are as follows:
- .1 The evaluation or viability of a specific asbestos containing materials control option shall be primarily based on the ACM's current condition and overall accessibility. The logic behind this statement is that damaged ACM located in frequently accessed areas of the vessel is of a higher priority than damaged ACM in an infrequently accessed area of the vessel.
 - .2 Existing regulations and good practice require the immediate clean-up and possible abatement of areas where there is ACM in POOR condition or ACM debris, or where such materials or debris is likely to be disturbed during normal use of the space (i.e. ACM is in POOR condition, and/or DEBRIS, combined with ACCESSIBILITY A or B).
 - .3 ACM in POOR condition is not routinely repairable. If an abatement action is necessary, removal is the preferred action (enclosure may also be considered in unusual circumstances).
 - .4 Mechanical insulation in FAIR condition can normally be repaired or removed based on the following general recommendations applied on a case-by-case basis. Note: Either repair or removal are both legally acceptable options for the treatment of ACM found in FAIR condition.
 - (a) Repair ACM mechanical insulation found in FAIR condition in ACCESS B or ACCESS C (EXPOSED) areas.
 - (b) Remove ACM mechanical insulation found in FAIR condition in ACCESS B and ACCESS C (EXPOSED) areas, where future damage to the ACM is likely to occur.
 - (c) Removal of ACM mechanical insulation found in FAIR condition in ACCESS A is normally recommended to eliminate the potential for future re-damaging of the ACM.
 - .5 Friable or potentially friable forms of ACM found in GOOD condition in ACCESS A is only subject to surveillance under existing regulations provided it is not subject to disturbance by future renovations or maintenance. However, as a matter of corporate policy all such asbestos-containing materials shall be abated on a proactive basis wherever damage is possible by on-going occupant activity (accidental or intentional). This recommendation exceeds current regulatory requirements.
 - .6 Non-friable and/or manufactured products, which are in POOR condition, must be treated the same as friable materials in POOR condition and the appropriate Action assigned.

- .7 For non-friable or manufactured products reported in GOOD condition, Action 7 (Surveillance) shall be assigned regardless of Accessibility.
- .8 Consideration may also be given to whatever other action that can practically be performed to negate the need for the implementation of an Asbestos Management Program (AMP). Such measures may include the removal of ACM prior to renovations or at any other time when a major disturbance of the ACM is anticipated. Removal may also be considered a practical measure when small quantities of ACM are present in a specific area of the vessel.
- 3.2 With these principles in mind the following Action Matrix Table shall be utilized to establish the normal recommended asbestos control action. Note that factors not included in the above discussion may result in a recommendation different from that in the following table.

ACTION MATRIX FOR FRIABLE ASBESTOS MATERIALS					
ACCESS	CONDITION			DEBRIS	SUSPECT MATERIAL
	GOOD	FAIR	POOR		
A	Action 5/7 ¹	Action 5/6 ²	Action 3	Action 1	Action 8
B	Action 7	Action 6	Action 3	Action 1	Action 8
C (Exposed)	Action 7	Action 6	Action 4	Action 2	Action 8
C (Concealed)	Action 7	Action 7	Action 4	Action 2	Action 8
D	Action 7	Action 7	Action 7	Action 7	Action 8
¹ If ACM in ACCESS (A)/GOOD condition is not removed ACTION 7 is required.					
² If ACM in ACCESS (A)/FAIR condition is not removed ACTION 6 is required.					

NON-FRIABLE & POTENTIALLY FRIABLE MATERIALS				
ACCESS	CONDITION			SUSPECT MATERIAL
	GOOD	FAIR	POOR	
A	Action 7	Action 3/ ¹	Action 1	Action 8
B	Action 7	Action 3/ ¹	Action 1	Action 8
C (Exposed)	Action 7	Action 4/ ¹	Action 2	Action 8
C (Concealed)	Action 7	Action 4/ ¹	Action 2	Action 8
D	Action 7	Action 7/ ¹	Action 7	Action 8
¹ Non-friable and potentially friable ACM found in POOR condition shall be treated as friable ACM.				

LEGEND - ACTION MATRIX TABLES

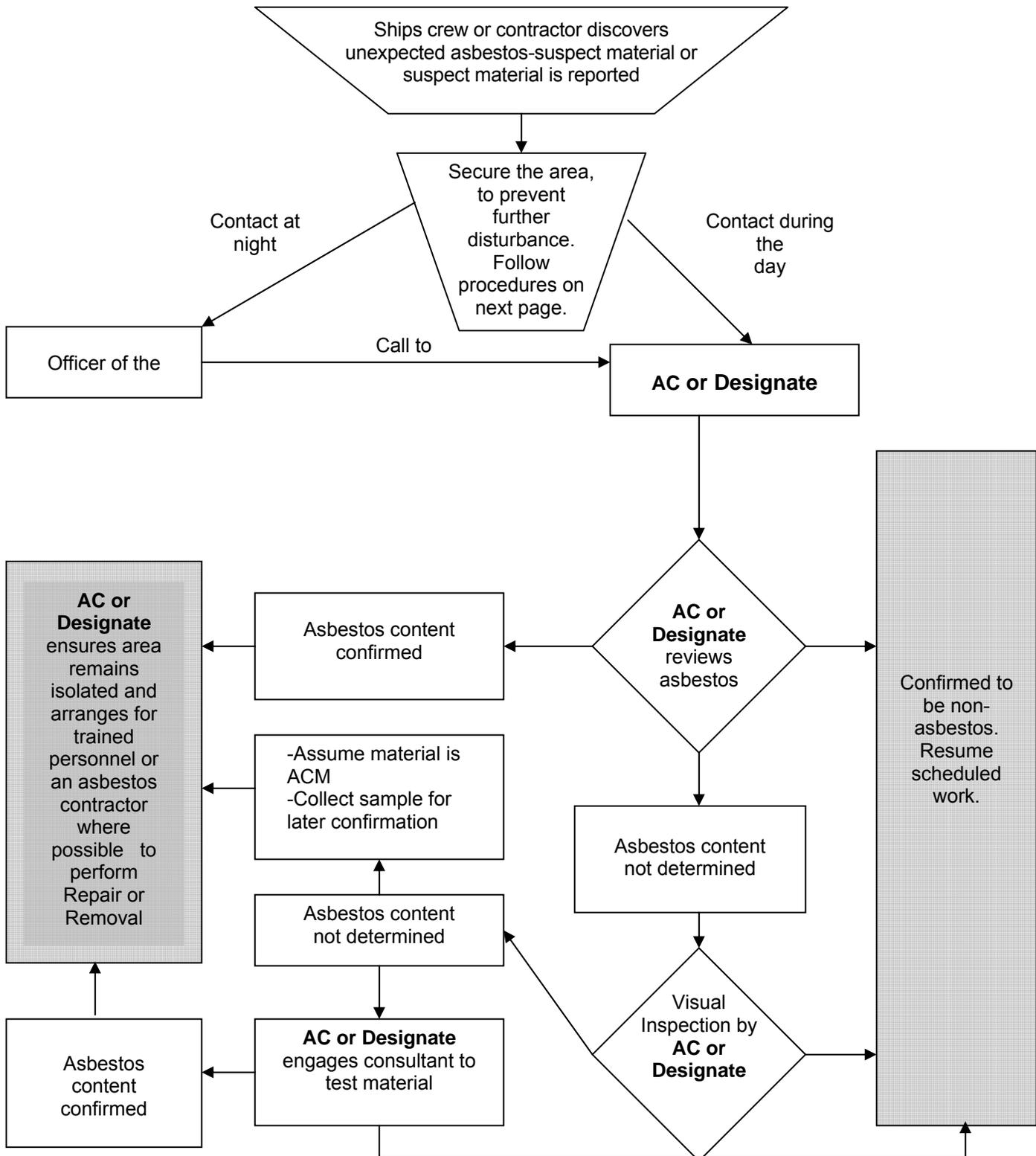
ACTION 1 Immediate Clean-up	Restrict access that is likely to cause a disturbance of the ACM debris and clean-up the ACM debris immediately. Utilize correct asbestos procedures. The surveyor should immediately notify the Asbestos Programs Officer of this condition.
ACTION 2 Type 2 Entry	At locations where ACM debris cannot be practically removed or cleaned-up, restrict access to the area to persons utilizing Type 2 asbestos precautions. The precautions will be required until the ACM debris has been cleaned-up, and the source of the debris has been stabilized or removed.
ACTION 3 Removal	Removal of ACM is required to comply with existing regulations and good practice. Utilize asbestos procedures appropriate to the scope of the removal work being done.
ACTION 4 Type 2 Access	Entry to these spaces which is likely to cause disturbance of the ACM will require Type 2 procedures until the ACM is abated (use ACTION 1 or 2 if debris is present).
ACTION 5 Pro-active Removal	Existing regulations do not require removal, however as a matter of corporate policy, pro-active removal is recommended to avoid any future damage to the material and the resultant concerns.
ACTION 6 Recommended Repair	Repair ACM found in FAIR condition, but not likely to be disturbed during normal use of the area or room. Upon completion of the repair work treat the ACM as material in GOOD condition and implement ACTION 7 .
ACTION 7 Surveillance	No immediate abatement action other than the implementation of the asbestos management program, including routine surveillance and use of asbestos precautions during disturbance of the ACM.
ACTION 8 Assumed/Suspect Materials	Materials that are historically known to possibly contain asbestos but either cannot be sampled due to restricted access or the need to analyze an unreasonable number of samples to confirm with confidence the presence or absence of asbestos, are identified as Suspect Material (SM) (i.e. vinyl floor tiles, smooth plaster on walls or ceilings). These suspect materials are to be considered asbestos-containing with ACTION 7 applying until subsequent sampling confirms the presence or absence of asbestos. Sampling may be most cost-effective prior to disturbance of the suspected ACM by renovation, demolition, or maintenance work.

APPENDIX B: BULK SAMPLE COLLECTION PROCEDURES

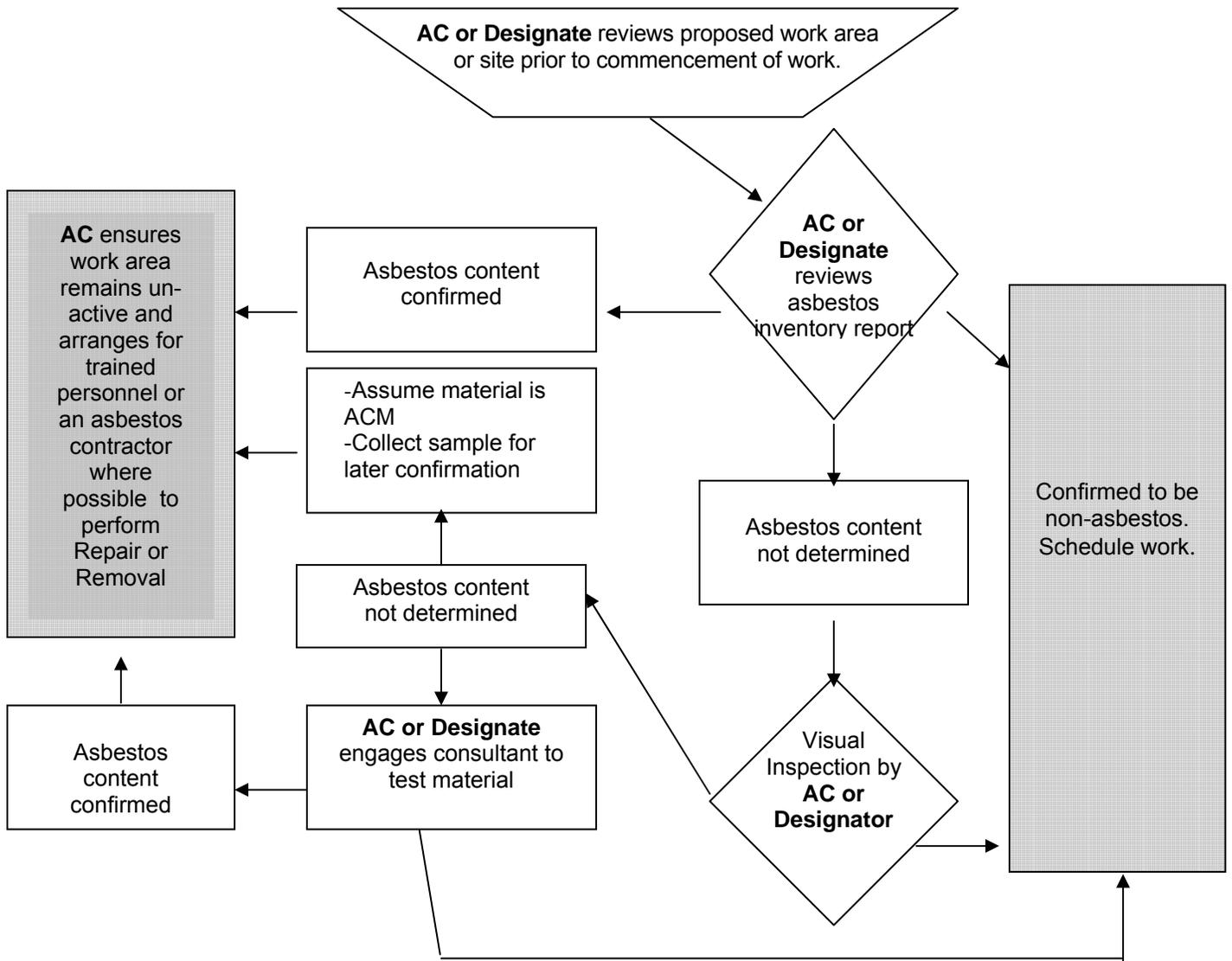
1. Sample the material when the area is not in use. Only those persons needed for sampling should be present in the immediate area.
2. Spray the material with a light mist of water to prevent fibre release during sampling. Do not disturb the material any more than necessary.
3. Materials of different appearance should be sampled separately. Mechanical insulation must be sampled separately on all systems, tanks, vessels, etc. Sample both the straight sections of pre-formed insulation and the insulating cement typically present at elbows, fittings, etc. (unless visually identified as fibreglass).
4. Collect the sample by penetrating the entire depth of the material (since it may have been applied in more than one layer or covered with paint or other protective coating).
5. Depending on the condition of the material, airborne fibres can be generated during sampling. The use of a respirator is required for all sampling.
6. If pieces of material break off during sampling, the contaminated area must be cleaned up with a HEPA vacuum cleaner or by wet cleaning. Any debris generated must be placed in plastic bags, labelled, sealed and disposed of as asbestos waste.
7. Place samples in labelled plastic bags with a zip-lock closure or in sealed plastic vials. Sample amount should be approximately 5-10 grams of the suspect material. For shipment of sample place sample in a second seal container with excessive air removed. Samples shall be identified with the following information:
 - Sample Number
 - Vessel
 - Room Number
 - Date of Sampling
 - Name of Sampler
 - Source of sample e.g. Cold Water Pipe, Cold Water Fitting, etc.
8. Temporarily seal any openings created to collect the sample, for example, with metal foil tape or duct tape wrapped completely around the pipe.

APPENDIX C: WHAT TO DO IN THE EVENT OF FINDING SUSPECTED ASBESTOS

EMERGENCY REACTION IN THE EVENT OF SUSPECTED ASBESTOS SPILL OR A DISCOVERY OF SUSPECT ASBESTOS MATERIAL AND PROCEDURES FOR ASBESTOS REVIEW PRIOR TO MAINTENANCE OR CONTRACTED WORK



**Procedures For Asbestos Review
Prior To Maintenance Or Contracted Work**



APPENDIX D: WORK PRACTICES – EMERGENCY WORK

WORK PRACTICES-EMERGENCY WORK

Emergency asbestos procedures shall be implemented when required in order to protect those undertaking the work, as well as to protect all others from, or limit exposure to, airborne asbestos. Procedures indicated shall be followed as closely as possible, in the event of an emergency situation.

Procedures for asbestos work, required as an immediate response to pipe breaks, Backed sanitary equipment, system isolation, ceiling collapses, or other emergencies that affect asbestos materials, are as follows:

1. Clear area of all occupants.
2. Construct enclosure around area if time and conditions permits.
3. Shut down ventilation system serving area.
4. Worker performing repair shall wear personal protective equipment required for asbestos abatement operations.
5. Use drop sheet under work, if possible, to minimize clean-up.
6. Perform emergency repair with minimum disturbance of asbestos.
7. Obtain asbestos equipment and perform clean-up of visible material. Use HEPA filtered vacuums or wet cleaning. Dispose of all cleaning supplies other than hand tools that may be cleaned for reuse as contaminated waste.
8. The worker should wipe off or vacuum disposable clothing and footwear. Proceed to washroom to wash face and hands.
9. Notify the **AC or their Designate** regarding the asbestos disturbance, before allowing unprotected persons to enter the area. The **AC or their Designate** will contact an Asbestos Consultant if deemed necessary to obtain inspection and air monitoring.
10. The **AC or their Designate** shall investigate the extent of asbestos disturbance, to determine additional actions to be undertaken as a result of this investigation.

APPENDIX E: TYPE 1 ASBESTOS WORK PROCEDURES

These procedures are to be followed by all shipboard personnel and contractors performing the following work on the CCGS Vessels.

- Installation or removal of manufactured asbestos products such as vinyl tiles, gaskets, seals, packings, friction, friction products or asbestos – cement products and acoustic tiles.
- Access to deck head spaces for inspection purposes should be conducted following Type 1 asbestos entry procedures.
- Access to deck head spaces to facilitate a cable pull or pipe repair creating only a minor disturbance, use Type 1 asbestos abatement procedures.

For locations of asbestos materials, refer to the current versions of the Asbestos Survey Report.

NOTE: These Type 1 Asbestos Procedures assume the non-friable material can be removed with relatively little loose dry dust released. Generation of debris is permissible as long as the debris can be well wetted before being removed. If the work will release more than a trivial amount of dry loose dust, do not proceed further with work. The **AC or designate** will determine which of Type 1 or 2 procedures are appropriate.

1. EQUIPMENT

All equipment must be on site before proceeding.

1.1 Vacuum

Use of a vacuum is optional. Wet cleaning methods may be used in place of a vacuum. If a vacuum is used it must be equipped with a high efficiency particulate arresting (HEPA) filter and all brushes, fittings, etc. The vacuum **must only** be opened to be cleaned or dislodging of blocked objects in an enclosure following Type 2 procedures. The vacuum exterior should be carefully wet cleaned after each use or after each emptying.

1.2 Respirators

Workers within the work area shall wear approved respirators. Respirators and filters will be provided by the employer, and individually assigned to workers. The employer will supply a half face respirator with HEPA filters, with training on use and qualitative fit testing. Respirators must be used according to written use procedures provided to workers as per training procedures. Filters must be changed after 24 hours of wear or sooner if breathing resistance increases as filters become damp. No person using a respirator shall wear facial hair that affects the seal between respirator and face.

1.3 Protective Clothing

Disposable clothing is required. Disposable clothing and respirator filters are to be disposed of as asbestos waste.

1.4 Other Equipment

- plastic sheet (6 mil polyethylene) - to serve as a drop sheet.
- pump sprayer with misting nozzle or alternative method to wet material.
- labelled yellow asbestos waste bags (6 mil) - for all asbestos waste, disposable equipment, plastic, etc.
- small tools and cleaning supplies - e.g. scouring pads, sponges, brushes, buckets, etc.

2. OTHER PROTECTIVE MEASURES

- Do not eat, drink or smoke in the work area.
- Upon leaving the work area, proceed to the washroom and wash all exposed skin on hands and face.

3. PREPARATION

- Before disturbing non-friable asbestos materials, cover floor (vinyl tile excepted) and surfaces below work with polyethylene sheeting to catch debris.
- Wherever dust on a surface is likely to be disturbed, pre-clean and remove using a HEPA vacuum or damp cloth.

4. EXECUTION

4.1 Removal of Other Non-Friable Asbestos Materials

- 4.1.1 The Type 1 procedures apply only to materials that can be removed intact, or in sections, without producing a pulverized or powdered waste. This method is most applicable to transite.
- 4.1.2 Wet all material to be disturbed.
- 4.1.3 Place removed material into asbestos waste receptor. Clean surrounding surfaces and asbestos work area frequently with HEPA vacuum or with wet methods (i.e. damp cloth disposed of as asbestos waste after cleaning).
- 4.1.4 Drop sheets that are not cleaned shall be disposed of as asbestos waste.

4.2 WASTE TRANSPORT AND DISPOSAL

- 4.2.1 Place waste into asbestos labelled disposal bag, seal with tape, clean the exterior of the bag with a clean cloth, and place into a second clean bag, also to be sealed with tape.
- 4.2.2 Provide storage area for holding minor amounts of asbestos waste in sealed containers. Garbage containers shall be labelled and assigned exclusively for asbestos waste.
- 4.2.3 When waste is removed from site, collect the completed waste waybills from the disposal firm. For work performed by a contractor, the contractor will complete and provide to the **AC** copies of the waste manifest. Waste generated on the vessel will be stored at a secure location until an appropriate time and location for disposal. Disposal of waste is to comply with the appropriate regulatory body requirements respecting the disposal of asbestos waste.

APPENDIX F: TYPE 2 ASBESTOS WORK PROCEDURES

These procedures are to be followed by all shipboard personnel and contractors performing the following work on the CCGS Vessels.

- Entry into any ceiling space, wall chase or other area in which excessive asbestos-containing debris is present.
- Entry into any ceiling space, wall chase or other area in which friable asbestos-containing debris is present.
- Clean up of asbestos-containing debris from mechanical insulations or sprayed fireproofing.
- Enclosure of friable material containing asbestos.
- Repair (such as application of tape or sealant or other covering) of any extent of asbestos mechanical insulation.
- Removal of any extent of asbestos-containing vinyl sheet flooring. Note: If power tools such as grinders are required to remove all paper backing from the substrate Type 3 procedures must be utilized.
- Removal of minor amounts of friable asbestos-containing materials including, texture coat, sprayed fireproofing and mechanical insulation. (Minor removal is defined by to wet removal of less than 10 square feet or an equivalent amount of pipe insulation).

1. EQUIPMENT

Equipment required for the work must be on site before proceeding.

1.1 VACUUM

An asbestos-approved vacuum (HEPA filtered) equipped with brushes, fittings, etc. A fully protected worker within a Type 2 enclosure can only open a HEPA vacuum.

1.2 RESPIRATORS

Workers within the work area shall wear a approved respirator. Respirators and filters will be provided by the employer, and individually assigned to workers. Respirator shall be a half face respirator with high efficiency filters. Respirators must be kept in position on the face during the entire time the worker is in the Type 2 Work Area. This is the period from the first removal of the deck head panel, opening of hatches or the first disturbance of the asbestos material. Change filters after 24 hours of wear or sooner if breathing resistance increases as filters become damp. No person wearing a respirator shall wear facial hair, which affects seal between respirator and face.

1.3 PROTECTIVE CLOTHING

All workers shall wear disposable coveralls with attached elasticized hood (i.e. Tyvek®). Coveralls should be worn with the hood in place at all times. Suit and head cover shall remain in place until worker leaves the Type 2 enclosure or work area. Boot covers are required if wet wiping or HEPA vacuuming cannot effectively clean footwear.

1.4 OTHER EQUIPMENT

- plastic sheet (6 mil polyethylene) - to erect a total enclosure or to serve as drop sheet;
- wood framing or clips to support polyethylene sheeting, as appropriate to work area
- duct tape to fasten plastic enclosure to ceiling, walls, or to tape drop sheet to floor; 3/4" double-sided tape recommended for attaching polyethylene to T-bar ceiling
- labelled asbestos waste bag (6 mil) - for all asbestos waste, disposable suit, plastic for disposal, etc.;
- pump sprayer containing water with wetting agent to wet asbestos as necessary; dilute wetting agent 2 oz per gallon of water.
- asbestos warning signs
- cleaning supplies - e.g. scouring pads, sponges, brushes, buckets, etc.
- insulation repair supplies (lagging compound, cloth, PVC covers)
- encapsulating sealer, for brush or airless spray application

2. OTHER PROTECTIVE MEASURES

- 2.1 Do not eat, drink or smoke in the work area.
- 2.2 On completing clean up of work area, use vacuum or wet cloth to clean hands respirator and boots, and wet cloth remaining exposed skin on face while remaining in the work area. Remove protective equipment and proceed to nearest washroom to thoroughly wash exposed skin on hands and face.

3. SCHEDULING OF WORK

- 3.1 Schedule work in a manner that minimizes access near the removal areas by ship board personnel. If persons are present, do not start work.
- 3.2 If work is required on an emergency basis and the area is occupied, the **AC or Their Designate** or an assigned representative is to advise occupants to vacate area until work is complete and clearance is given to return.

4. PREPARATION

- 4.1 Shut down ventilation systems to and from the work area. Seal over all ventilation openings, diffusers, grilles, etc. with plastic and tape.
- 4.2 Where practical, clear areas of movable furnishings or equipment. This should include anything which occupants may wish to use during work period. Any furnishings or equipment not removed shall be adequately covered and sealed using 6-mil polyethylene and tape. The intent of the protection is to provide an airtight envelope to protect the articles from airborne dust or splashed debris.
- 4.3 Post signs to indicate asbestos hazard and requirement for protective clothing for anyone entering the space.
- 4.4 For small rooms, cover walls with plastic such that the complete room becomes the work area. For larger rooms, erect enclosure of 6-mil polyethylene of suitable dimensions to enclose the work area. The enclosure shall extend to the underside of the deck head panel. The enclosure shall be as airtight as conditions permit including the provision of a double overlapping flap at the entrance. The floor of the work area shall be a layer of 6-mil polyethylene sealed to the plastic walls of the enclosure.
- 4.5 Don protective clothing and respirator prior to disturbing any asbestos-containing materials in Type 2 enclosure.

5. EXECUTION

- 5.1 Removed Asbestos-containing materials should be placed directly into 6 mil polyethylene bags as they are removed. Avoid dropping material to floor wherever possible. After bulk removal is complete, brush clean completely, and wet wash the exposed surface.
- 5.2 Frequently, and at regular intervals during the work, clean up dust and waste in the work area by wet mopping, placing in disposal bags, or by HEPA vacuuming.
- 5.3 Apply sealer coat to surfaces from which asbestos material was removed.
- 5.4 At completion of work, decontaminate equipment, tools and materials used in the work area by wet cleaning or HEPA vacuum.
- 5.5 Dispose of drop sheets and enclosures by wetting the polyethylene, then folding into disposal bags. Do not reuse drop sheets or enclosures.
- 5.6 Before leaving work area, decontaminate shoes and protective clothing by using HEPA vacuum or damp wiping. When protective clothing is to be disposed of, it shall be decontaminated as above and placed in labelled disposal bags. Workers shall wash all exposed skin, and vacuum suit and respirator, and proceed to nearest washroom to thoroughly wash hands, face and all exposed skin.

6. WASTE TRANSPORT AND DISPOSAL

- 6.1 Place waste into asbestos labelled yellow disposal bag, seal with tape, clean the bag, and place into a second clean bag, also to be sealed with tape.
- 6.2 Provide storage area for holding minor amounts of asbestos waste in sealed containers. Containers shall be labelled and assigned exclusively for asbestos waste.
- 6.3 When waste is removed from site, collect copies of the waste waybills from the disposal firm. For work performed by a contractor, the contractor will complete and provide to the **AC** copies of a waste manifest. Waste generated by personnel will be stored in a secure location until sufficient accumulates for a waste pick-up. Disposal of waste is to comply with the appropriate regulatory body requirements respecting the disposal of asbestos waste.

APPENDIX G: GLOVE BAG ASBESTOS WORK PROCEDURES

These procedures are to be followed by shipboard personnel and contractors performing the following work on the CCGS Vessels.

- using glove bags to remove asbestos pipe insulation from piping systems.

1. EQUIPMENT

All equipment must be on site before proceeding with the work.

Glove Bag

Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl-chloride bag with integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elasticized port. Bag shall be equipped with reversible double-pull double throw zipper on top. Bag must incorporate internal closure strip if it is to be removed from pipe for re-use elsewhere. Provide size and configuration appropriate for insulation to be removed. The bag must be disposed of once filled. Bag shall not be emptied and reused.

Securing Straps

Reusable nylon straps at least 1" wide with metal buckle for sealing ends of bags around pipe and/or insulation. Duct tape may be used as a safe substitute for straps.

Water Sprayer

Garden reservoir type, low velocity, capable of producing mist or fine spray with water containing wetting agent.

HEPA Vacuum

High Efficiency Particulate Air (HEPA) filtered, with various fittings (brush, floor, wand, crevice tool).

Respirators

Workers using glove bag must wear approved respiratory protection. Respirators and filters must be provided by the employer, and individually assigned to workers. Respiratory protection must be equal to or exceed protection of half-face respirator with high efficiency filters. Respirators must be kept in position from the time the worker attaches bag to pipe until final cleaning of the pipe and bagging of waste is completed. Filters shall be changed after 24 hours of wear or sooner if breathing resistance increases. No person using respirator shall wear facial hair which affects the seal between respirator and face.

Protective Clothing

Workers shall wear disposable coveralls with attached elasticized hood (i.e. Tyvek®). Coveralls and hood shall remain in place until worker completes cleaning of pipe. Suit may be disposed of as asbestos waste.

Other Equipment

Labelled asbestos waste bags (6 mil) - for all asbestos waste in glove bag, disposable suit, cleaning materials, etc.

- asbestos warning signs
- wire saw - saw with flexible serrated wire blade and handles to allow use inside glove bag
- knife with fully retractable blade for use inside glove bag
- plastic sheet (2 mil polyethylene) to cover exposed or damaged section of pipe prior to attaching glove bag and to cover exposed openings or voids in the proximity of the Glove Bag operation.
- plastic drop sheet (6 mil polyethylene) to protect furnishings, flooring or equipment in the event of a spill.
- tape - to fasten plastic
- cleaning supplies e.g. scouring pads, sponges, brushes, buckets, etc.
- high temperature sealer
- wire cutters, snips

2. OTHER PROTECTIVE MEASURES

Do not eat, drink or smoke in the work area.

On completing clean up of work area, use HEPA vacuum or wet cloth to clean hands, respirator and boots, and wet cloth remaining exposed skin on face while remaining in the work area. Remove protective equipment and proceed to nearest washroom to thoroughly wash all exposed skin on hands and face.

3. SCHEDULING OF WORK

- 3.1** Schedule work in a manner that minimizes the potential for ships crew to be exposed to asbestos fibres during removal operations.

4. PREPARATION

- 4.1 Where practical, clear area below pipe of moveable furnishing or equipment. Provide scaffold as required to reach pipe.
- 4.2 Install plastic drop sheet over furnishings, flooring or equipment for protection in the event of a spill. Drop sheet shall be sufficient size to capture any material dislodged from the pipe.
- 4.3 Post an asbestos warning sign at all entrances to room in which the procedure is being used. If necessary use rope or tape barriers to separate work area.
- 4.4 Disable ventilation system in area of Glove Bag operation.
- 4.5 Seal voids and openings in the proximity of the Glove Bag operation, including ventilation ducts.
- 4.6 Pre-clean with HEPA vacuum or wet methods any loose material on any surface in the work area. If significant amount of material is on deck, Type 2 procedures may be required for clean up. (See Type 2 Procedures.)
- 4.7 Check condition of pipe insulation where removal will be performed. If the insulation has minor damage, mist surface and patch with tape. If damage is more extensive, wrap pipe with plastic and "candy stripe" with duct tape first. If pipe insulation is severely damaged and cannot be simply repaired, glove bag is not appropriate. (Use Type 2 Procedures.)
- 4.8 Place necessary tools in bottom of glove bag.

5. EXECUTION

- 5.1 Zip the bag onto the pipe and seal each end to the pipe with the securing straps. Do not pull the bag tightly to the ends - a small amount of slack allows better room to work within the bag. If a vertical bag is in use, ensure lower strap passes through plastic grommet and cloth tab on zipper.
- 5.2 Place hands into gloves and use necessary tools (wire saw, utility knife, wire cutters) to remove insulation from pipe. Arrange insulation in bottom of bag to obtain full capacity of bag. Roll metal jacketing carefully to minimize ripping or puncturing of the bag.
- 5.3 Insert nozzle of spray pump into bag through valve and wash pipe and interior of upper section of bag thoroughly. Use one hand to aid washing process. Wet surface of insulation in lower section of bag and any exposed ends of asbestos insulation remaining on pipe.
- 5.4 If bag is to be removed from a pipe for use on a new section of pipe, seal internal zip-lock closure. Insert HEPA vacuum hose into Glove Bag through the elasticized valve and extract air from within the bag. Re-install and seal in new location before reopening closure.

-
- 5.5** If bag is to be moved along the same pipe, loosen securing straps, move bag, re-seal to pipe using double-pull zipper to pass hangers. Repeat insulation removal operation.
- 5.6** If during use the glove bag is ripped, cut or opened in any way, cease work and repair opening or replace with a new bag before continuing work. All spilled material must be cleaned up and removed with a HEPA vacuum or wet cleaning.
- 5.7** To remove bag after completion of insulation removal, thoroughly wash top section of bag and tools and seal internal zip-lock closure. Place tools in one glove, pull hand out inverted, twist to create a separate pouch, tape inside-out glove at two separate locations 1" apart to seal pouch. Remove inside-out glove and tools by cutting between the tape seals. Insert HEPA vacuum hose into Glove Bag through the elasticized valve and extract air from within the bag.
- 5.8** Pull a 6-mil polyethylene bag over glove bag before removing from pipe. Remove securing straps. Unfasten zipper. Seal glove bag and seal 6-mil polyethylene bag to create an asbestos waste container.
- 5.9** Place glove pouch and tools into the next clean glove bag to be used. Alternately, place the tool pouch into water bucket, open pouch underwater and clean tools, then allow to dry.
- 5.10** After removal of bag ensure pipe is clean of all residue. If necessary, after removal of each section of asbestos, vacuum all surfaces of pipe, using HEPA filtered vacuum equipment or wipe with wet cloth.
- 5.11** Seal all surfaces of freshly exposed pipe with encapsulating sealer to tack-down any residual dust. Cover exposed ends of any remaining asbestos insulation with lagging cloth or tape.
- 5.12** Before leaving work area, a worker shall decontaminate his shoes and protective clothing by using HEPA vacuum or damp wiping. When protective clothing is to be disposed of, it shall be decontaminated as above and placed in labelled disposal bags. Workers shall wet cloth all exposed skin and vacuum, suit, respirator and hair (after removing hood) and proceed to nearest washroom to thoroughly wash hands and face.

6. WASTE TRANSPORT AND DISPOSAL

- 6.1** Provide storage area for holding minor amounts of asbestos waste in sealed containers. Containers shall be labelled and assigned exclusively for asbestos waste.
- 6.2** When waste is removed from site, collect the completed waste waybills from the disposal firm. For work performed by a contractor, the contractor will complete and transfer copies of the waste manifest, on behalf of the owner. Waste generated by shipboard personnel will be stored at a secure location until an appropriate time for a waste pick-up. Disposal of waste is to comply with the appropriate regulator body requirements respecting the disposal of asbestos waste.

APPENDIX H: RESPIRATOR FITTING, INSPECTION, CLEANING AND DISINFECTION

NOTES FOR AIR PURIFYING HALF FACE RESPIRATORS

WARNING: This respirator does not supply oxygen. It must not be used in oxygen deficient atmospheres (less than 19.5%); in poorly ventilated areas or enclosed spaces such as tanks or small rooms; for abrasive blasting or fire fighting; or for protection against contaminants excluded or not covered by the applicable Approval Label.

Respirators must be approved for protection against asbestos. Check for NIOSH certification as outline in the asbestos awareness training seminars.

1. Respirator Fitting

- 1.1 Persons required to wear respirators must first pass a qualitative fit-test administered according to the current version of CSA standard Z-94.4. The fit-test should be repeated yearly.
- 1.2 The respirator wearer must be clean-shaven along all the seal points for proper protection. Even stubble growth may be sufficient to reduce the seal of the face piece, and therefore the protection. The respirator approval is voided for users with facial hair that interferes with the seal.

2. Check Prior To Each Use

2.1 Examine respirator for:

- dirt (clean if necessary);
- cracks, tears or holes (obtain new respirator);
- distortion and inflexibility
- crack or breaks in filter holders, worn threads and missing gaskets.
- Examine head straps for:
 - breaks or tears;
 - loss of elasticity;
 - broken or malfunctioning buckles and attachments.

2.2 Examine valves for:

- detergent residue, dust or other material on valves or valve seats (clean before use);
- cracks, tears or distortion in the valve material;
- missing or defective valves or valve covers .

2.3 Examine filter for:

- proper filter for protection against asbestos (High Efficiency Particulate/P100)
- incorrect installation, loose connections, missing or worn gaskets or cross threading (remove and re-install);
- cracks or dents in filter housing (replace).

2.4 Perform the following tests for leaks on each donning of the respirator:

- negative pressure test: cover inlets to filters, breathe in and hold breath; respirator should be drawn to face for minimum of 10 seconds (if not, check exhalation valve and fit)
- positive pressure test: cover exhalation valve cover and puff out slightly and hold breath; respirator should slightly pressurize and still hold seal (if not, check inhalation valves and fit)

3. Respirator Cleaning And Disinfection**3.1** Remove filters.

3.2 Wash respirator in warm water (50°C - 60°C) with mild detergent, using a brush. Respirator suppliers can provide ready-made cleaning and disinfectant solutions and instructions for use.

3.3 Thoroughly rinse respirator in clean, warm water.

3.4 Air dry or hand dry components with a clean, lint-free cloth.

APPENDIX I: ASBESTOS WORK RECORD AND WORK PERMIT FORM

ASBESTOS WORK RECORD

AREA: _____

DESCRIPTION OF WORK: _____

DATE WORK REQUESTED: _____

SUPERVISOR RESPONSIBLE FOR WORK: _____

CLASSIFICATION OF WORK:

- ↑ TYPE 1
- ↑ TYPE 2 REMOVAL (Emergency Only)
- ↑ TYPE 2 ASBESTOS CLEAN-UP
- ↑ TYPE 3 REMOVAL (as performed by outside contractors)

DATE PERFORMED: _____

START/STOP TIMES: _____

VESSEL PERSONNEL OR CONTRACTOR: _____

ASBESTOS COORDINATOR: _____

ASBESTOS WORKERS: _____

ASBESTOS WORK RECORD TO BE INITIATED BY **AC OR THEIR DESIGNATE**. ORIGINAL WORK RECORD TO BE KEPT ON FILE WITH THE ASBESTOS MANAGEMENT PROGRAM DOCUMENT WITH COPIES TO BE SENT TO CONTRACTOR RESPONSIBLE FOR WORK. PREPARE SEPARATE ASBESTOS RECORD FOR ALL WORK ORDERS OR PROJECTS.

APPENDIX J: WORKER TRAINING RECORD**CERTIFICATE OF WORKER'S TRAINING**

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBRES CAN CAUSE VARIOUS TYPES OF LUNG DISEASE INCLUDING CANCER. SMOKING INCREASES THE RISK OF LUNG CANCER FROM ASBESTOS EXPOSURE.

RESPIRATOR PROTECTION: I have been supplied with a respirator and received training for its proper use including qualitative fit testing. I understand that I must be free of any facial hair which may interfere with the seal of the respirator to my face. I understand that retesting or respirator fit-testing is required annually.

MEDICAL EXAMINATION: Medical examinations may be required for workers performing asbestos work. I acknowledge that I may have to undergo the necessary tests as prescribed by the Department of Environment and Labour of this province or the Canada Labour Code Occupational Safety and Health Regulations, Subsection 124.

TRAINING COURSE: I have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Work practices including hands-on or on-job training for (tick as appropriate)

- ┆ Type 1 procedures
- ┆ Type 2 procedures
- ┆ Personal decontamination procedures

By signing this certificate, I acknowledge that I have received the above training and agree to follow these procedures for all work assigned to me.

EMPLOYEE NAME: _____

EMPLOYEE LOCATION: _____

RESPIRATOR MANUFACTURER: _____ SIZE: _____

SIGNATURE: _____ DATE: _____

TRAINER: _____ DATE: _____

APPENDIX K: CONTRACTOR NOTIFICATION

CONTRACTOR NOTIFICATION AND ACKNOWLEDGEMENT FORM

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBRES CAN CAUSE VARIOUS TYPES OF LUNG DISEASE INCLUDING CANCER. SMOKING INCREASES THE RISK OF LUNG CANCER FROM ASBESTOS EXPOSURE.

CCG has identified the presence of various non-friable asbestos materials in the CCGS Vessels. An asbestos inventory report showing the locations and amounts of these materials is available for viewing from the **AC OR THEIR DESIGNATE**.

The disturbance of asbestos vessel materials shall only be undertaken by contractors who have received training in asbestos-related precautions. The following activities may disturb friable asbestos materials (All classifications of work). The **AC OR THEIR DESIGNATE** must be notified prior to performing the following:

- Ceiling entry which may disturb asbestos;
- Any other operation which may generate airborne asbestos.

There are also non-friable asbestos materials in the vessels, including gaskets and packings, etc.

As a condition of our contract to provide services and materials, this company will not disturb asbestos-containing materials without prior notification to the **AC OR THEIR DESIGNATE**. This firm and its workers, will follow all procedures specified by CCG and/or the applicable provincial/federal regulation. All asbestos waste will be packaged and disposed of in accordance with Department of the Environment requirements.

COMPANY NAME: _____

SIGNATURE: _____ DATE: _____

NAME AND TITLE: _____

APPENDIX L: REASSESSMENT FORM

ANNUAL REASSESSMENT SURVEY INFORMATION

Upon completion of Annual Reassessment Survey, fill out the following form in its entirety and file in this vessel's Asbestos Management Plan and/or survey. Provide a copy to **Health and Safety Committee**.

Dates of Asbestos Reassessment Survey:

Organization completing Asbestos Reassessment Survey:

Names of all in attendance:

Representing:

Surveyor # 1:

Surveyor # 2:

Other:

Other:

Other:

Other:

Location of Survey

Summary of survey findings:

Signature of Surveyor # 1:

Signature of Surveyor # 2:

APPENDIX M: EQUIPMENT FOR ASBESTOS MANAGEMENT PROGRAM

1. PROTECTIVE EQUIPMENT AND APPAREL

Respirators, half face air purifying, with P100 cartridge filters. Respirators should be individually assigned. Acceptable product: i.e. MSA Advantage 200 series respirator with P100 filters.

Disposable coveralls, full body, with integral hood and elastic at cuffs and wrists. Extra-large size (Tyvek) suits are recommended.

Rubber boots, or heavy duty boot covers, to ease cleaning of footwear after use. As an alternate, disposable boot covers.

Respirator wiping/sanitizing pads.

2. EQUIPMENT

Vacuum cleaner, High Efficiency Particulate Air (HEPA) filtered, with various fittings (brush, floor, wand, crevice), Extension hose is necessary for ceiling entry work.

Water sprayer, manual garden-type, with nozzle capable of fine mist spray.

Signs, warning of asbestos work area.

Small tools, i.e., buckets, sponges, scrapers, retractable blade utility knives, wire brushes, tin snips, cleaning/scouring pads (Scotchbrite pads).

3. SUPPLIES

Disposal bags, 6 mil minimum thickness, labelled as asbestos waste.

Polyethylene sheeting, 6 mil thickness, 10' or 12' width, width dependent on ceiling height.

Duct tape, fibre-reinforced, 2" wide.

Wetting agent, Asbestos-Wet or other surface active agent to enhance water penetration.

APPENDIX N: BACKGROUND INFORMATION ON ASBESTOS MATERIALS IN VESSELS AND HEALTH HAZARDS

1. BACKGROUND ON ASBESTOS

Occurrence and Types of Asbestos

Asbestos is not one mineral but a generic term used to describe a family of naturally occurring fibrous hydrated silicates. These are divided on the basis of mineralogical features into two groups; serpentines and amphiboles. The important property of asbestos as compared to non-asbestiform varieties of silicates is the presence of long, thin fibres that can be easily separated. According to some definitions, there are as many as thirty varieties of asbestos, but only six are of commercial importance. Chrysotile, which is by far the most abundant, is the only type that belongs to the serpentine group. Crocidolite and amosite, the two other most commonly used fibres, together with anthophyllite, tremolite, and actinolite belong to the amphibole group. The distinction between asbestos types is important due to the different degrees of severity of asbestos related disease with different asbestos types. Of the three commercially important types (chrysotile, amosite and crocidolite), chrysotile is considered the least hazardous. In general, Canadian regulations reflect this variation of health effects.

Health Effects of Asbestos

For many years asbestos has been recognized as a health hazard for workers employed in asbestos mining, processing and installing of asbestos products. Several serious, debilitating diseases that often end in death have been linked to the inhalation of fine asbestos fibres. It is not clear how asbestos fibres cause disease after they enter the lung. For each disease there is a period of latency, usually more than ten years, between first exposure to asbestos and the appearance of the disease. The diseases linked to asbestos exposure are described below.

Asbestosis: Asbestosis is a fibrosis (scarring) of the lung tissue, which makes breathing difficult. The most prominent symptom is breathlessness. Detection of asbestosis is by physical examination, X-ray examination and lung function testing. The disease is irreversible and may continue to progress even after exposure is stopped. Rarely a cause of death itself, asbestosis results in an appreciable reduction in life expectancy due to deaths from related illnesses. Asbestosis will develop only with chronic exposure to high levels of airborne asbestos.

Mesothelioma: This is a rare cancer of the cells of the pleura (lining of the chest cavity and lungs) and the peritoneum (lining of the abdominal cavity). The development of mesothelioma is characterized by a long latency period, usually at least 15 years and sometimes more than 40. There is no effective treatment for mesothelioma. Large proportions of mesothelioma patients die within a year of diagnosis; few survive longer than five years. The amphibole asbestos materials are considered more important than

chrysotile in the causation of mesothelioma. Although asbestos was once thought to be responsible for all mesothelioma, other causes have now been identified. Still, the chance of getting mesothelioma in the absence of asbestos exposure is considered to be extremely remote. Mesothelioma is a very rare cancer in the general population.

Lung Cancer: Unlike asbestosis and mesothelioma, lung cancer is not associated only with asbestos exposure. Cigarette smoking has been and continues to be the major cause of lung cancer. Furthermore, there is no basic difference between lung cancer caused by asbestos and that due to other causes. In general, the risk of getting lung cancer increases with the extent of asbestos exposure, in terms of both intensity and duration. This risk is also greatly enhanced by smoking; most asbestos workers who develop lung cancer are smokers. There is no difference in the risk for lung cancer between chrysotile and the amphibole asbestos minerals.

Other Asbestos-Related Cancers: The relationship between asbestos exposure and asbestosis, mesothelioma and lung cancer has been clearly established and is beyond argument. Several other cancers have also been associated with inhalation of asbestos. Although the evidence is not as good as for the diseases discussed above, these cancers should be noted. They are gastrointestinal cancer affecting all sites in the gastrointestinal tract (oesophagus, stomach, colon and rectum) and cancer of the larynx. The elevated risks of these diseases in the most heavily exposed asbestos workers have always been much less than the elevated risk for lung cancer and mesothelioma. If asbestos exposures are controlled to prevent any increase in lung cancer or mesothelioma risk, the other potential cancer risks should also be well controlled.

Other Asbestos-Related Conditions: A number of less serious effects have been associated with asbestos exposure, namely pleural plaques and asbestos warts. Pleural plaques are areas of scarring of the pleural surfaces. In general, they are not associated with any functional abnormality and are merely an indicator of asbestos exposure. Asbestos warts are harmless skin growths that occur when asbestos fibres penetrate the skin. These will usually retract when exposure ceases.

2. USES OF ASBESTOS IN VESSEL MATERIALS

Asbestos has been widely used in vessels and several uses continue today. The uses of asbestos are generally classed into two groups for purposes of hazard assessment; friable and non-friable products. A friable material is a material that when dry can be crumbled, pulverized or powdered by hand pressure. The use of friable materials in construction is banned today but due to the widespread use of friable materials in the past, these materials still are present in many vessels. In order to establish an asbestos management program, the possible uses of asbestos must be known. These are discussed below in the categories of non-friable, potentially friable and friable products.

Non-Friable Asbestos Materials

2.1.1 Asbestos-cement (A/C) Products

The largest use of asbestos, in terms of the tonnage of fibres employed, is as a reinforcing agent in cement products. Asbestos-reinforced cement is strong, durable, rigid and resistant to both fire and weather. Portland cement, water and asbestos are mixed to form a slurry from which end-products can be fabricated by a process similar to that used in paper making. Products include sheets, pipes and a wide variety of other shapes. The asbestos fibre content of A/C products is usually about 15 percent.

Asbestos-cement sheet is produced in four basis forms: flat sheet, corrugated sheet, siding shingles and roofing shingles. The main use of A/C sheet is for the roofing and cladding of vessels. Other uses are ceiling tiles, decorative panelling, electrical insulation and laboratory tabletops. Asbestos-cement pipe is used for water supply, sewage, irrigation, drainage applications, the transport of corrosive chemical fluids, and electric and telephone conduits. Asbestos cement products are still in production. Non-asbestos substitute cement products are available for some though not all asbestos products.

2.1.2 Gaskets and Packings

The combination of long asbestos fibres and high temperature rubbers has provided some of the best gasket materials. The asbestos, in bulk fibre, woven, or plaited form, provides strength and temperature resistance, while the rubber or synthetic compound acts as binder and sealing material. Asbestos yarns have been commonly used in the manufacture of braided and woven packing materials. Many of these uses, particularly in sheet forms are still in production and use.

2.1.3 Coatings and Sealants

Asbestos has been used in roof coatings and cement and, to a lesser extent, in sealants and caulks. Roof coatings consist of asphalt liquefied with solvents and asbestos fibre filler. Roof cements are similar, but are formulated to a thicker consistency so that they can be used to seal openings through which a liquid coating would flow. Some of these are still in production.

2.1.4 Paper Products

Asbestos paper products have been used in a wide variety of applications. Among the most important in construction are roofing felt, gaskets, pipeline wrap, millboard and electrical insulation. Some of these applications are discussed under the headings "Insulation" and "Gaskets and Packings".

2.1.5 Plastics

Asbestos has been used as a reinforcing agent in a wide range of asbestos/polymer composites. Applications include, floor tiles, engine housings, bins and containers, and a variety of coatings, adhesives, caulks, sealants and patching compounds. Two areas have dominated asbestos use in plastics: phenolic moulding compounds and vinyl-asbestos tile. Few of these products remain in production.

2.1.6 Asbestos Textiles

Asbestos textile materials are predominantly manufactured from chrysotile fibres. Two types of yarn are produced: plain, possibly braced with organic fibres, and reinforced, which incorporates either wire or another yarn such as nylon, cotton or polyester. Major uses for asbestos textiles are gaskets, packings, friction materials, thermal and electrical insulation, and fire resistant applications, e.g. welding curtains, protective clothing, theatre curtains, hot conveyor belts and ironing board covers. These products may be considered or become friable in use. Asbestos textiles are no longer in widespread production.

2.1.7 Friction Materials

Asbestos has been used in the manufacture of brake and clutch linings and pads. The asbestos fibres may be embedded in a phenolic resin with various mixtures of fillers or a woven asbestos cloth may be impregnated with the resin. Friction products are primarily used in vehicles but may be used in any rotating machinery, for example elevators or printing presses. They are still widely produced and used.

2.1.8 Acoustic Ceiling Tiles

Some types of mineral wool type acoustic ceiling tiles were formulated with asbestos from the early 1960's. The use of asbestos in ceiling tiles was discontinued in the early 1980's. Analytical testing is required to distinguish the asbestos and non-asbestos ceiling tiles. From field experience at Pinchin LeBlanc Environmental Ltd., the fire-rated tiles are more likely to contain asbestos. Amosite was the predominant fibre type used. Acoustic tile, particularly if splined or glued on, can become friable or release dust when removed. They are usually considered non-friable as they are normally handled intact.

2.1.9 Drywall Joint Compound

Drywall joint compound also contained asbestos until the early 1980's. The concentration is quite low (again less than 5%, often around 1% and always chrysotile). The product in place is quite hard and is treated as non-friable (except in British Columbia).

Potentially Friable Plaster

Asbestos was used in random fashion in the brown coat and surface coat of smooth plaster finishes. This has been used at a low level (less than 10% in most cases). In many instances the asbestos content is less than 1% or even less than 0.5%. This is often due to the presence of vermiculite in plaster. Vermiculite frequently contains actinolite or chrysotile as an impurity which contributes to the asbestos content.

Plaster is non-friable in place but removal is impossible without causing it to become friable. This is significantly different than lay-in acoustic tiles or transite boards which can be removed intact.

Friable Asbestos Materials

Friable asbestos products are the main concern of the public and the asbestos management program due to the ease of fibre release. None of the products are still in production in North America or Europe.

2.1.10 Fireproofing or Sprayed Insulation

Several types of fireproofing or insulation were applied by spraying or trowel application in the period from the mid 1930's to 1974. Fibrous products were spray applied after being blown as a dry mix through an application gun. These products may contain up to 90% asbestos and any of the three major types (chrysotile, amosite or crocidolite). Cementitious products were trowelled or sprayed as a wet slurry. These were harder products that did not contain more than 25% asbestos. Only chrysotile asbestos was used in the cementitious type materials.

2.1.11 Texture or Acoustic Plasters

The use of asbestos was widespread in trowelled or sprayed texture coats, stipple coats and acoustic plasters from the 1950's to the late 1970's (at least as late as 1980). These products always contain less than 25% chrysotile. Some of the harder stipple coats may be considered non-friable in place and only become friable when disturbed by construction or demolition. Other products in this group can be very soft and extremely friable.

2.1.12 Mechanical Insulation

This is the most widespread use of friable asbestos in vessels. The use dates from the late 1800's to the late 1970's. The material can have a number of appearances and asbestos contents.

- white, brown, pink or grey block
- white or grey corrugated paper
- white, grey or brown layered paper
- grey trowelled or hand applied material (with the appearance of hard or granular grey dry mud)

It is possible to find all asbestos types in mechanical insulation although chrysotile is predominant and amosite the next most common.

3. HAZARDS OF ASBESTOS MATERIALS IN VESSELS

Beginning in the late 1970's, public health authorities, the media, and the public in general, became concerned about the health effect of these asbestos materials on vessel occupants. It was known that asbestos miners and factory workers and installers who handled asbestos materials suffered a higher incidence of several respiratory diseases. These groups had been exposed to very high levels of asbestos dust for prolonged periods. In order to assess whether the public anxiety over the current situation of asbestos materials the hazard of in-place materials, the Ontario Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario was established in 1981. This 3 year study considered all aspects of the asbestos problem, from production, through installation and use in-place, to maintenance and demolition. After considering all available data and commissioning several research studies, the Commission concluded in its final report (Chapter 9, Page 585):

"...The risk to occupants from asbestos in vessels is a small fraction of the risks faced by workers exposed to asbestos under the 1 f/cc control limit for chrysotile (the current exposure limit for industrial asbestos use in Ontario). It is less than 1/50 as great as the risk of commuting by car to and from those vessels. In concluding that this risk is insignificant, we conclude that the risk does not present a public health problem. While asbestos has caused serious health problems for workers and may present a problem for vessel maintenance, renovation, construction, and demolition workers, we conclude that it does not pose a significant problem for the general occupants of a vessel, except in the three situations outlined in Section D of this chapter, namely: (i) the occupant is in the immediate vicinity of work that disturbs friable asbestos-containing insulation; (ii) the occupant is within the range of air circulation of work that disturbs friable asbestos-containing insulation; or (iii) significant quantities of friable asbestos-containing insulation have fallen onto vessel surfaces and are being disturbed."

and in the overview to this section (Chapter 9, page 548):

"We will conclude that it is rarely necessary to take corrective action in vessels containing asbestos insulation in order to protect the general occupants of those vessels. On the other hand, construction, demolition, renovation, maintenance, and custodial workers in asbestos-containing vessels may be exposed to significant fibre levels and may, during their work, cause elevated fibre levels for nearby occupants."

The general conclusions of the Royal Commission have been supported by independent testing by independent researchers, the Ontario Ministry of Labour, and authorities in other jurisdictions. Air sampling has shown that the airborne asbestos levels in vessels with sprayed asbestos are no higher than outdoor levels, unless the friable asbestos or asbestos debris is being disturbed at the time. Airborne levels in vessels are not elevated even when the ceiling space containing the sprayed asbestos or asbestos mechanical insulation functions as an air plenum.

The Ministry of Labour Regulation respecting Asbestos on Construction Projects and in Vessels and Repair Operations was modelled on the Commission findings. Several other provinces have since issue regulations or guidelines similar to the Ministry of Labour Regulation. The Asbestos Management Program was prepared to be consistent with the recommendations of the Commission and to meet all requirements of applicable Regulation.

APPENDIX O: ASBESTOS MATERIALS SURVEY

The asbestos containing materials survey report has been issued under separate cover as titled *ASBESTOS MATERIALS SURVEY – for vessels that have been confirmed to contain asbestos materials*