ASBESTOS AWARENESS FOR BUILDING OCCUPANTS AND MAINTENANCE WORKERS

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1. NATURE OF ASBESTOS AND ASBESTOS MINERAL TYPES

Asbestos is a generic term used to describe a family of fibrous minerals composed of magnesium and calcium silicates. The use of asbestos dates from the times of ancient Rome and Greece, where the fire-resistant and flexible properties of the mineral were well known. In fact, the term “asbestos” comes from the Greek term for “inextinguishable” and refers to the use in temple lamps of asbestos wicks that would not be consumed by the flame. Until the 1960s and 1970s asbestos was looked on by the public as a wonder product with no drawbacks.

The asbestos minerals 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 has accounted for most of the asbestos in commercial use, is the only type that belongs to the serpentine group. Crocidolite and amosite, the two other more 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), until recently chrysotile has been considered the least hazardous and crocidolite the most hazardous. Amosite and crocidolite products generally produce higher airborne fibre levels when disturbed and new uses are effectively banned worldwide. Some health authorities also consider amosite and crocidolite fibres to be more hazardous than chrysotile, especially for the risk of mesothelioma. Some Canadian jurisdictions set different exposure limits for the different asbestos types, and in Ontario, a higher grade of respirator is needed for large-scale (Type 3) removal of some amosite or crocidolite materials.

**ASBESTOS TYPES**

![Asbestos Types Diagram]

Although none of the other asbestos types have been used commercially, actinolite, tremolite or a mixture of these types has been found as an impurity in vermiculite ore originating in the Libby, Montana mines of W.R. Grace which operated until around 1990. Expanded vermiculite has been widely used in residential construction.
2. **PAST USES OF ASBESTOS IN BUILDING MATERIALS**

Asbestos has been widely used in buildings and several uses continue today. According to the North American asbestos industry, over 3,000 separate asbestos products have been produced and distributed. The majority of asbestos used in the past was made into building materials – by some estimates, up to 70%. Although very little asbestos is used today in the production of building materials, the older asbestos materials remain in many buildings. Since the late 1970’s, it has been recognized that disturbance of these materials, for example during renovations or maintenance can lead to worker exposure and disease.

Asbestos materials are classed into friable and nonfriable products for the purposes of hazard assessment. A friable material is a material that when dry can be crumbled, pulverised or powdered by hand pressure and includes such material that is crumbled, pulverised or powdered. Airborne dust levels are much higher when friable products are disturbed. The many past uses of asbestos in building materials are described below.

### 2.1 NONFRIABLE ASBESTOS MATERIALS

Asbestos has been used in the manufacture of a wide range of nonfriable products. Most manufacturers have phased out the use of asbestos in manufactured goods, where possible, and some nations have acted strongly to reduce or eliminate the use of asbestos in industry. While the tonnage of asbestos used in manufactured goods is greatly reduced from the 1950’s and 1960’s, many products are still commercially available. The following list gives some of the more common uses of non-friable asbestos products in buildings and industry. The symbol (* ) indicates the material is still manufactured or imported into Canada. All of these products except Drywall joint compound are still legal for use in Canada however only a few including asbestos cement products, roof coating products, gaskets and some textiles are in any common use. Most uses of asbestos ceased in Canada in the 1970s.

<table>
<thead>
<tr>
<th><strong>Material</strong></th>
<th><strong>Common Applications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos-cement pipe *</td>
<td>• Municipal water systems</td>
</tr>
<tr>
<td></td>
<td>• Roof drains, sanitary sewers</td>
</tr>
<tr>
<td></td>
<td>• Electrical wire conduit</td>
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*Asbestos cement exterior panels at an oil refinery*
<table>
<thead>
<tr>
<th>Material</th>
<th>Common Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos-cement sheet products</td>
<td>• Heat-resistant panels, i.e. for welding booths&lt;br&gt;• Roofing and wall panels&lt;br&gt;• Soffit and fascia board&lt;br&gt;• Insulation board&lt;br&gt;• Cooling tower panels&lt;br&gt;• Acoustic ceiling and wall panels</td>
</tr>
<tr>
<td>Patching compound</td>
<td>• Drywall joint compound</td>
</tr>
<tr>
<td>Paper and felts</td>
<td>• Roofing felt and building paper&lt;br&gt;• Electrical insulation&lt;br&gt;• Duct wrap</td>
</tr>
<tr>
<td>Gaskets and packings *</td>
<td>• Gaskets for boilers, pumps, etc.&lt;br&gt;• Valve and seal packings</td>
</tr>
<tr>
<td>Reinforced plastics</td>
<td>• Phenolic resin products&lt;br&gt;• Vinyl asbestos floor tile&lt;br&gt;• Resilient sheet flooring (asbestos paper present in the backing layer)</td>
</tr>
<tr>
<td>Caulking and glues</td>
<td>• Mastic for building and ductwork use&lt;br&gt;• Window putties&lt;br&gt;• Flooring adhesives&lt;br&gt;• Roof patch materials</td>
</tr>
<tr>
<td>Friction materials *</td>
<td>• Brake shoes and pads for vehicles&lt;br&gt;• Brakes for industrial equipment (cranes, elevators, rotating presses, etc.)&lt;br&gt;• Clutch friction materials</td>
</tr>
<tr>
<td>Woven textile products</td>
<td>• Heat-resistant clothing and gloves&lt;br&gt;• Fire blankets&lt;br&gt;• Heat-resistant laboratory equipment</td>
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### 2.2 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. The use of friable asbestos was banned in...
Ontario officially in March 1986 however most uses had ceased by 1975 (sprayed fireproofing and thermal insulation as well as thermal insulation on mechanical systems) or by 1982 (sprayed decorative or texture finishes).

**Sprayed Asbestos Materials Applied for Fireproofing, Acoustic Control, Thermal Insulation or Decorative Purposes**

Several types of sprayed products composed of asbestos fibres, binders, and fillers, were formulated in the mid 1930's to 1974. The products were mostly sprayed but in some applications were applied by troweling. These were widely applied in construction, in industry, transportation, and ship-building, for a variety of purposes. Common applications included fireproofing of structural steel, as thermal, sound or decorative finishes during the construction of walls, ceilings or roofs, in ship-building and other transportation applications, and as thermal insulation on boilers and other industrial equipment. The presence of asbestos in sprayed asbestos materials applied before 1974 for fireproofing purposes is a practical certainty, since the only products licensed for this purpose were formulated with asbestos. Most sprayed asbestos products were phased out of production between 1971 and 1974.

**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 early 1980’s. These products always contain less than 25% chrysotile. Some of the harder stipple coats may be considered nonfriable in place and only become friable when disturbed by construction or demolition. Other products in this group can be very soft and extremely friable.

**Mechanical Insulation**

This is the most widespread use of friable asbestos materials in buildings. The use dates from the late 1800's to the late 1970's. Asbestos mechanical insulations include rope insulation, pre-formed block materials of various compositions and appearances (usually a brown or white compressed block), paper or corrugated
cardboard-like material and insulating cement, commonly applied by hand or trowel at pipe fittings such as elbows and valves. Asbestos insulations may be found on virtually any mechanical equipment: boilers, hot water storage tanks, chemical reactors, pipes, heat exchangers, and air ducts. It has been widely used on hot water heating systems.

**Vermiculite (In Loose Fill Insulation and Other Uses)**

The presence of low percentages (less than 1%) of asbestos (usually tremolite, actinolite or a tremolite/actinolite variation) in vermiculite from some deposits has been well documented. The primary source of vermiculite until 1990 was the Libby Mantana mine of W.R. Grace. Although the percentage asbestos by weight is low, when vermiculite has been used as loose attic or cavity insulation or insulating block fill and is disturbed, this asbestos fibre can become airborne. It is our recommendation that disturbance of loose fill vermiculite be considered an asbestos operation until extensive testing is performed. Major removal or major disturbance of vermiculite may require Type 2 or 3 precaution. It should be noted that much of the vermiculite used in the past (and all in use today) does not contain asbestos.

Once incorporated in a matrix such as plaster or cementitious fireproofing, the asbestos fibres appear to become locked down and do not (from our testing) pose the same risk of release. It must be noted that the percentage of asbestos in vermiculite containing plaster may be greater than 0.1% or even 0.5% which would be considered asbestos in Quebec and Manitoba and possibly Ontario.

### 2.3 POTENTIALLY FRIABLE ACM

Two common asbestos building materials do not fit easily into either the non-friable or friable category.

**Acoustic Ceiling Tiles**

Some types of acoustic ceiling tiles were formulated with asbestos, possibly to the 1970’s. Amosite asbestos was most commonly used, although tiles may have contained chrysotile asbestos. The removal or other disturbance of a few ceiling tiles will probably not create measurable airborne asbestos concentrations, so can be safely performed with the work practices set for non-friable materials. However, the removal of large numbers of asbestos-containing acoustic tiles can release excessive dust and so for such disturbances these tiles should be handled as friable materials. Removal of less than 7.5 square metres (80 square feet) is a Type 1 operation. More than this quantity is a Type 2 operation.

**Asbestos-Containing Plaster**

In the past, asbestos was added to some plaster formulations as a reinforcing agent. Its use in plaster may have extended to as late as 1980. Asbestos-containing plasters are non-friable in place, and can be treated as non-friable materials until disturbed. However, cutting or demolition of the plaster may release
significant dust, and for those operations, procedures set for friable materials should be followed.

**Deteriorated Non-friable Materials**

Some non-friable materials can become weathered or deteriorated to the point that the asbestos fibres are no longer effectively held in the binding agent. Common examples include:

- Weathered asbestos cement board that has been subject to chronic water or chemical exposure
- Weathered asbestos paper
- Deteriorated textile products, including woven mechanical gaskets, or
- Deteriorated sheet flooring, where the covering vinyl layer has been significantly worn or abraded so that the underlying asbestos felt is exposed.

The use of non-friable, Type 1 procedures for the disturbance of non-friable asbestos materials in a significantly deteriorated state may not provide adequate safety for the worker and containment of dust. Judgements on the appropriate procedures will have to be made on a case-by-case basis, but usually at least Type 2 procedures are required.

### 2.4 TYPICAL USES (BUILDING SECTIONS)

The uses of ACM have been described in text above. The buildings sections provided here illustrate the typical applications found in various types of construction. The following diagrams (courtesy of the Construction Safety Association of Ontario) illustrate the uses of asbestos as follows:

- **Figure 1** Asbestos Products and Locations in Commercial/Institutional Buildings
- **Figure 2** Asbestos Products and Locations in Industry
FIGURE 3: ASBESTOS PRODUCTS AND LOCATIONS IN COMMERCIAL/INSTITUTIONAL BUILDINGS

- Asbestos Cement
- Pipe Covering
- Acoustic or Resilient Ceiling
- Asbestos Roofing Felt
- Joint Filling Compound
- Deck Furring Strip
- Spray-On Fireproofing
- Sprayed-On Fireproofing
- Boiler Insulation
- Fireplace Asbestos
- Casing Material
- Vinyl Insulation
2.5 ASBESTOS IDENTIFICATION

It is important to understand that many non-asbestos products are similar in appearance to asbestos products. Friable asbestos material ceased to be used by 1983 however so this allows the range of buildings with friable asbestos to be reduced. After this time only non-friable products require testing. Legally and practically the collection of samples followed by laboratory analysis is the only way to be certain of the identification of an asbestos-containing material (ACM). It is quite simple to collect samples and have them analysed. A brief description is provided below. To collect the samples we recommend:

- Take the sample carefully using a knife or screwdriver to dislodge the sample. Attempt to sample from an exposed or damaged edge.
- If you want, you can mist the material with a water sprayer (like a plant mister or Windex bottle). Do not saturate the material or it will delay the analysis. Although it is possible to wear a respirator to filter the air if you avoid creating dust by careful work practices the use of a respirator is not necessary.
- Remove a piece (a tablespoon or two is ideal) and place in a plastic zip-lock bag, pill bottle or envelope. Close the container and avoid cross-contaminating any other samples
- Avoid leaving any dust or debris behind by using a drop sheet or plastic bag below the sample location and / or by wet wiping the floor with a damp paper towel
- Ensure the sample is labelled with information such as: client name, address, location of the sample (pipe, boiler, etc.), sample number, etc.
- Record the information you want on a transmittal sheet or piece of paper
  - client name, address, location of sample, sample number, name of person submitting sample (who will be billed), etc.
- The analysis should be done by a certified laboratory. There are currently 4 in Ontario although other (non-certified) laboratories do offer the service. The cost should be in the $40 - $90/ sample – cost depending on the number of samples and turnaround requested

If sampling vermiculite it is important to collect the sample from the bottom of the installation so that the fines which collect towards the bottom and contain most of the asbestos are actually collected for analysis. Vermiculite analysis is more expensive.
3. HEALTH EFFECTS OF ASBESTOS EXPOSURE

For many years asbestos has been recognized as a health hazard for workers employed in asbestos mining, processing and installation of asbestos products. Several serious, debilitating diseases that often end in death have been linked to the inhalation of fine asbestos fibres. For each disease there is a period of latency, from 10 to 40 or more 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 related illnesses. Asbestosis will develop only with chronic exposure to high levels of airborne asbestos and is not a major cause of asbestos death today.

Lung Cancer

Prolonged asbestos exposure will increase the risk of developing lung cancer. Long term survival from lung cancer is still not common with current treatments. Cigarette smoking is also a well-established risk factor for lung cancer, and unfortunately the combined effects of smoking and asbestos exposure are very significant. In the past, non-smoking asbestos workers who took no precautions may have had a risk of lung cancer 10 times as high as those without asbestos exposure. In some studies, asbestos workers who also smoked cigarettes had an increased risk up to 90 times the general population risk for non-smokers.

Mesothelioma

Mesothelioma is a rare cancer of the cells of the pleura (lining of the chest cavity and lungs) or the peritoneum (lining of the abdominal cavity). Mesothelioma is a very rare cancer in the general population. There is no commonly available treatment for this disease. The great majority of mesothelioma patients die within a year of diagnosis. The development of mesothelioma after asbestos exposure is characterised by a long latency period, at least 20 years and often more than 40. The amphibole asbestos materials are considered more important than chrysotile in the development of mesothelioma. Asbestos is believed to be responsible for as much as 80% to 90% of all cases of mesothelioma. Mesothelioma is a risk even for short-term exposures. In some cases, exposures as brief as a summer’s employment have been sufficient to cause this type of cancer.
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. The evidence is not as good as for the other diseases mentioned below. The cancers in questions are: gastrointestinal cancer affecting all sites in the gastrointestinal tract (oesophagus, stomach, colon and rectum) and cancer of the larynx and oesophagus. 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 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.

Asbestos Deaths in Construction Trades.

It is a remarkable fact that as many construction workers die today from asbestos exposure as due to all traumatic injuries combined (electrocution, falls, confined space, crushed, etc.) There are of the order of 20 mesothelioma deaths per year among construction workers in Ontario. This affects plumbers, insulators and steam fitters to a great extent but is very common in labourers, electricians or virtually any trade in construction. While most of the deaths are due to high exposure in the 1960s and 1970s, workers must still be vigilant to avoid the same type of hazardous exposure today. It is a remarkable fact that more construction workers are dying of asbestos disease than die from all traumatic injuries combined (falls, electrocution, etc.).
4. HAZARDS OF ASBESTOS MATERIALS IN BUILDINGS

In 1981 the Ontario government established the Ontario Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario, partly in response to the public concern at that time related to asbestos building materials. 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 buildings is a small fraction of the risks faced by workers exposed to asbestos under the 1 f/cc control limit for chrysotile (the exposure limit for industrial asbestos use in Ontario at the time). It is less than 1/50 as great as the risk of commuting by car to and from those buildings. 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 building maintenance, renovation, construction, and demolition workers, we conclude that it does not pose a significant problem for the general occupants of a building, except in the three situations.... 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 building 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 buildings containing asbestos insulation in order to protect the general occupants of those buildings. On the other hand, construction, demolition, renovation, maintenance, and custodial workers in asbestos-containing buildings may be exposed to significant fibre levels and may, during their work, cause elevated fibre levels for nearby occupants."

The Ministry of Labour Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations, Ontario Regulation 278/05 was modelled on the Commission findings.
5. **ONTARIO MINISTRY OF LABOUR REGULATION 278/05**

The Ontario Ministry of Labour acted on the conclusions of the Royal Commission by publishing a Regulation under the Occupational Health and Safety Act entitled "Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations". This Regulation came into effect on March 16, 1986. Recently the Ministry have updated the regulation to reflect improvements in abatement techniques and to provide greater protection to workers. The new regulation of the same title is now Ontario Regulation 278/05. The Regulation is based on the principle of “management in place”. It does not require removal of friable asbestos unless the material is being disturbed, so that exposure to airborne asbestos is likely to occur. The Regulation outlines very specific precautions to be followed in the event of the disturbance of asbestos or settled dust or debris from asbestos. The Regulation does have specific requirements related to the detection, reporting and management of asbestos, particularly the friable forms of asbestos. Most building managers elect to remove friable asbestos materials at the time of major renovations, partly to rid the building of the concern, but also to eliminate any requirement for precautions during the reconstruction.

*Conditions Requiring Asbestos Removal*

Regulation 278/05 requires asbestos materials to be removed or otherwise remediated under two conditions:

- All asbestos materials must be removed *prior to demolition* of all or part of a building, machinery or system, usually a mechanical system such as a boiler or tank.
- Friable ACM which has fallen and is being disturbed so that exposure is likely to occur, must be cleaned up as a minimum and if it will continue to fall it must be repaired, sealed, removed or permanently enclosed.

5.1 **ASBESTOS MANAGEMENT PROGRAM (NOT APPLICABLE TO RESIDENCES ≤ 4 UNITS)**

The Regulation requires that the owner or manager of a building with known friable ACM to put in place an Asbestos Management Program. As of November 1, 2007 this requirement applies to all buildings with friable or non-friable ACM. The major duties required by the Regulation include:

1. Prepare and maintain on the premises a record of the location of asbestos.
2. Provide the Occupier of the building (commonly the tenant or lessee) with the record of ACM in the area that they occupy.
3. Provide any employer who may work on or in close proximity to the ACM of the information in the record.
4. Advise workers employed by the owner who may work on or in close proximity to the ACM of the information in the record.
5. Provide specified training to workers who may disturb or work in close proximity to the asbestos (hazards, personal protective equipment and work practices).
6. Inspect the material in the record at reasonable intervals (at least annually).
7. Clean up and then repair, seal, remove or permanently enclose any fallen ACM which is being disturbed and likely to cause exposure.

8. Prior to calling tenders for any demolition, alteration or repair of any part of the building or equipment, determine if any friable or non-friable ACM be handled dealt with or disturbed by the project.

9. Furnish to any prospective constructor (who must furnish it to contractors and sub-contractors) in advance of receiving tenders, a copy of all drawings, plans or specifications which show the location of any ACM that may be handled, dealt with, disturbed or removed. The Owner is liable for extra costs to safely handle asbestos materials not listed in a pre-tender report.

10. In the case of major work (more that one square meter of friable material), the contractor must notify the Ministry of Labour.

11. Prepare and submit a Ministry of Labour Asbestos Work Report for every worker who has performed Type 2 or Type 3 work in the past year (or when terminated).

The Regulation is a regulation by procedure and does not require air monitoring as a routine procedure in asbestos-containing buildings (other than at the completion of major asbestos removal projects). The regulation outlines three levels of work and the appropriate precautions. Type 1 has the lowest risk of producing elevated asbestos fibre levels and Type 3 is expected to release airborne asbestos above acceptable concentrations. The type of operation and appropriate precautions for each are summarised below.

5.2 TYPE 1 OPERATIONS, MEASURES AND PROCEDURES (LOW RISK)

Operations classified as Type 1 have a low risk of releasing airborne asbestos. The list below is based on the Ontario Regulation. The precautions to adequately protect workers are simple to follow and, for most operations, would require little change from current practices. As stated in Section 12 of O. Reg. 278/05:

(2) The following are Type 1 operations:

1. Installing or removing ceiling tiles that are asbestos-containing material, if the tiles cover an area less than 7.5 square metres and are installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

2. Installing or removing non-friable asbestos-containing material, other than ceiling tiles, if the material is installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

3. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if:
   
   i. the material is wetted to control the spread of dust or fibres, and
   
   ii. the work is done only by means of non-powered hand-held tools.
4. Removing less than one square metre of drywall in which joint-filling compounds that are asbestos-containing material have been used.

The more common non-friable materials that would be encountered in buildings include vinyl asbestos floor tiles, drywall with asbestos-containing joint compounds, asbestos cement (transite) pipe and board, some ceiling tiles, and packings, caulking and gaskets for mechanical equipment. It should be assumed that these materials contain asbestos unless the manufacturer states it is asbestos-free, or unless laboratory analysis shows no asbestos present.

The Measures and Procedures to be taken in Type 1 tasks can be summarized from Section 14 as follows:

1. Before beginning work, visible dust shall be removed with a damp cloth or a HEPA vacuum from any surface in the work area, including the thing to be worked on, if the dust on that surface is likely to be disturbed.

2. The spread of dust from the work area shall be controlled by measures appropriate to the work to be done including the use of drop sheets of polyethylene or other suitable material that is impervious to asbestos.

3. In the case of removal of drywall with asbestos joint compound, the material shall be wetted before and kept wet during work to control the spread of dust or fibres, unless wetting would create a hazard or cause damage.

4. A wetting agent shall be added to water that is to be used to control the spread of dust and fibres.

5. Frequently and at regular intervals during the doing of the work and immediately on completion of the work,

   i. dust and waste shall be cleaned up and removed using a HEPA vacuum, or by damp mopping or wet sweeping, and placed in an asbestos waste container.

6. After the work is completed, polyethylene sheeting and similar materials used for drop sheets, barriers and enclosures shall not be reused, but shall be wetted and placed in an asbestos waste container.

7. After the work is completed, barriers and portable enclosures that are rigid, can be cleaned thoroughly and that will be reused shall be cleaned, by using a HEPA vacuum or by damp wiping.

8. Compressed air shall not be used to clean up and remove dust from any surface.

9. Eating, drinking, chewing or smoking shall not be permitted in the work area.
10. If a worker requests that the employer provide a respirator to be used by the worker, the employer shall provide the worker with a NIOSH approved air purifying half mask respirator with high efficiency (100 rating) filters, and the worker shall wear and use the respirator.

11. If a worker requests that the employer provide protective clothing to be used by the worker, the employer shall provide the worker with head, full body and footwear protective clothing.

12. A worker who is provided with protective clothing shall, before leaving the work area,
   
   i. decontaminate his or her protective clothing by using a HEPA vacuum, or by damp wiping, before removing the protective clothing,

   ii. if the protective clothing will not be reused, place it in an asbestos waste container.

13. Facilities for the washing of hands and face shall be made available to workers and shall be used by every worker when leaving the work area.

### 5.3 TYPE 2 OPERATIONS, MEASURES AND PROCEDURES (MODERATE RISK)

Type 2 operations have a greater risk of airborne asbestos as they are performed on friable material. The extent of disturbance is minor so the precautions are somewhat localized. As stated in Section 12 of the regulation:

12.(3) The following are Type 2 operations:

1. Removing all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling.

2. The removal or disturbance of one square metre or less of friable asbestos-containing material during the repair, alteration, maintenance or demolition of all or part of machinery or equipment or a building, aircraft, locomotive, railway car, vehicle or ship.

3. Enclosing friable asbestos-containing material.

4. Applying tape or a sealant or other covering to pipe or boiler insulation that is asbestos-containing material.

5. Installing or removing ceiling tiles that are asbestos-containing material, if the tiles cover an area of 7.5 square metres or more and are installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

6. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if,

   i. the material is not wetted to control the spread of dust or fibres, and
ii. the work is done only by means of non-powered hand-held tools.

7. Removing one square metre or more of drywall in which joint filling compounds that are asbestos-containing material have been used.

8. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.

9. Removing insulation that is asbestos-containing material from a pipe, duct or similar structure using a glove bag.

10. Cleaning or removing filters used in air handling equipment in a building that has sprayed fireproofing that is asbestos-containing material.

11. An operation that,
   i. is not mentioned in any of paragraphs 1 to 10,
   ii. may expose a worker to asbestos, and
   iii. is not classified as a Type 1 or Type 3 operation

The techniques to reduce exposure to airborne asbestos are simple following the general rules of working with wet material, using personal protective equipment, cleaning up and disposing of asbestos contaminated material properly. The procedures below outline the requirements of O.Reg 278/05 but are similar to most provincial requirements.

1. The work area shall be identified by clearly visible signs warning of an asbestos dust hazard.

2. Signs shall be posted in sufficient numbers to warn of the hazard and shall state in large clearly visible letters that,
   i. there is an asbestos dust hazard, and
   ii. access to the work area is restricted to persons wearing protective clothing and equipment.

3. A wetting agent shall be added to water that is to be used to control the spread of dust and fibres.

4. Eating, drinking, chewing or smoking shall not be permitted in the work area.

5. Containers for dust and waste (referred to as asbestos waste containers) shall be,
   i. dust tight,
   ii. suitable for the type of waste,
   iii. impervious to asbestos,
   iv. identified as asbestos waste,
v. cleaned with a damp cloth or a HEPA vacuum immediately before being removed from the work area, and

vi. removed from the workplace frequently and at regular intervals.

6. The employer shall provide every worker who will enter the work area with a NIOSH approved respirator and the worker shall wear and use the respirator (Table 2). In practice, most operations require a half mask air purifying respirator with P100 filters. Contaminated ceiling entry and the use of HEPA filtered power tools on dry material only requires either a non-powered or powered full facepiece respirator with P100 or HEPA filters.

7. Protective clothing shall be provided by the employer and worn by every worker who enters the work area, and the protective clothing,

i. shall be made of a material that does not readily retain nor permit penetration of asbestos fibres,

ii. shall consist of head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing,

iii. shall include suitable footwear, and

iv. shall be repaired or replaced if torn.

8. Compressed air shall not be used to clean up and remove dust from any surface.

9. Only persons wearing protective clothing and equipment shall enter a work area where there is an asbestos dust hazard.

10. If the operation is contaminated ceiling entry, the friable material that is likely to be disturbed shall be cleaned up and removed by using a HEPA vacuum when access to the work area is obtained.

11. Before commencing work that is likely to disturb friable asbestos-containing material that is crumbled, pulverized or powdered and that is lying on any surface, the friable material shall be cleaned up and removed by damp wiping or by using a HEPA vacuum. (Pinchin Note: this clean up can be performed without the need for an enclosure or tent).

12. Friable asbestos-containing material that is not crumbled, pulverized or powdered and that may be disturbed or removed during the work shall be thoroughly wetted before the work and kept wet during the work, unless wetting would create a hazard or cause damage.

13. The spread of dust from a work area shall be controlled by measures appropriate to the work to be done, including the use of drop sheets of polyethylene or other suitable material that is impervious to asbestos.
14. If the operation is contaminated ceiling entry or minor removal and indoors, (Pinchin note: these are the only operations where an enclosure is mandatory – an enclosure is only needed "when appropriate to the work" otherwise) the spread of dust from the work area shall be prevented, if practicable by,

i. using an enclosure of polyethylene or other suitable material that is impervious to asbestos (including, if the enclosure is opaque, one or more transparent window areas to allow observation of the entire work area from outside the enclosure), if the work area is not enclosed by walls,

ii. disabling the mechanical ventilation system serving the work area, and

iii. sealing the ventilation ducts to and from the work area.

15. Frequently and at regular intervals during the doing of the work and immediately on completion of the work,

i. dust and waste shall be cleaned up and removed using a HEPA vacuum, or by damp mopping or wet sweeping, and placed in asbestos waste containers.

ii. drop sheets shall be wetted and placed in an asbestos waste container as soon as practicable after this clean up.

16. After the work is completed, polyethylene sheeting and similar materials used for barriers and enclosures shall not be reused, but shall be wetted and placed in an asbestos waste container as soon as practicable after clean up of the work area.

17. After the work is completed, barriers and portable enclosures that are rigid, can be cleaned thoroughly and that will be reused shall be cleaned, by using a HEPA vacuum or by damp wiping.

18. Before leaving the work area, a worker shall,

i. decontaminate his or her protective clothing by using a HEPA vacuum, or by damp wiping, before removing the protective clothing, and

ii. if the protective clothing will not be reused, place it in an asbestos waste container.

19. Facilities for the washing of hands and face shall be made available to workers and shall be used by every worker when leaving the work area.

The above procedures are not intended to be used for major removal of sprayed insulation, extensive renovation of ceiling systems or significant amounts of mechanical insulation.
Asbestos Awareness for Building Occupants & Maintenance Workers

these cases, the erection of a full enclosure, decontamination enclosures, showers etc. required under Type 3 procedures will be required. Details of Glove Bag use (another Type 2 Operation to remove insulation from pipes) is found in Section 17 of O.Reg. 278/05 and will not be repeated here.

5.4 TYPE 3 OPERATIONS AND PRECAUTIONS

Type 3 operations cover work where a known high level of airborne asbestos is produced by the disturbances. Concentrating only on the normal operations of maintenance, building renovation or demolition, Section 12 states the following are Type 3 operations:

1. The removal or disturbance of more than one square metre of friable asbestos-containing material during the repair, alteration, maintenance or demolition of all or part of a building, aircraft, ship, locomotive, railway car or vehicle or any machinery or equipment.

2. The spray application of a sealant to friable asbestos-containing material.

3. Cleaning or removing air handling equipment, including rigid ducting but not including filters, in a building that has sprayed fireproofing that is asbestos-containing material.

4. Repairing, altering or demolishing all or part of a kiln, metallurgical furnace or similar structure that is made in part of refractory materials that are asbestos-containing materials.

5. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material, if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.

The scope of this presentation does not include the discussion of Type 3 removal operations however a summary of the required precautions is as follows:

1. Written notice must be given to the Construction Health and Safety Branch. The MOL must be notified of all Type 3 work, regardless of dollar value.

2. Full decontamination chambers, including two change rooms (clean and dirty) separated by a shower, must be connected to the work area. A worker removes all contaminated clothing when leaving the site, showers, and changes into clean clothing whenever exiting a site.

3. Workers in the work area wear full body coveralls (with hoods) which can be readily cleaned or discarded.

4. Workers performing wet removal of all asbestos material must wear full facepiece powered air purifying respirators with HEPA filters as a minimum. Supplied air respirators are required for Wet removal of any sprayed amosite or crocidolite and for all dry removal of friable asbestos materials.

5. The work area is completely enclosed and all mechanical ventilation systems are disabled and sealed off.

6. For all sites (except where the building is to be demolished at the end of the asbestos removal) a reduced (negative) pressure of 0.02 inches of water must be established within the work area relative to the surrounding area. Air extracted
from the site must be vented through HEPA filters to the exterior of the work area. The negative pressure must be measured regularly and recorded.

7. All material must be wetted where wetting does not create a hazard.

8. Existing electrical power is de-energised to allow safe use of water. Ground fault circuit interrupters must be used for all powered tools.

9. The work site enclosure and the negative air units must be inspected at least daily and defects repaired before work can continue.

10. At the completion of work the area must be carefully and totally cleaned. The work site must pass a very strict air clearance protocol using forced air monitoring. Normally a lockdown or glue is applied to the interior of the site to assist cleaning.

11. The plastic enclosures are disposed of as asbestos waste.

Other precautions are required by Regulation 278/05 for work outside of a structure or for power tools without dust collection devices used on non-friable asbestos materials but they are similar to the above.
### Classification of Asbestos Work

**Ontario regulation R.R.O. 278/05**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DISTURBANCE</th>
<th>EXTENT</th>
<th>CLASSIFICATION</th>
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</thead>
<tbody>
<tr>
<td><strong>NONFRIABLE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transite Roofing</td>
<td>Hand Held Non-Powered</td>
<td>Not Broken</td>
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</tr>
<tr>
<td>Gaskets</td>
<td>Hand Held Non Powered Wet</td>
<td>Any Amount</td>
<td>TYPE 1</td>
</tr>
<tr>
<td>Vinyl Floor Tile Textile</td>
<td>Hand Held Non Powered Dry</td>
<td>Any Amount</td>
<td>TYPE 2</td>
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<tr>
<td>Sheet Flooring Etc.</td>
<td>Power Tools Without Effective HEPA Dust Collector</td>
<td>Any Amount</td>
<td>TYPE 3</td>
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<tr>
<td></td>
<td>Power Tools With HEPA Dust Collector</td>
<td>Any Amount</td>
<td>TYPE 2</td>
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<td></td>
<td>Drywall with Asbestos Joint Compound</td>
<td>&lt; 1m²</td>
<td>TYPE 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 1m²</td>
<td>TYPE 2</td>
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<tr>
<td><strong>ACOUSTIC CEILING TILES</strong></td>
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<tr>
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<td>TYPE 2</td>
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<tr>
<td><strong>FRIABLE</strong></td>
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<tr>
<td>Sprayed Asbestos Acoustic/Texture Plaster</td>
<td>Removal Or Disturbance</td>
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<td>TYPE 2</td>
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<tr>
<td>Mechanical Insulation</td>
<td></td>
<td>&gt;1m²</td>
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</tr>
<tr>
<td>Asbestos Plaster (When Disturbed)</td>
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<td>TYPE 2</td>
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<tr>
<td></td>
<td>Spray Encapsulation Of Sprayed Asbestos Or Acoustic/Stipple Plaster</td>
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<td>Cleaning Or Removal Of Ductwork, AHU In Building With Asbestos Fireproofing</td>
<td>Any Amount</td>
<td>TYPE 3</td>
</tr>
<tr>
<td></td>
<td>Replacing AHU filters in building with Asbestos Fireproofing</td>
<td>Any Amount</td>
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<td>Repair, Alteration Or Demolition Of A Kiln, Furnace With Asbestos Refractory</td>
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<tr>
<td></td>
<td>Repair, Alteration Or Demolition Of A Building Where Asbestos Was Used In Manufacture</td>
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<td>TYPE 3</td>
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</tbody>
</table>

General Note: Ministry of The Environment requirements for packing and hauling asbestos waste apply to Type 1, Type 2, and Type 3 work, i.e. no exemption for non-friable materials.