

The electrical code used by all jurisdictions is the *National Electrical Code* (NEC), published by the NFPA. In order to maintain greater uniformity in building regulations, the ICC does not publish an electrical code, but relies on the NEC.

Model codes also make extensive use of industry standards that are developed by trade associations, such as the Gypsum Association (GA); government agencies; standards-writing organizations, such as ASTM International and the NFPA; and standards-approving groups, such as the American National Standards Institute (ANSI). Standards are adopted into a building code by reference name, number, and date of latest revision. For example, most codes adopt by reference the American National Standard ICC/ANSI A117.1, *Accessible and Usable Buildings and Facilities*. This standard was developed by the ICC based on previous ANSI accessibility standards and is approved by ANSI.

#### 4. TESTING AND MATERIAL STANDARDS

All approved materials and construction assemblies referred to in building codes are required to be manufactured according to accepted methods or tested by approved agencies according to standardized testing procedures, or both. There are hundreds of standardized tests and product standards for building materials and constructions. Some of the more common ones are listed in this section. Information about additional soils tests is included in Chap. 35 of this book, and concrete testing is included in Chap. 48 and Chap. 49 of this book.

As previously stated, standards are developed by trade associations, standards-writing organizations, and government agencies. By themselves, standards have no legal standing. Only when they are referred to in a building code and that code is adopted by a governmental jurisdiction do standards become enforceable.

#### Standards-Writing Organizations

ASTM International is one organization that publishes thousands of standards and test procedures that prescribe, in detail, such things as how the test apparatus must be set up, how materials must be prepared for the test, the length of the test, and other requirements. If a product manufacturer has one of its materials successfully tested, it will indicate in its product literature what tests the material has passed. Standards are developed through the work of committees of experts in a particular field. Although ASTM International does not actually perform tests, its procedures and standards are used by testing agencies.

The NFPA is another private, voluntary organization that develops standards related to the causes and prevention of destructive fires. The NFPA publishes hundreds of codes and standards in a multivolume set that covers the entire scope of fire prevention including sprinkler systems, fire extinguishers, hazardous materials,

firefighting, and much more. As mentioned earlier in this chapter, the NFPA has published its own building code, *NFPA 5000*.

Other standards-writing organizations are typically industry trade groups that have an interest in a particular material, product, or field of expertise. Examples of such trade groups include ASHRAE, the Illuminating Engineering Society (IES), the GA, the American Concrete Institute (ACI), the American Iron and Steel Institute (AISI), and the American Institute of Timber Construction (AITC), among others. There are hundreds of construction trade organizations such as these.

ANSI is a well-known organization, but unlike the other standards-writing groups, ANSI does not develop or write standards. Instead, it approves standards developed by other organizations and works to avoid duplications between different standards. The ANSI approval process ensures industry consensus for a standard and avoids duplication of standards. For example, ANSI 108, *American National Standard Specifications for the Installation of Ceramic Tile*, was developed by the Tile Council of America and reviewed by a large committee of widely varying industry representatives. Although the ANSI approval process does not necessarily represent unanimity among committee members, it requires much more than a simple majority and requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

#### Testing Laboratories

When a standard describes a test procedure or requires one or more tests in its description of a material or product, a testing laboratory must perform the test. A standards-writing organization may also provide testing, but in most cases a Nationally Recognized Testing Laboratory (NRTL) must perform the test. An NRTL is an independent laboratory recognized by the Occupational Safety and Health Administration (OSHA) to test products to the specifications of applicable product safety standards.

One of the most well-known **NRTLs** is Underwriters Laboratories (UL). Among other activities, UL develops standards and tests products for safety. When a product successfully passes the prescribed test, it is given a UL label. There are several types of UL labels, and each means something different.

When a complete and total product is successfully tested, it is *listed*. This means that the product passed the safety test and is manufactured under the UL follow-up services program. Such a product receives a *listed label*.

Another type of label is the *classified label*. This means that samples of the product were tested for certain types of uses only. In addition to the classified label, the product must also carry a statement specifying which conditions were tested. This allows field inspectors and others to determine if the product is being used correctly.