

Part 3 Execution

- *Acceptable installers.* Quality can be enhanced by the contractor's use of subcontractors and craftsmen with qualifications and experience in a particular trade or with certain expertise for special products or systems types. This article is suggested for use in sections for historical projects, testing and balancing of mechanical systems, special finishes, and others that may require a high quality of workmanship.
- *Site tolerances.* Establish an acceptable range of deviation from specified dimensions. Contractor is required to control dimensional tolerances, and verification may be required if the deviation appears visually unacceptable or interferes with performance requirements. Dimensional tolerances may involve such issues as surface flatness, levelness, plumbness, or alignment. Frequency of the deviation from tolerances is sometimes controversial. A tolerance that indicates that deviation shall not exceed $\frac{1}{4}$ in. in 10 ft may be questioned as to direction and whether the deviation is cumulative (e.g., $\frac{3}{4}$ in. in 30 ft), fragmentary (e.g., $\frac{1}{4}$ in. in 1 ft), or multiple (e.g., $\frac{1}{4}$ in. every 6 in. or so).
- *Field quality control.* Represents the last form of verification and may form the basis for decisions about defective work during or after installation.
 - *Site tests.* Usually involve quality control of variable conditions. Test methods, frequency interval, and location of testing are important issues. Field testing may involve soil compaction, load tests, compression tests, and various forms of non-destructive testing. Field testing may not always be performed at the site but may be performed on samples taken from the site.
 - *Inspection.* May involve simple visual observation for conformance with certain specified criteria, or may require third-party inspection of construction to verify conformance with contract requirements.
 - *Manufacturers' field service.* May require an authorized manufacturer's representative to visit the site to instruct or supervise installer in the installation/application of a product or system, or for training on, start-up of, or demonstration of specialized equipment. The manufacturer's field service may be required to determine or verify compliance with manufacturer's instructions. A manufacturer's field report as a quality control submittal should be required for these services.

17.4 FIELD OBSERVATION AND INSPECTION

The term *field observation* is often used as an architectural term denoting the type of periodic site visits associated with the services of a standard design services contract with a building owner. The term *inspection* more often implies special services that are more time-intensive and typically associated with structural engineering services and construction quality control. The items and issues that should be covered under an architect's field observation services are outlined in Chapter 18. The following discussion covers engineering inspection of structural masonry. Refer also to Chapter 12 for more on structural masonry inspection.

The owner typically engages independent testing laboratories and special inspectors to test, inspect, and verify the quality of work. Additional testing and inspection beyond the minimum required by code may be specified for some projects. Testing laboratories and inspectors are normally selected for their qualifications in a particular area of expertise. Testing laboratories

for masonry construction should be accredited in accordance with ASTM C1093, *Standard Practice for Accreditation of Testing Agencies for Unit Masonry*. Quality control testing and inspection may also be required by governmental authorities having jurisdiction over the project. This may involve tests, inspections, and approvals of portions of the work as required by building codes, laws, ordinances, rules, regulations, or orders of public authorities. Any required certificates of testing, inspection, or approvals by the building inspector are secured by the contractor and delivered to the A/E as quality control submittals. The contractor may also obtain independent testing and inspection services as a part of its own quality control program.

17.5 INDUSTRY STANDARDS FOR MASONRY

Industry standards such as those developed and published by the American Society for Testing and Materials (ASTM) are an important part of quality assurance and quality control in construction. Some standards establish minimum requirements for products or systems, and others outline standardized testing procedures for verifying compliance with the requirements stated in the contract documents.

At last count, there were more than 80 ASTM standards on masonry and masonry-related products, with more in development. Most project specifications, however, require reference only to a core group of standards that apply to the most frequently used products and systems. Because there are so many different products and materials that fall under the umbrella of the term *masonry*, there are perhaps more standards than for other construction systems. Some standards, however, are embedded references within other standards and ordinarily do not require specific citation in project specifications. Others apply to specialty products such as sewer brick, chemical-resistant units and mortar, high-temperature refractory brick, and clay flue liners that are outside the scope of the typical design project. Still other standards are used primarily for research and product development rather than building construction.

Many ASTM standards cover more than one grade, type, or class of material or product from which the specifier must choose. Some also contain language designating which requirements govern by default if the project specifications fail to stipulate a preference. The following summary of standards should serve as a checklist in preparing project specs and developing a quality assurance and quality control testing program.

17.5.1 Standards for Clay Masonry Units

ASTM C216, Standard Specification for Facing Brick (Solid Masonry Units Made of Clay or Shale). Face bricks are solid clay units for exposed applications where the appearance of the brick is an important consideration in the design. “Solid units” are defined as those with a maximum cored area of 25%. ASTM C216 covers two grades and three types of face brick. Brick *type* designates size tolerance and allowable chippage and distortion based on desired appearance. Type FBS (Standard) is the industry standard and the type of face brick used in most commercial construction. Type FBX (Select) has tighter size tolerances and less allowable chippage for use in applications where a crisp, linear appearance is desired such as stack bond masonry. Type FBA (Architectural) is non-uniform in size and texture, producing characteristic “architectural” effects such as those typical of, or required to simulate, hand-made brick. Type FBA is