



Designation: E2260 – 21a

Standard Guide for Repointing (Tuckpointing) Historic Masonry¹

This standard is issued under the fixed designation E2260; 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.

1. Scope

1.1 This guide applies only to existing historic masonry construction. For purposes of this guide historic masonry is intended to refer to buildings that have significant historic, architectural, cultural or social meaning and are constructed of masonry materials. Similar techniques and evaluation should be employed for non-historic masonry, but are not addressed in this guide.

1.2 This guide outlines procedures for repointing historic masonry and is intended to provide guidelines for the user to establish project-specific requirements for repointing of historic masonry.

1.3 This guide only pertains to masonry units: brick, terra cotta, stone, cast stone, and concrete brick laid in mortar, and may or may not be appropriate for other masonry units.

1.4 This guide addresses repointing (tuckpointing) as defined in 3.1.3.

1.5 When considering repointing, especially on masonry of artistic, architectural, cultural, or historical significance, guidance from a specialist experienced in historic masonry and repointing should be sought.

1.6 This guide does not address pointing styles or profiles used on masonry or the methods of producing them.

1.7 Additional repairs that may impact the structural integrity of the masonry may necessitate that a structural stability analysis be completed prior to the execution of any work.

1.8 Following this guide may involve hazardous materials, operations, and equipment. *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 requirements prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standard-*

¹ This guide is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.24 on Building Preservation and Rehabilitation Technology.

Current edition approved Oct. 15, 2021. Published October 2021. Originally approved in 2003. Last previous edition approved in 2021 as E2260 – 21. DOI: 10.1520/E2260-21A.

ization 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:²

C67/C67M Test Methods for Sampling and Testing Brick and Structural Clay Tile

C140/C140M Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

C170/C170M Test Method for Compressive Strength of Dimension Stone

C270 Specification for Mortar for Unit Masonry

C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

C1324 Test Method for Examination and Analysis of Hardened Masonry Mortar

C1713 Specification for Mortars for the Repair of Historic Masonry

E631 Terminology of Building Constructions

E1857 Guide for Selection of Cleaning Techniques for Masonry, Concrete, and Stucco Surfaces

2.2 Other Documents:

BIA Technical Note 1 Hot and Cold Weather Construction, June 2018³

BIA Technical Note 46 Maintenance of Brick Masonry, December 2017³

The Secretary of the Interior's Standards for the Treatment of Historic Properties, 2017⁴

TMS 602 Specifications for Masonry Structures⁵

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from The Brick Industry Association (BIA), 12007 Sunrise Valley Dr., Suite 430, Reston, VA 20191, <https://www.gobrick.com>.

⁴ Available from Technical Preservation Services, National Park Service, U.S. Department of the Interior, 1849 C Street NW, Mail Stop 7243, Washington, DC 20240, <https://www.nps.gov/tps/standards.htm>.

⁵ Available from The Masonry Society (TMS), 105 South Sunset Street, Suite Q, Longmont, CO 80501-6172, <https://www.masonrysociety.org>.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *in-situ mortar*—mortar existing in the masonry construction which includes the original setting or pointing mortar, or both and subsequently installed setting or repointing mortar.

3.1.2 *masonry*—for this guide, masonry is defined as brick, terra cotta, stone, cast stone and concrete brick which is set in mortar.

3.1.3 mortar removal techniques:

3.1.3.1 *chiseling*—use of a hammer and chisel to remove mortar.

3.1.3.2 *power chiseling*—hand-held short stroke pneumatic carving tool with a round shank chisel blade with no retainer to remove mortar.

3.1.3.3 *power router*—hand-held motor driven device using a diamond embedded router bit or other suitable abrasive bit to removal mortar.

3.1.3.4 *raking*—use of a hand tool to remove mortar.

3.1.3.5 *sawing/grinding*—use of a diamond-tipped, silicon carbide-tipped, or other suitable abrasive blade to remove mortar.

3.1.4 *original mortar*—mortar used in the original construction of the masonry wall which may be only the original setting mortar or may also include original pointing mortar.

3.1.5 *original pointing mortar*—the mortar placed into a joint (exposed outer edge) from which fresh setting mortar was raked out during original construction of the masonry wall.

3.1.6 *point*—placing mortar into a properly prepared joint.

3.1.7 *repointing*—the process of removal of defective mortar from between masonry units and placement of fresh mortar.

3.1.8 *repointing mortar*—the new mortar to be selected by the user of this guide.

3.1.9 *specialist*—architect, conservator, engineer or other professional with appropriate applicable experience, hereinafter referred to as the specialist.

3.1.10 *tuckpointing*—for purposes of this guide, synonymous with repointing.

4. Significance and Use

4.1 Repointing masonry improves weather resistance, reduces water penetration, maintains structural and visual integrity, and prolongs the life of the building by allowing a mortar joint to shed water and avoid the accumulation and penetration of rainwater between mortar and masonry units.

4.2 This guide provides for the selection of the most effective methods appropriate for repointing masonry based upon the following parameters:

- 4.2.1 Determination of joints to be repointed.
- 4.2.2 Evaluation of in-situ masonry.
- 4.2.3 Evaluation of techniques for removal of mortar.
- 4.2.4 Determination of appropriate repointing mortar.
- 4.2.5 Selection of repointing mortar.
- 4.2.6 Establishing the method of execution of the work.

4.2.7 Visual inspection of the work.

5. Determination of Joints to be Repointed

5.1 In many cases, not all joints in the masonry need to be repointed. It may be prudent to repoint only portions of the masonry or not to repoint at all (see Secretary of the Interior's Standards).

5.2 Closely examine mortar joints to determine which joints require repointing. Defective joints require repointing. Defective joints include joints that are cracked, deteriorated, eroded, contain voids, or are poorly bonded to masonry units. Cleaning of selected areas of the masonry to help identify areas needing repointing should only be done when necessary for evaluation (see Guide E1857 and Secretary of the Interior's Standards).

5.3 If the masonry was previously repointed with a mortar which has a higher compressive strength than the adjoining masonry, the previously installed repointing mortar should be removed and the joints should be repointed.

5.4 Visually inappropriate, previously installed repointing mortar should be replaced. If color, texture, and joint profiles do not match the existing historic mortar joints, the joints should be removed and repointed.

5.5 In some cases, sealants or other inappropriate materials may have been used in joints of masonry units. These materials should be removed and the joints repointed.

6. Evaluation of In-Situ Masonry

6.1 If shoring of the masonry is required, the necessary materials and methods should be identified.

6.2 Evaluate In-Situ Mortar:

6.2.1 In-situ mortar may include previously installed repointing mortar, and each masonry structure may be comprised of different mortars of varying ages and materials. Identification of the original mortar is an integral part of the process of selecting an appropriate repointing mortar.

6.2.2 The color and texture of the in-situ mortar to be matched should be evaluated by visual and laboratory means. Original color can be reasonably determined by visual examination of a freshly broken surface of a mortar sample.

6.3 *Evaluate Masonry Materials*—The physical properties of masonry units should be assessed to ensure compatibility with the repointing mortar.

6.3.1 When required, the physical properties of the masonry should be tested in accordance with Test Methods C67/C67M, C140/C140M, and C170/C170M, respectively.

6.3.2 For some repointing projects, sampling and testing of masonry units and materials is not permitted or necessary. In such cases, a qualitative assessment of the physical properties of materials can suffice. Such qualitative assessment should include identification of the type of masonry materials and a visual inspection of the condition of the materials. Literature from the appropriate period can be reviewed for an indication of properties of the materials. When available, the original material specifications and relevant maintenance and repair work for the building should be reviewed.

7. Evaluation of Techniques for Removal of Mortar

7.1 In determining the method of mortar removal, a standard should be established for joint preparation that limits the damage to masonry units and provides a proper substrate for bonding of new mortar. Prior to beginning the work, potential techniques for mortar removal should be evaluated.

7.2 Mortar removal procedures should attempt to remove all mortar from joints to the specified depth and to provide a substrate to which the repair mortar can properly adhere.

7.3 Mortar can be removed using various procedures. Techniques including raking, chiseling, routing, and grinding, are listed and described in Section 3. Combinations of these techniques can also be used.

7.4 On historic masonry, it is recommended that the most effective and least damaging technique be used as the method of mortar removal.

NOTE 1—Hand raking alone as a technique should only be used if it can be determined that hand raking can be performed without causing damage to masonry. If hand raking is determined to damage the masonry units, other techniques of mortar removal shall be considered.

7.5 Although some damage may be inevitable, careful joint preparation can help limit damage to masonry units.

7.6 It is the responsibility of the user of this guide to evaluate the advantages and disadvantages of the various removal techniques as they relate to type and condition of the masonry to be repointed.

7.7 The use of power tools is not recommended for joints of less than 3 mm, where the geometry of the joint limits access, or where the masonry units are weak or friable.

7.8 Evaluate the method of mortar removal with regard to the structural and visual integrity of the masonry.

7.9 Technicians should be evaluated with regard to their ability to remove in-situ mortar without damage to the masonry units. A demonstration of their ability should be conducted and approved on a test area representative of the work to be performed.

8. Use of Mortar Samples and Test Areas

8.1 Samples of the proposed repointing mortar should be prepared for comparison with the original mortar for color, texture, and finish prior to the repointing work. Samples should be compared after the mortar has sufficiently hardened for handling and has attained its final color.

8.2 Samples of the proposed repointing mortar should be prepared prior to the repointing work to determine mortar properties. Mortar properties should be evaluated in accordance with the sampling and testing procedures in Test Method C780.

8.3 Test areas should be used to evaluate mortar removal techniques, mortar formulation, pointing techniques, final cleaning and appearance. Test areas should be approved prior to proceeding with the work. Test areas should have the following characteristics:

8.3.1 Test areas should include materials and conditions representative of surfaces to be repointed.

8.3.2 Test areas should permit evaluation of the effects of the repointing work on materials, surfaces, and surroundings.

8.3.3 Test areas should permit visual inspection and comparison to adjacent masonry surfaces that have not been repointed. Inspection should be performed under similar lighting and exposure conditions.

9. Selection of Repointing Mortar

9.1 The repointing mortar should be selected based on the purpose of repointing and with consideration given to its historic proportions and compatibility with masonry materials. Formulation of the repointing mortar should not be based on an inappropriate, previously installed pointing mortar. Specification C1713 can be used to specify mortar for historic masonry and includes an appendix covering the evaluation, selection, and use of mortar for the repair of historic masonry.

9.2 The selected repointing mortar should match the original mortar (if originally used) or exposed mortar unless it is determined that either is inappropriate for use.

9.3 The selected repointing mortar should be the appropriate color and texture as determined by the user of this guide and exhibit the durability and performance desired. See 8.1.

9.4 The visual matching of in-situ mortar with the repointing mortar may be desired but can be difficult to achieve. An acceptable match can require analysis of the in-situ mortar materials, trial mix proportions using new mortar materials, and variations in placement and tooling of the repointing mortar. If it is desired to match the appearance of the repointing mortar to the in-situ mortar, the unsoiled color, determined by examining the interior surface of the mortar, should be matched. Proposed repointing mortars should be installed and evaluated in test areas, refer to Section 8.

9.5 The composition of the repointing mortar should be designed and assessed to ensure compatibility of the physical properties with the in-situ mortar and masonry units. Mortar composition may be evaluated in accordance with Test Method C1324.

NOTE 2—Substantial disparity between the compressive strengths or other physical properties of the in-situ mortar and the repointing mortar, or the repointing mortar and the masonry units can lead to spalling or other distress of the masonry units. A common approach to ensure compatibility of physical properties is to evaluate the composition of the in-situ mortar and approximate the compressive strength of the mortar before selecting the repointing mortar. The repointing mortar should have a similar or lower compressive strength and greater water vapor permeability than the masonry units.

9.6 Mortar materials should be chosen in accordance with the applicable ASTM material specifications. Appropriate pigments and additives may be permitted if analysis of original mortar and evaluation of the project repointing mortar requirements indicate that inclusion of such materials is applicable.

9.7 In regions subject to freeze-thaw cycling, resistance to freeze-thaw damage is an important consideration. The mortar should have the capacity to transmit more water vapor than the masonry unit.