

# New thinking on WATER-REPELLENT COATINGS for brick masonry

*The Brick Institute of America now advises careful selection and cautious application rather than discouraging their use*

By Carolyn Schierhorn



The Brick Institute of America now states that water-repellent coatings may be appropriate for use on brick masonry in certain situations.

The Brick Institute of America (BIA) used to discourage the use of clear water-repellent coatings on clay brick masonry in most situations. *Technical Notes on Brick Construction-7E*, "Colorless Coatings for Brick Masonry," last reissued in 1987, devoted much of its two-and-a-half pages to a litany of warnings and a lengthy checklist of procedures to follow when colorless coatings are used.

Such coatings, BIA stressed, are often misapplied and can actually trap moisture in the wall, contributing to efflorescence and spalling. No substitute for proper design and construction, colorless coatings cannot bridge large cracks or incompletely filled mortar joints, common culprits of moisture penetration (Ref. 1).

*Technical Notes-7E* focused on

the importance of good detailing, workmanship, and materials, which, it emphasized, should make the application of a colorless coating unnecessary, if not undesirable. The publication mentioned the different types of colorless coatings available but did not discuss their particular strengths and weaknesses in any detail.

Last year, however, BIA officially modified its position on clear coatings, replacing *Technical Notes-7E* with *Technical Notes on Brick Construction-6A*, "Colorless Coatings for Brick Masonry." Still emphasizing proper design and construction, especially the superior moisture resistance of a drainage wall system, the new publication does not wholeheartedly endorse colorless coatings. But it does allow that, under cer-

## Typical properties of colorless coatings for brick masonry

Coating type	Water vapor transmission	Water repellency	Life span (years)	Glossy finish possible	Graffiti-resistant
<b>Film formers</b>					
Acrylics	Poor	Very good	5-7	Yes	Yes
Stearates	Poor	Varies	1	No	No
Mineral gum waxes	Poor	Good	Varies	No	No
Urethanes	Poor	Very good	1-3	Yes	Yes
Silicone resins	Fair	Varies	1	Yes	No
<b>Penetrants</b>					
Silanes	Very good	Very good	10+	No	No
Siloxanes	Very good	Very good	10+	No	No
Blends	Varies	Varies	Varies	No	No

Source: Brick Institute of America (Ref. 2)

tain circumstances, a coating may be beneficial.

Water-repellent coatings do reduce moisture absorption by brick masonry, BIA states. Eleven pages long, *Technical Notes-6A* discusses the merits and disadvantages of different types of colorless coatings when applied to clay brick substrates.

"We surveyed people in the industry representing a variety of geographic locations, asking them to tell us of cases where water-repellent coatings performed successfully and where they caused problems," says J. Gregg Borchelt, BIA's director of engineering and research. There were enough instances of successful performance to cause BIA to revise its position.

### Appropriate applications

BIA now suggests that water-repellent coatings may be useful on brick building elements that are particularly vulnerable to moisture penetration, especially in areas with large amounts of rain.

**Barrier walls.** Barrier walls, which have no provision for the internal drainage of water, may benefit from a clear water repellent. These walls include singlewythe exterior walls and multiwythe walls with filled collar joints.

**Chimneys and parapets.** Applying a water-repellent coating to chimneys and parapets also may help reduce water-related problems. These building elements often are exposed to wind-driven rain and water rundown from the chimney crown or coping. In addition, they can be subject to water penetration from failures in the crown or coping and improper flashing installations.

**Faulty drainage walls.** When drainage-type masonry walls, such as brick veneer and cavity wall systems, are not designed or constructed properly, applying a water repellent may help alleviate water penetration problems (Complete all other repairs first, however). BIA recommends using vents at the top and bottom of all

### Pre-use guidelines

When selecting and before using a clear water-repellent coating, follow these suggestions offered by the Brick Institute of America (Ref. 2):

1. Require test reports for relevant performance criteria and a written warranty from the coating manufacturer.

2. Verify the qualifications of the application contractor; make sure the contractor protects adjacent and surrounding surfaces from overspray as necessary.

3. Use a coating produced by a well-known manufacturer that has been in business at least five years.

4. Make sure the coating brand has had a good track record for the past five years.

5. Request references of projects with similar applications, materials, and exposure.

6. Make sure the wall is clean; heavy accumulations of atmospheric dirt interfere with proper penetration or adhesion of the coating and result in poor performance and shorter life.

7. On newly constructed brick walls, allow at least a month to pass after close-in of the building before

applying the coating; this allows the walls to cure sufficiently and moisture in the building materials to evaporate. A delay of one year is preferred so that efflorescence due to water absorbed during construction (new building bloom) is not entrapped by the coating.

8. For remedial applications, complete all necessary repairs first.

9. Allow freshly repointed mortar and repaired sealant joints to cure for a minimum of 72 hours.

10. The moisture content of the wall should be consistent with the manufacturer's recommendation; check the moisture content at several locations.

11. Observe the climatic conditions recommended by the coating manufacturer for application on clay brick substrates; typically, temperatures should be above 40° F and below 100° F.

12. Test the selected coating on wall sections scheduled for treatment; the test areas should be at least 10 feet square. (For information on applying water-repellent coatings, see "Water Repellents: Selection and Usage," December 1993, pages 527-532.)

wall cavities, when treating a drainage wall, to promote the evaporation of moisture from the brick masonry.

**Highly absorptive brick.** A coating may be useful on highly absorptive brick masonry, such as walls that have been sandblasted. By reducing the amount of water absorbed by a brick masonry wall, water-repellent coatings may help reduce staining and efflorescence (Ref. 2).

### Inappropriate applications

*Technical Note-6A* describes the following situations where clear water repellents are unnecessary, will not help, or will harm brick masonry:

**Effective drainage walls.** When designed and constructed properly, drainage walls do not require a water-repellent coating. They accommodate water penetrating the exterior brick wythe without damage to the interior components of

the wall system.

**Walls with severe defects.** Clear water-repellent coatings can't stop water penetration through larger than 0.02-inch cracks, incompletely filled mortar joints, or ineffective sills, caps, or copings. BIA recommends long-term remedial measures, such as removing and replacing defective sealant and spalled or cracked brick, repointing the mortar joints, or surface grouting separations between the brick and mortar.

**Freeze-thaw regions.** BIA warns that in climates that experience freeze-thaw cycling, colorless coatings may adversely affect the durability of brick masonry by inhibiting moisture evaporation.

**Exterior pavements.** Freeze-thaw cycles are particularly damaging to exterior brick pavements that have been treated with a water-repellent coating. BIA does not recommend using a water-repellent coating on brick pavements

in climates with much freeze-thaw activity. Because pavements are laid horizontally, they are subjected to considerably more water exposure. Moreover, by the nature of their construction, pavements allow moisture to evaporate through only one face—the wearing surface—and, thus, have a lower rate of water vapor transmission (Ref. 2).

### Selecting a coating

The water vapor transmission rate refers to the amount of water that can evaporate through the face of the masonry. According to BIA, this is the most important property to consider when selecting a coating for exterior brick masonry.

BIA recommends choosing breathable coatings, which have a high water vapor transmission rate. Coatings that aren't breathable can trap water-soluble salts in the brickwork—salts that might otherwise be deposited on the surface as efflorescence. As salts crystallize, they expand; over time, their accumulation can cause spalling of the brick. In addition, water may condense at the level of the clear water repellent and lead to freeze-thaw damage of the brick.

Coatings for brick masonry are classified into two general categories—penetrants and film formers. BIA, in general, recommends penetrants, which allow more water vapor transmission and last longer.

### Film formers

Water-repellent products that form a film when applied to brick masonry include acrylics, stearates, mineral gum waxes, urethanes, and silicone resins. These coatings have a large molecular size, which prevents them from penetrating the substrate but allows them to bridge hairline cracks. They are effective water repellents but, because they have poor water vapor transmission, BIA advises they not be used in freeze-thaw environments (See table). In addition, they generally

need more frequent reapplication than penetrants.

However, film-forming products make effective graffiti-resistant coatings by preventing surface contaminants from penetrating the masonry. (For more information, see also "Water Repellents: Selection and Usage," *Masonry Construction*, December 1993, pages 527-532.)

If a film-forming coating is selected for exterior applications, make sure it will not degrade in ultraviolet light. Find out whether the substrate should be thoroughly dry before applying the coating. According to BIA, certain of these products may impart a milky white appearance to the substrate if moisture gets underneath the coating.

### Penetrants

Penetrants are coatings that penetrate the substrate, usually up to  $\frac{3}{8}$  inch. To repel water, they change the capillary force of the pores in the masonry face from positive to negative; and they change the contact angle at which water meets the masonry surface. According to BIA, penetrants promote better water vapor transmission because they coat pores rather than bridge them. These coatings also are more resistant to UV degradation because of their chemical composition and because they penetrate the masonry surface.

Penetrants can be classified into five groups: siloxanes, silanes, silicates, methyl siliconates, and blends of these. BIA does not recommend the use of silicates or methyl siliconates on brick masonry. Use blends only with caution, reviewing product data and test results carefully.

BIA reports that siloxanes and silanes have been used successfully on some brick masonry installations. Siloxanes provide good water repellency, long-term performance, and have proved effective on brick masonry walls. Silanes containing chemical catalysts have also performed well.

**Silanes.** Silanes have a small molecular structure, which allows good penetration on even dense substrates. Used in relatively high concentrations (typically 20% or more solids content), silanes chemically bond with materials containing silica or alumina to make the material more water-repellent.

An alkaline substrate such as concrete or concrete masonry acts as a catalyst to speed the chemical reaction that forms a water-repellent surface. For use on brick masonry, contractors must add a chemical catalyst to the silane concentration.

Silanes have a relatively long life span of 10 years or more. For best performance, apply silanes to a slightly damp surface.

**Siloxanes.** Siloxanes have a slightly larger molecular structure than silanes, but good penetration and water repellency can be achieved. Siloxanes also chemically bond with silica- or alumina-containing materials such as brick, resulting in a service life of at least 10 years.

Siloxanes are less volatile than silanes and react with chemically neutral substrates without a chemical catalyst. However, BIA warns, siloxanes are highly reactive with silica and will bond with glass that is not properly protected (Ref. 2).

To order *BIA Technical Notes on Brick Construction-6A*, contact Brick Institute of America, 11490 Commerce Park Dr., Reston, VA 22091 (703-620-0010; fax 703.620.3928). ■

### References

1. "Colorless Coatings for Brick Masonry," *BIA Technical Notes on Brick Construction-7E*, February 1987, Brick Institute of America, 11490 Commerce Park Dr., Reston, VA 22091.
2. "Colorless Coatings for Brick Masonry," *BIA Technical Notes on Brick Construction-6A*, April 1995.

PUBLICATION #M960172

Copyright © 1996, The Aberdeen Group  
All rights reserved