

## REPOINTING (TUCKPOINTING) BRICK MASONRY

### Introduction

The terms pointing, repointing and tuckpointing are often used interchangeably, which has led to confusion within the masonry industry. For years, the Brick Industry Association has used the term "tuck-pointing" to describe one form of maintenance of brick masonry. However, the meaning of tuckpointing may vary by geographical region, leading to conflicts regarding job specifications and expected repairs. Recently these terms have been defined in ASTM E 2260, Guide for Repointing (Tuckpointing) Historic Masonry, as follows:

**Point** - placing mortar into a properly prepared joint

**Repointing** - the process of removal of defective mortar from between masonry units and placement of fresh mortar.

ASTM E 2260 defines tuckpointing as synonymous with repointing, however the term also applies to an older practice of pointing masonry with a flush mortar joint that approximates the color of the masonry units and a mortar of contrasting color that is shaped into a thin strip, giving the appearance of a very thin mortar joint.

This *Brick Brief* covers the process that ASTM E 2260 defines as repointing. Thus the term repoint is used throughout to avoid confusion.

### Why Repoint?

The longevity of mortar joints will vary with the exposure conditions and the mortar materials used. A lifespan exceeding 25 years is typical for mortar joints. The longevity of brick units, however, may well exceed 100 years. Consequently, occasional repair of the mortar joints may be necessary over the life of the brick masonry. The most common reason for repointing brick masonry is to improve water penetration resistance. Repointing deteriorated mortar joints is one of the most effective and permanent ways of decreasing water entry into brickwork. This is because a common means of water entry into a brick masonry wall is through debonded, cracked or deteriorated mortar joints.

### What to Repoint

A critical step in the repointing operation is to identify wall areas that require repointing. This step is critical because only defective joints require repair. Repointing is very labor-intensive work and original mortar joints in good condition are preferable to repointed mortar joints. Conditions that require repointing include:

- mortar erosion exceeding  $\frac{1}{4}$  in. (6.4 mm.)
- crumbling mortar
- mortar with voids
- hairline cracks in the mortar

- cracks between the brick and mortar.

Visual observation in combination with light scraping with a metal tool can detect cracked, spalled and friable mortar joints. This is the most common means of determining areas to be repointed. On older buildings, "cleaning" by low or moderate pressure water wash (not grit or chemical wash) may be required prior to evaluating the condition of existing mortar joints. Consult *Technical Note 20* for proper water washing techniques. Care should be taken to not cause further damage to the brickwork when cleaning.

### Repointing Mortar

The strength, composition and color of the existing mortar should be considered when selecting a repointing mortar.

**Strength.** To avoid irreparable brick damage, the compressive strength of the repointing mortar should be similar to or weaker than the compressive strength of the original mortar. Under load, a stronger repointing mortar will deform less than a weaker original mortar, causing the load to be concentrated on the thin strip of stronger repointing mortar. This stress concentration can lead to spalling of the brick face. The brick masonry is loaded by its self-weight and any externally applied loads present. In addition, the brick masonry is subjected to internal loads due to its thermal expansions and contractions and the shrinkage of the repointing mortar.

Matching compressive strengths of the original and the repointing mortar may be done by matching mortar material proportions. By petrographic or chemical analysis, it is possible to analyze a sample of the original mortar and determine proper proportions of components. ASTM C 1324, Standard Test Method for Examination and Analysis of Hardened Masonry Mortar, can be used to determine the mortar proportions. However, such testing is an added cost, typically only appropriate for historic structure repointing projects which are required to closely match existing conditions. Rather than extensive testing, simply considering the age of the building will give a strong indication of the main contents of the original mortar. For example, mortar containing portland cement was not used in brickwork until after the turn of the twentieth century. Until that time, a common lime and sand mortar in one to three proportions was clearly the most frequently used brick masonry mortar.

**Composition.** Typically, repointing mortar will be Type N, O or K mortar. The proportions of portland cement and lime for Types N and O mortars should be in accor-

dance with ASTM C 270, Standard Specification for Mortar for Unit Masonry or BIA M1-88 (see *Technical Note 8A*). Type K mortar proportions are no longer included in the body of ASTM C 270, but are given in an appendix on repointing. Mortar specifications permit a range of proportions of materials for each type of mortar. However, the following are typical proportions by volume :

- Type N - 1 part portland cement, 1 part hydrated lime, and 6 parts sand
- Type O - 1 part portland cement, 2 parts hydrated lime, and 9 parts sand
- Type K - 1 part portland cement, 4 parts hydrated lime and 15 parts sand

In some cases, it may be necessary to match sand gradation with that in the original mortar. For example, brick masonry constructed with thin mortar joints may require sand with finer maximum particle size than permitted by ASTM C 144, Standard Specification for Aggregate for Masonry Mortar. A matching sand gradation may be determined by analysis of the original mortar. The color of the sand to a large extent influences the mortar color since it is the most prevalent of the mortar constituents. Local sand suppliers should be contacted to match sand color. Water for repointing mortar should be clean and potable and should be free of deleterious amounts of acids, alkalies or organic materials.

**Additives.** In general, the use of chemical additives in the repointing mortar mix should be avoided. However, in many older buildings, the original mortar may contain additional materials such as oyster shells and horsehair. If duplication of the original mortar is required, the repointing mortar should contain these materials in matching quantities. Oyster shells, if required, should be thoroughly washed and rinsed with clear water to remove all traces of salt and biological growth. The oyster shells should be crushed to a size matching that in the original mortar. To avoid detriment to the repointing mortar performance, the quantity of oyster shells should not exceed 2 parts by volume of the mix.

Coloring of the mortar with pigments may be required to match the original mortar color. Pigments should be metallic oxides and not organic chemicals. Coloring additives may be added to the mix in quantities not to exceed 10 percent by weight of the portland cement in the mix, with carbon black limited to 2 percent. When matching an existing mortar compare the mixed sample to existing mortar that has been wetted and then compare fully dried samples.

### **Mortar Preparation and Placement**

The repointing mortar should be prepared and placed in accordance with the procedures given in *Technical Note 7F* and the repointing appendix of ASTM C 270. Prehydration of the repointing mortar is a very important step in the process, as prehydration helps avoid excessive shrinkage of the repointing mortar. Removal of defective mortar and cleaning of the joint prior to repoint-

ing are necessary for successful performance of the repointing mortar. The depth of mortar removal should equal or exceed two times the mortar joint thickness. Proper layering and compaction of the repointing mortar helps develop bond with the adjacent brick and mortar. ASTM E 2260, Standard Guide for Repointing (Tuckpointing) Historic Masonry, provides further information on preparing and repointing mortar joints.

### **Locating a Quality Repointer**

An important step toward a successful repointing job is to secure a qualified and experienced repointing craftsman. An individual who is an excellent mason/bricklayer may not be skilled in repointing. It is suggested that skills be substantiated by prior repointing projects or by pre-qualifying. One method of evaluating craftsmanship is to designate an inconspicuous section of the brick masonry and allow candidates to demonstrate their work. The skills in question are:

- cutting out the mortar joints to the proper depth and profile with minimal damage to adjacent brick
- proper preparation of the mortar for repointing
- proper placement of mortar by layering, compacting and tooling
- accurate color matching to adjacent, original mortar joints.

Cleanliness of the repointing operation is also important, so that extensive cleaning of the finished wall is not necessary.

### **Summary**

These recommendations are necessarily general in nature to address the many scenarios for which repointing may be required. The application of these recommendations should be done with skill and engineering judgment. Where repointing work on structures of artistic, architectural, cultural or historical significance is considered, guidance from a preservation specialist should be sought.

*Brick Briefs are short discussions of a particular topic. The information contained herein is based on the experience of Brick Industry Association technical staff and must be used with good technical judgment. Final decisions on the use of this information must rest with the project designer and owner.*