



Designation: E2394 – 11 (Reapproved 2020)<sup>ε1</sup>

## Standard Practice for Maintenance, Renovation, and Repair of Installed Asbestos Cement Products<sup>1</sup>

This standard is issued under the fixed designation E2394; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

<sup>ε1</sup> NOTE—Keywords were added editorially in January 2020.

### 1. Scope

1.1 This practice describes work practices for asbestos-cement products when maintenance, renovation, and repair are required. This includes common tasks such as drilling and cutting holes in roofing, siding, pipes, etc. that can result in exposure to asbestos fibers if not done carefully. These work practices are supplemented and facilitated by the regulatory, contractual, training, and supervisory provisions of this practice.

1.2 Materials covered include those installed in or on buildings and facilities and those used in external infrastructure such as water, wastewater, and electrical distribution systems. Also included is pavement made from asbestos-cement manufacturing waste.

1.3 The work practices described herein are intended for use only with asbestos-cement products already installed in buildings, facilities, and external infrastructure. They are not intended for use in construction or renovation involving the installation of new asbestos-cement products.

1.4 The work practices are primarily intended to be used in situations where small amounts of asbestos-cement products must be removed or disturbed in order to perform maintenance, renovation, or repair necessary for operation of the building, facility, or infrastructure.

1.5 The work practices described herein are also applicable for use where the primary objective is the removal of asbestos-cement products from the building or other location, particularly the use of wet methods and other means of dust and fiber control.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical

conversions to SI units that are provided for information only and are not considered standard.

1.7 **Warning**—Asbestos fibers are acknowledged carcinogens. Breathing asbestos fibers can result in disease of the lungs including asbestosis, lung cancer, and mesothelioma. Precautions in this practice should be taken to avoid creating and breathing airborne asbestos particles from materials known or suspected to contain asbestos. Comply with all applicable regulatory requirements addressing asbestos.

1.8 *This practice does not address safety hazards associated with working on asbestos-cement products such as falling through roof panels or trench cave-ins. The use of power tools presents possible electrical hazards, particularly in wet environments. These and other safety hazards must be considered and controlled in compliance with the employer's policies and applicable regulations.*

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[E1368 Practice for Visual Inspection of Asbestos Abatement Projects](#)

[E2356 Practice for Comprehensive Building Asbestos Surveys](#)

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.07 on Sampling, Analysis, Management of Asbestos, and Other Microscopic Particles.

Current edition approved Jan. 1, 2020. Published February 2020. Originally approved in 2004. Last previous edition approved in 2011 as E2394 – 11. DOI: 10.1520/E2394-11R20E01.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



## 2.2 Other Standards:

Guidance Manual Asbestos Operations and Maintenance Work Practices<sup>3</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 *amended water*, *n*—water to which a surfactant has been added to reduce surface tension.

3.1.2 *asbestos*, *n*—the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite.

3.1.3 *asbestos-cement products*, *n*—materials containing asbestos fiber added during the manufacturing process to cement and other binders or fillers, including pavement made from waste material produced by this manufacturing process.

3.1.4 *asbestos-containing materials*, *n*—material containing more than one percent asbestos.

3.1.5 *dust and debris*, *n*—visible particles, fragments, or chunks of material, large enough to have settled in the work area by virtue of their weight, that are presumed to have originated from asbestos-containing material.

3.1.6 *friable material*, *n*—material easily crumbled or powdered by moderate (hand) pressure; also weakly-bound and low-density materials.

3.1.7 *non-friable material*, *n*—material not easily crumbled or powdered by moderate (hand) pressure; also strongly-bound and high-density materials.

3.1.8 *thickened substance*, *n*—a liquid with sufficient density and viscosity to capture dust and debris released from a material during one of the operations described in Section 7.

## 4. Summary of Practice

4.1 This practice describes the following aspects of maintenance, renovation, and repair operations involving installed asbestos-cement products:

4.1.1 The characteristics of asbestos-cement products commonly found in buildings, facilities, and external infrastructure such as utilities.

4.1.2 Maintenance, renovation, and repair operations that can result in the release of airborne asbestos fibers and the creation of asbestos-containing dust and debris.

4.1.3 Methods for controlling the release of airborne asbestos fibers and minimizing the creation of asbestos-containing dust and debris.

4.1.4 Methods of determining and minimizing worker and community exposure to airborne asbestos fibers from these materials and operations.

4.2 This practice accepts the premise that removal of asbestos-cement products is always the preferred approach because it eliminates the potential for exposure to asbestos fibers, but also acknowledges that removal is not always feasible or the most advantageous course of action. In situations where asbestos-cement products cannot be removed and

replaced with asbestos-free materials, this practice provides techniques for maintenance, renovation, and repair operations that are most protective of worker and community health.

4.3 While the provisions of this practice can apply to abatement projects whose purpose is removal of the asbestos-cement products, such work may involve the handling of large, heavy pieces of material with mechanized equipment that is not discussed in this practice.

4.4 If the work can be done without disturbing any asbestos-cement products, that is the most desirable course of action to reduce the potential for exposure to asbestos fibers. Before commencing any work involving materials that are suspected of containing asbestos, ask if there is reliable information available to confirm the presence or absence of asbestos in the product. (See 8.1.1 and 8.1.2.)

4.5 This practice includes supporting information and general precautions applicable to the materials and work practices covered to enhance their understanding by the user. These sections are intended for users with a sufficient technical background to benefit from the material contained therein, and who are probably in a supervisory, management, or other official capacity within their organization. The appendices contain detailed step-by-step instructions for selected procedures and materials, and it is expected that these instructions will either be provided to workers in writing or explained to them verbally by their supervisors.

4.6 This practice does not require compliance with the regulations of any specific governmental agency, although excerpts and references are included. It is expected that users of this practice will comply with all applicable regulations in their country and other governmental jurisdiction thereof.

## 5. Significance and Use

5.1 The inhalation of airborne asbestos fibers has been shown to cause asbestosis, lung cancer, and mesothelioma.

5.1.1 The U.S. Environmental Protection Agency reports that “Effects on the lung are a major health concern from asbestos, as chronic (long-term) exposure to asbestos in humans via inhalation can result in a lung disease termed asbestosis. Asbestosis is characterized by shortness of breath and cough and may lead to severe impairment of respiratory function. Cancer is also a major concern from asbestos exposure, as inhalation exposure can cause lung cancer and mesothelioma (a rare cancer of the thin membranes lining the abdominal cavity and surrounding internal organs), and possibly gastrointestinal cancers in humans. EPA has classified asbestos as a Group A, known human carcinogen” (1).<sup>4</sup>

5.1.2 The World Health Organization states: “Exposure to asbestos occurs through inhalation of fibres primarily from contaminated air in the working environment, as well as from ambient air in the vicinity of point sources, or indoor air in housing and buildings containing friable asbestos materials. The highest levels of exposure occur during repackaging of

<sup>3</sup> Available from National Institute of Building Sciences (NIBS), 1090 Vermont Avenue, NW, Suite 700, Washington DC 20005-4905, <https://www.nibs.org>.

<sup>4</sup> The boldface numbers in parentheses refer to the list of references at the end of this standard.

asbestos containers, mixing with other raw materials and dry cutting of asbestos-containing products with abrasive tools” (2).

5.1.3 The World Bank states: “Health hazards from breathing asbestos dust include asbestosis, a lung scarring disease, and various forms of cancer (including lung cancer and mesothelioma of the pleura and peritoneum). These diseases usually arise decades after the onset of asbestos exposure. Mesothelioma, a signal tumor for asbestos exposure, occurs among workers’ family members from dust on the workers’ clothes and among neighbors of asbestos air pollution point sources” (3).

5.2 Extensive litigation has occurred worldwide as a result of the health effects of asbestos over the past century, resulting in considerable economic consequences. The regulatory response to asbestos hazards has resulted in civil sanctions and criminal prosecution of violators.

5.3 Regarding the production and use of asbestos fiber:

5.3.1 The U.S. Geological Survey (USGS) reports: “World consumption was relatively steady between 2003 and 2007, averaging 2.11 million metric tons (Mt). The leading consuming countries in 2007 were, in decreasing order tonnage, China (30 %), India (15 %), Russia (13 %), Kazakhstan and Brazil (5 % each), and Thailand, Uzbekistan, and Ukraine (4 % each). These eight countries accounted for about 80 % of world asbestos consumption in 2007. From 2003 through 2007, apparent consumption declined in most countries. However, there were significant increases in apparent consumption in China, India, and Uzbekistan between 2003 and 2007. In general, world asbestos consumption is likely to decline as more countries institute bans on its use” (4).

5.3.2 The World Health Organization also states: “Bearing in mind that there is no evidence for a threshold for the carcinogenic effect of asbestos and the increased cancer risks have been observed in populations exposed to very low levels, the most efficient way to eliminate asbestos-related diseases is to stop using all types of asbestos. Continued use of asbestos-cement in the construction industry is of particular concern, because the workforce is large, it is difficult to control exposure, and in-place materials have the potential to deteriorate and pose a risk to those carrying out alterations, maintenance, and demolition” (2).

5.3.3 The Chrysotile (formerly Asbestos) Institute reports that: “More than 90 % of the world production of chrysotile is used in the manufacture of chrysotile-cement, in the form of pipes, sheets, and shingles. These products are used in some sixty industrialized and developing countries” (5).

5.4 It follows that the installed base of asbestos-cement products worldwide is enormous and continues to grow. In other words, the problem of exposure to asbestos fibers from working with these materials is substantial and will remain significant for the foreseeable future.

5.5 The significance of this practice is that it provides work practices that protect worker and community health within the resources available in developing as well as industrialized countries. It relies as much as possible on tools, equipment, and supplies that are readily available without recourse to specialty

suppliers. The techniques require careful and diligent workmanship but do not require the services of highly-skilled tradesmen.

5.6 This practice is intended to be used not only by construction workers and tradesmen in the performance of their work, but also by building owners and others as the basis for preparing contracts and tenders for activities included in the scope of this practice. It will also provide a foundation for government officials to develop regulations intended to protect worker and community health. Where such regulations already exist, of necessity they take precedence over this practice in event of a conflict.

5.7 The persons who are most at risk of exposure to airborne asbestos fibers are those who perform work on asbestos-cement products during maintenance, renovation, and repair operations. This practice places its primary emphasis on the protection of their health. However, other members of the community—other workers and individuals in a building being renovated, residents of a house undergoing repairs, and unsuspecting bystanders—are at risk to a lesser degree. By minimizing the risk to the worker performing the maintenance, renovation, and repair operations, the potential exposure of others is reduced as well.

5.8 It is expected that employers will comply voluntarily with the provisions of this practice in the interest of protecting worker and community health and reducing their own liability. However, the existence of a regulatory infrastructure for occupational and community health greatly enhances compliance with measures to reduce exposure to asbestos fibers and other toxic materials. In some countries, such a system is highly advanced, but in others it needs to be created or further developed. These efforts can be furthered by referencing this practice in laws and regulations and requiring compliance with its provisions.

5.8.1 Issuance of construction permits can be made contingent on showing evidence of worker training, experience in the use of these procedures, and adequate resources (manpower, equipment, and supplies) to use them properly.

5.8.2 A contractual framework that references this practice and requires use of its procedures ensures the building owner or other party securing construction services under a contract or tender arrangement that the responding offeror has been informed as to the expected level of performance when working with asbestos-cement products.

## 6. Uses and Characteristics of Asbestos-Cement Products

6.1 In order to apply the methods for controlling the release of airborne asbestos fibers and minimizing the creation of asbestos-containing dust and debris, it is necessary to understand the uses to which asbestos-cement products have been put, their physical characteristics and their composition including asbestos fibers and other constituents.

6.2 All asbestos-cement products are defined and regulated as non-friable asbestos-containing materials—that is, while some of them may be broken into smaller pieces by hand without the use of tools or mechanical equipment, the broken pieces cannot be crumbled into powder by hand pressure alone.