# A New Standard for Repair and Maintenance of Installed Asbestos-Cement Materials

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## Abstract

*The ASTM Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products has been developed by ASTM International*[1] *and assigned the designation E2394. The standard provides the underlying rationale and detailed procedures for working with asbestos-cement products – roofing, siding, ducts, pipes and other construction materials – that have already been installed in and between buildings. It covers operations that can produce dust and airborne asbestos fibers – drilling, cutting, breaking, filing, etc. – during routine maintenance, repairs and small-scale renovation. Control of dust and fiber release using wet methods – soapy water, shaving cream and similar substances – is stressed. Four appendices cover underground pipes, buried ducts, drilling holes and removing panels, and additional appendices will be prepared to cover other operations and materials. Installation of new asbestos-cement products is not encouraged by the standard. Large-scale abatement is not the intended purpose, although some of the procedures may apply to such operations.*

*The procedures are intended for use in developing as well as industrialized countries; therefore, the use of hand tools and easily-obtained equipment and supplies is emphasized. The use of power tools is discouraged to minimize the possibility of creating airborne fiber levels that would require wearing respiratory protection.*

*E2394 is intended for use by supervisors and managers responsible for construction and maintenance as well as by government agencies and NGOs responsible for worker and community health programs. The standard offers useful guidance for countries in the process of developing their asbestos laws and regulations. ASTM International intends to provide training on the use of this standard in countries where it will be used through arrangements with standards organizations in those countries.*

## WHY THE STANDARD IS NEEDED

E2394 fills a need that is driven by the worldwide use of asbestos-cement products for over a century [1] and the health hazards associated with the maintenance, renovation and repair of these materials that have already been installed in buildings.

[1] ASTM International (www.astm.org).is the world's largest producer of voluntary consensus standards. As Chairman of the Task Group on Asbestos Management of ASTM International, Mr. Oberta is also responsible for E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects and E2356 Standard Practice for Comprehensive Building Asbestos Surveys.

## Worldwide Use of Asbestos-Cement Products

Canada exports 300,000 tonnes of chrysotile asbestos fiber to forty countries, and these exports – along with those from Brazil, Russia and other exporting countries – contribute to the 85 – 90% of the chrysotile fiber that goes into asbestos-cement products [2]. However, these products have also been made with crocidolite and amosite asbestos fibers as well as with chrysotile. A plant in Israel used all three types of fiber from 1952 to 1985 and continued production using chrysotile and amosite until 1997. [3]

Not counting this paper, there are six papers with "cement" in their title being presented at this Global Asbestos Congress – two each from Vietnam and Brazil, and also from Poland and Japan. Asbestos-cement products are mentioned in publications and websites from developing and industrialized countries that are too numerous to document here. They continue to be manufactured and installed – in Brazil as recently as 2000, the author was shown a new asbestos-cement roof that replaced a previous one.

A complete list of asbestos-cement products would take several pages – those most commonly encountered inside and outside of buildings include the following:

- Roofing – flat and corrugated
- Siding – flat and corrugated
- Flat panels
- Pressure and non-pressure pipe
- Air ducts
- Electrical ducts
- Exhaust flues
- Gutters and downspouts
- Water tanks
- Laboratory tabletops and fume hoods
- Garden and greenhouse fixtures and furniture
- Cooling tower panels and stacks
- Pavement (from manufacturing wastes)

In the United States, the trade name "Transite" has become synonymous with asbestos-cement as many of the above products were manufactured from this material. Actually, it is a specific formulation consisting of asbestos fibers, silica flour and Portland cement [4]. The composition of asbestos-cement products from other manufacturers will vary in the type of asbestos fiber(s), binders and fillers used.

## Characteristics of asbestos-cement products

Asbestos-cement products in an intact state are considered non-friable, which means they cannot be crumbled to powder by hand pressure. Another term for this characteristic is "strongly-bound." However, this does not mean that some forms of asbestos-cement, such as flat sheets, cannot be broken by hand.

Like other asbestos-containing materials, asbestos-cement products exhibit resistance to fire, heat transfer and electrical current. They also resist chemical attack, although the high alkalinity due to

their cement content makes them somewhat susceptible to strong acids. They are dense and highly abrasive, and consequently destructive of drilling and cutting tools.

Some asbestos-cement products are made with a lamination process that produces a waste stream that itself has been used as paving and construction material. Although the surface layer of this type of pavement is not friable, the underlying substrate that has not hardened during installation is friable.

### Health Hazards Associated with Asbestos-Cement Products

The hazards of inhaling asbestos fibers have been extensively documented in the literature. Fibers in construction materials must be released into the air for inhalation to occur. For asbestos-cement products, fiber release can occur through the following operations.

- Breaking
- Cutting
- Dismantling
- Drilling
- Filing
- Grinding
- Sanding
- Scraping
- Surface cleaning

In addition to these operations, deterioration of asbestos-cement can occur due to weathering, producing a condition where asbestos fibers are released from the surface [5].

### Existing Information on Control Methods

Publications on controlling dust and fiber release from asbestos-cement products have either dealt with the installation of new materials or have stressed the use of power tools with dust capture devices. These publications are reviewed in E2394 for their applicability to maintenance, renovation and repair operations. E2394, however, places more emphasis on the use of hand tools and wet methods, which are also reviewed and form the basis of the procedures in the appendices.

## WHAT E2394 CONTAINS AND PROVIDES TO THE USER

### Rationale and background

The main text of E2394 contains the rationale for using the standard, which is intended mainly for use by those in supervisory, management and regulatory positions:

- Removal of asbestos-containing materials is preferable but not always feasible, requiring that maintenance, renovation and repair operations be conducted on installed materials remaining in place;
- Disturbance of the material should be avoided if possible; if not, the procedures in E2394 should be used;
- No regulations are cited; rather, the user is expected to comply with the regulations of his country. Also, E2394 can be used as a foundation for developing asbestos control regulations in countries where they are needed;

- The emphasis is on protecting the worker, who is at the greatest risk of exposure to airborne asbestos fibers. By adequately protecting the worker, exposure to bystanders and the general community is also reduced.
- Careful workmanship is needed when using the procedures, but they do not require the services of highly-skilled tradesmen.

There are expanded descriptions of the materials and operations described above, and a detailed section on the following control methods to reduce dust and fiber release:

- *Wet methods*
  - Water (with surfactant)
  - Thickened substances (e.g. shaving cream)
  - Wet sponges
  - Liquid adhesives
  - Material softening agents
  - Wet wiping
- *Tools and equipment*
  - Hand tools
  - Power tools
  - HEPA- filtered vacuum cleaners[2]

The use of hand tools rather than power tools is emphasized to keep airborne fiber concentrations below the level where respiratory protection would be needed. The use of HEPA- filtered vacuum cleaners is discouraged where wet methods of clean-up will suffice, because the maintenance of these vacuum cleaners – which become contaminated as soon as they are used to pick up asbestos-containing debris – requires special facilities and training.

Worker protection is validated by measuring exposure to airborne fibers to determine the effectiveness of control measures for compliance with regulatory limits. Although the procedures in E2394 are intended to reduce exposure to levels where respirators would not be required, the use of respirators, protective clothing and decontamination is covered in the standard.

Finally, the need for worker training is addressed and the use of hands-on exercises with non-asbestos materials that simulate asbestos-cement products is encouraged.

## The Appendices – Detailed Procedures

There are four appendices with detailed procedures and more will be added as E2394 is revised in the future. It is intended that these procedures will be explained to the workers in training classes or at a job site by the supervisor.

*Appendix X1. Removing Damaged Asbestos Cement Pipe*[3] – This procedure is used to remove a damaged section of an underground asbestos-cement pipe located in an outdoor environment, typically requiring excavation of an open trench. This procedure is applicable to pressure and non-pressure pipe of all sizes.

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[2] HEPA – High Efficiency Particulate Air. Describes a filter with a minimum efficiency of 99.97% when tested against an aerosol of 0.3 micrometers diameter.

[3] This procedure is based in part on Best Practices for Removing Asbestos Cement Pipe, prepared by the Underground Contractors Association of Illinois (www.uca.org.).

*Appendix X2. Working on Damaged Asbestos-Cement Electrical Ducts Encased in Concrete Slabs* – This procedure is used to access and enter asbestos-cement electrical ducts encased in buried concrete slabs to inspect the cables for damage and repair the damaged section of the duct.

*Appendix X3. Drilling holes in asbestos-cement panels* – This procedure is used to drill blind holes into or through a panel forming a vertical surface such as a wall or an overhead horizontal surface such as a ceiling.

*Appendix X4. Removal of Asbestos-Cement Panels* – This appendix addresses the removal of small sections of asbestos-cement panels used for interior walls and ceilings, and exterior roofing and siding panels on buildings and cooling towers.

## GETTING COPIES OF ASTM STANDARDS

E2394 and other ASTM standards may be obtained by one of the following methods:

- Order on-line from www.astm.org. Enter the designation of the standard (such as E2394) in the search box on the home page, then follow the on-screen instructions to order a printed copy or download the file and print out a single copy.
- Order by phone from ASTM International at 610-832-9585 in the United States.
- Purchase a single copy and a license to reproduce additional copies for training purposes only at a substantial discount. Contact khooper@astm.org for more information.
- Order from an authorized distributor of ASTM publications in one of 42 countries. A list is posted at http://www.astm.org/InterNatDist.html ("Ordering Options Outside of the United States").

## GETTING TRAINING TO USE THIS STANDARD

ASTM International provides training on using their standards through their Technical and Professional Training program and will support the training financially in countries outside of the United States where the standards are used. Arrangements are preferably made through the standards organization in the country where the training will be given.

A training program is being developed on using E2394 and inquiries from interested parties are encouraged. Contact the author of this paper (who serves as an instructor in the ASTM asbestos training courses) or the manager of ASTM Educational Services, Mr. Scott Murphy, who may be reached at smurphy@astm.org or 610-832-9685.

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5. Brown SK. Physical Properties of Asbestos-Cement Roof Sheeting after Long-term Exposure. J. Occup. Health Safety-AustNZ 1998, 14(2), 129-134.



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