



ADVANCING STANDARDS  
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# ASTM Construction Standards: Supporting the Building Industry

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# ASTM Construction Standards: Supporting the Building Industry



Today, more than 1,300 ASTM standards support the safe and economic construction of buildings, with the underlying quality and performance that will stand the test of time. These standards are the work of numerous ASTM technical committees that span a wide range of areas. The collective expertise of many of these committees is contained in the 45th edition of ASTM Standards in Building Codes, which contains specifications, practices and test methods that aid in the design of buildings that meet international code requirements.

#### Laying the Foundation: C01 and C09

Standards from ASTM Committees C01 on Cement and C09 on Concrete and Concrete Aggregates have long played a significant role in the worldwide construction industry.

Committee C01 on Cement was organized in 1902 to address the need for uniform test methods. From the start, Committee C01 has been a model of stakeholder collaboration and consensus standards development that is the hallmark of the ASTM International process. With a number of government and industry organizations, including the influential American Association of Portland Cement Manufacturers (now the Portland Cement Association), all involved in the emerging cement industry in the early 1900s, ASTM offered the opportunity for balanced participation in creating uniform specifications and test methods. Committee C01 released its first standard in 1904: the ASTM Standard Specification for Cement. The standard was embraced by stakeholders, including manufacturers, engineers, architects and government agencies. Moreover, the release of the standard turned out to be a watershed event for the young U.S. construction industry. With a single specification covering all general construction cement used in the United States, cement shipments and consumption nearly tripled in the next 10 years, driving dramatic industry growth.

#### C150: The Global Cement Standard

The cement specification was the forerunner to another standard that today is the bellwether specification for portland cement (C150/C150M) in the worldwide construction industry; it covers the physical and chemical requirements for manufacturing eight types of portland cement, the basic ingredient of concrete. C150 is universally adopted and utilized in the construction industry by cement manufacturers and purchasers as well as concrete producers, specifiers and users.

Over the years, C150 has been revised to address changing industry needs, ensuring the standard's ongoing vitality in building quality and performance. Recent revisions have focused on base cement technology improvements to achieve environmental-related benefits and to support sustainable construction goals. For example, C150 has been revised to include the inter-grinding of limestone, which helps reduce the energy-intensive process of grinding clinker to create cement. In addition, C150 specifies the technically sound inclusion of slag (a steel processing byproduct) and fly ash (a coal processing byproduct) in cement, allowing for the productive re-use of these industrial waste materials.

ASTM International technical committees highlighted in this piece include:

# C01

Cement

# C09

Concrete and  
Concrete Aggregates

# C24

Building Seals  
and Sealants

# D08

Roofing and  
Waterproofing

# E06

Performance  
of Buildings

# E60

Sustainability



C01

Performance Standards:  
Advancing the Durability  
of Cement

ASTM Committee C01 is also investing in the ongoing enhancement of cement performance standards. While standards such as C150 and the specification for blended hydraulic cements (C595/C595M) address both prescriptive and performance requirements, others, such as the performance specification for hydraulic cement (C1157/C1157M), are principally focused on durability and performance. C1157 specifies cements based on requirements for general use, high early strength, resistance to sulfates attack and heat of hydration.

**C01 Updates**

- Committee C01 has organized Subcommittee C01.98 on Sustainability Assessment, which has a scope of developing standards for the manufacture and use of hydraulic cement.

- A guide for measurement of the rheological properties of hydraulic cementitious paste using a rotational rheometer (C1749) is available; the standard is designed to determine yield stress and plastic viscosity.
- A practice for high-shear mixing of hydraulic cement pastes (C1738) has been published; the standard covers the process used by operators conducting measurements using fresh (before setting) cement paste.
- A test method for measuring cement paste consistency using a mini-slump cone is a proposed standard now under way; the standard will be used to predict cement consistency and assess early stiffening risk



## The Authoritative Source for Concrete Standards

A dozen years following the Committee C01 startup, Committee C09 was formed in 1914 to address standardization requirements for concrete. Today, Committee C09 has a membership of more than 1,400, including more than 100 participants from outside the United States. More than 30 technical subcommittees have jurisdiction over 180 standards pertaining to concrete and related materials. Like those from Committee C01, the standards created by Committee C09 are woven into the day-to-day workings of the construction industry. For example, C09 standards such as the specification for ready-mixed concrete (C94/C94M) cover fresh, unhardened ready-mixed concrete.

### Addressing New Technologies

Recently, Committee C09 has applied its expertise in developing test methods that support the advancement of new concrete technologies. One area of focus is pervious concrete, an environmentally friendly technology that provides communities with a better solution for stormwater management. Pervious concrete captures stormwater and allows it to seep into the

ground, reducing runoff and helping to meet U.S. Environmental Protection Agency stormwater regulations. Because of its porous nature, pervious concrete cannot be tested using traditional concrete standards. Subcommittee C09.49 on Pervious Concrete has begun to fill the standards void with methods specific to pervious concrete. For example, one method addresses density and void content of freshly mixed pervious concrete (C1688/C1688M); it is used as a means to verify that the pervious concrete delivered to a project corresponds to the producer's mix proportions.

Another technology that Committee C09 is addressing is self-consolidating concrete/high performance concrete, which can flow easily into tight and constricted spaces without segregating and without requiring vibration. The committee has released tests to measure the stability and consistency of self-consolidating concrete. These include the test method for passing ability of self-consolidating concrete by J-ring (C1621/C1621M), which is used in the mix design phase of self-consolidating concrete to assure proper mix optimization. It can also be used for production consistency quality control. Serving a similar purpose is another



▶ Pervious concrete captures stormwater and allows it to seep into the ground, reducing runoff and helping to meet U.S. Environmental Protection Agency stormwater regulations

C09 standard, the test method for static segregation of self-consolidating concrete using column technique (C1610/C1610M). Cohesive self-consolidating concrete is especially important for deep-section applications such as walls or columns. As a result, the degree of segregation, as measured by the C1610 test, can indicate the suitability of a concrete mixture for its purpose.

### C09 Updates

A proposed standard, a practice for fiber-reinforced concrete for making and curing test specimens in the laboratory and field, addresses the particulars of making consistent fiber-reinforced concrete test specimens.

Subcommittee C09.45 on Roller-Compacted Concrete is developing proposed standards to determine the density of specimens using the gyratory compactor and the density

and air content of freshly mixed roller-compacted concrete as well as a practice to mold the material using a vibrating hammer.

A specification for lightweight aggregate for internal curing of concrete (C1761/C1761M) covers the use of lightweight aggregate to increase concrete durability and service life; it will be useful in a variety of civil engineering projects.

### C01 and C09: Collaboration for Progress

Owing to their complementary missions, ASTM International Committees C01 and C09 often work closely together to achieve common goals. One notable area of collaboration is a joint subcommittee, C09.48/C01.48 on Performance of Cementitious Materials and Admixture Combinations. The group's aim is to develop standards for investigating interactions and for evaluating changes in early-age properties when various combinations of hydraulic cements, supplementary cementitious materials, other finely divided materials, water and chemical admixtures are used in cementitious mixtures. The subcommittee has completed its first standard, the practice for measuring hydration kinetics of hydraulic cementitious

mixtures using isothermal calorimetry (C1679). C1679 guides the investigation of the interactions and compatibility of various materials used to produce concrete.

Committees C01 and C09 have also collaborated to organize Subcommittee C09.50 on Risk Management for Alkali-Aggregate Reactions, which is developing standards on mitigating deleterious alkali-aggregate reactions in concrete. Another important, longstanding area of collaboration between Committees C01 and C09 is the joint sponsorship and management of the Cement and Concrete Reference Laboratory (CCRL). Through its laboratory inspection and proficiency sample programs, CCRL provides test data for quality assurance and control to program participants. Materials included in these programs are portland, blended and masonry cements; portland cement concrete, pozzolans, masonry mortar and concrete masonry units. Close to 1,600 laboratories worldwide participate in these programs.



**CCRL**  
Cement and Concrete  
Reference Laboratory





▶ D7492/D7492M covers information about selecting and installing systems used to promote drainage around the foundations of buildings and on plazas.



▶ D7120/D7120M details roof condition assessment as well as how to prepare a roof for coating through a guide for evaluating and preparing roof membranes for coating application.



## Keeping Buildings Safe and Dry

Another longstanding ASTM committee that has had an enduring impact on building construction is Committee D08 on Roofing and Waterproofing. Formed in 1905, Committee D08 has grown to more than 550 members who continue to deliver innovative standards solutions that protect consumers and provide a common language in the marketplace. With 12 technical subcommittees, D08 is responsible for more than 150 standards for roofing and waterproofing materials, products and systems largely composed of organic materials such as asphalt, coal-tar, polymer modifiers and rubbers. Considering that all buildings require roofing and waterproofing, the importance of D08 standards can be felt virtually everywhere.

While part of D08's early years were spent addressing the need for core specifications used by roofing and waterproofing product manufacturers, the group's activities have evolved to deliver standards that help define the expected reliability of finished products. D08 standards such as the test method for wind resistance of asphalt shingles (D7158/D7158M), help firms meet the performance and safety expectations of consumers.

New roofing and waterproofing innovations during the last two decades, as well as changes to traditional bituminous roofing technologies, have brought forward Committee D08's continued responsiveness. This is evidenced by the release of standards to address industry changes, including a test method for determining the capability of roofing and waterproofing materials to seal around fasteners (D7349/D7349M). D7349 measures water migration resistance at the point of penetration. Another standard, test methods for strength of modified bitumen sheet material laps using cold process adhesive (D7379), addresses the use of cold process adhesives in modified bitumen roofing systems.

### D08 Updates

A guide for use of drainage systems (D7492/D7492M) has been published; it covers information about selecting and installing systems used to promote drainage around the foundations of buildings and on plazas.

A standard from Subcommittee D08.20 on Roofing Membrane Systems provides details about roof condition assessment as well as how to prepare a roof for coating through a guide for evaluating and preparing roof membranes for coating application (D7120/D7120M).

A proposed vegetative roofing system standard (WK29304) is being developed to address the proper roofing and waterproofing membranes for a particular system.



## Performance of Buildings

### Helping Owners and Occupants

While numerous ASTM committees contribute to the construction industry through material- and product-related standards, another committee helps to ensure better building performance and management: ASTM Committee E06 on Performance of Buildings. Formed in 1946 during the post-war building boom, Committee E06 addresses topics related to the overall performance, improvement and management of buildings and related facilities. Working on one or more of over 15 technical subcommittees, E06's broad global membership of 1,200+ experts creates standards that assist building developers, owners and occupants in a number of areas pertaining to building health and safety.

One important role that Committee E06 fills is with standards pertaining to radon testing, lead contamination and asbestos control. The latter issue is the focus of Subcommittee

E06.24 on Building Preservation and Rehabilitation Technology, which has published a series of standards that guides building owners in better managing asbestos. Notable among these standards is a practice for visual inspection of asbestos abatement projects (E1368).

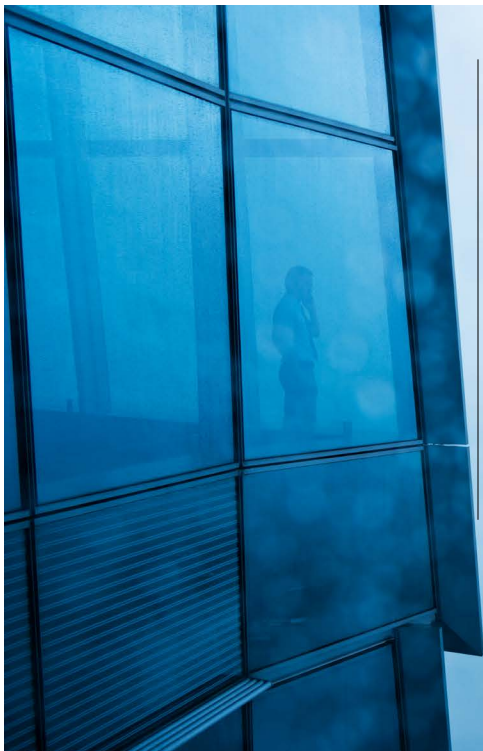
Subcommittee E06.23 on Lead Hazards Associated with Buildings has an extensive portfolio of standards dealing with lead-related issues, including a practice for selecting lead hazard reduction methods for identified risks (E2252). Radon testing is one of the many topics covered by the standards developed by Subcommittee E06.41 on Air Leakage and Ventilation Performance. Standards such as a practice for installing radon mitigation systems in existing low-rise residential buildings (E2121) provide contractors with a uniform set of practices that helps ensure a high degree of safety and success in retrofitting low-rise residential buildings with radon mitigation systems.

To help rate the performance of building windows, doors, skylights and curtain walls, Committee E06 has developed a series of standards that tests these components in a variety of environmental conditions such as wind and airborne

debris. Among the notable standards in this area is the specification for performance of exterior windows, curtain walls, doors and impact protective systems impacted by windborne debris in hurricanes (E1996).

A recent focus areas for Committee E06 is high-rise building external evacuation devices. Here, Subcommittee E06.77 on High-Rise Building External Evacuation Devices currently offers two standards for equipment to be used in emergencies where the primary routes to safety are not accessible: the specification for multi-story building external evacuation controlled descent devices (E2484) and the specification for multi-story building external evacuation platform rescue systems (E2513).

A recently added standard in the Committee E06 portfolio focuses on the use of insulating concrete form systems as energy efficient building envelopes for both residential and commercial construction. The specification for flat wall insulating concrete form (ICF) systems (E2634) is used by building officials as an enforcement tool and by architects to ensure that specified ICF products conform to minimum standards.



### E06 Updates

A practice for building enclosure commissioning (E2813) is a recent addition to E06's standards. E2813 provides two levels of building enclosure commissioning (BECx), fundamental and advanced, and it addresses testing to evaluate durability and performance as well as to establish required core competencies of BECx service providers.

A proposed standard practice now under way will provide an approach to evaluate building materials and assemblies for use in flood-resistant construction.

Subcommittee E06.21 on Serviceability is developing a standard for installing insulating concrete forms. The group has also developed a practice for intumescent coatings (E2924), which safeguard steel's structural integrity during a fire. The standard covers the specification, application and inspection of intumescent fire-resistant materials for structural steel.



## Sustainability

Facilitating a Sustainable Future  
Committee E06 activities have also been instrumental in the formation of an ASTM International committee that is working on sustainability for diverse industries. ASTM Committee E60 on Sustainability, formed in the fall of 2008, develops standards to advance the goals of sustainable development. E60 expanded on the work of the former Subcommittee E06.71 on Sustainability, which completed such standards as a guide for general principles of sustainability relative to buildings (E2432).

ASTM continues its work to support environmentally friendly buildings and facilities, evidenced by the adoption of more than 40 ASTM standards from several committees in the International Green Construction Code (IgCC), which focuses on the safe and sustainable construction of new and existing commercial buildings. Committee E60 is working on a series of

new standards that addresses such topics as marketing and product claims related to sustainable buildings, water stewardship and other issues.

### E60 Updates

A new group, Subcommittee E60.13 on Sustainable Manufacturing, has been organized to develop standards related to sustainable manufacturing processes; it will include building products.

A collection of several green meeting standards is helping to guide the evaluation and selection of destinations, exhibits, transportation, audio visual, communication materials, onsite offices, accommodations, food and beverage, and venues to produce more sustainable meetings and events.

# More Building Blocks

The ASTM technical committees already mentioned serve the worldwide construction industry, and many others also have long impacted the field of building construction.

ASTM Committee C24 on Building Seals and Sealants develops standards for the sealing of building joints that are considered to be part of the building complex. Examples of these include aerosol foam sealants, caulking compounds, elastomeric sealants, glazing compounds, preformed sealing tapes and preformed gaskets. The committee, with a membership of approximately 230, currently has jurisdiction over more than 90 standards. Significant among these is a specification for elastomeric joint sealants (C920), which covers the properties of a cured single- or multi-component cold-applied elastomeric joint sealant for sealing, caulking or glazing operations on buildings, plazas and decks for vehicular or pedestrian use. C920 is widely cited in building codes and is used by numerous U.S. government agencies.

ASTM Committee D07 on Wood is responsible for 90+ standards and test methods related to timber, wood, modified wood, veneer, wood-based structural panels and wood-based building products. Over the years the committee has kept pace with dynamic changes and expansion in the wood marketplace.

From its early origins in simple wood standards, the committee today is engaged in the development of standards for such growth areas as natural fiber-polymer composites and structural wood adhesives. One example of the progressive activities within Committee D07 is the release of a standard that recognizes the latest glued laminated timber technology. The ASTM practice for establishing characteristic values for reinforced glued laminated timber (glulam) beams using mechanics-based models (D7199) will assist manufacturers in the introduction of new reinforced glulam products to the marketplace.



The area of building masonry and use of natural stone is the focus of several ASTM committees, including C12 on Mortars and Grouts for Unit Masonry, C15 on Manufactured Masonry Units and C18 on Dimension Stone. C12 standards such as the specification for mortar for unit masonry (C270) cover the use of mortars in the construction of nonreinforced and reinforced unit masonry structures. Similarly, the specification for facing brick (solid masonry units made from clay or shale) (C216) is focused on the use of concrete brick and similar solid units intended for use in structural masonry or facing for buildings and other structures. In addition, C18 standards such as a guide for selection, design and installation of dimension stone anchoring systems (C1242) are utilized by architects, engineers, contractors and material suppliers to design, select, specify and install natural stone products.

Standards from ASTM Committee C11 on Gypsum and Related Building Materials and Systems and Committee C17 on Fiber-Reinforced Cement Products address a variety of materials and products for cement roofing, siding, ceilings, walls and other building components. Cooperation between the two committees is evident in the classification for abuse-resistant nondecorated interior gypsum panel products and fiber-reinforced cement panels (C1629/C1629M). The standard fills a gap in the marketplace by providing methods that specifiers can use to compare specific abuse-resistant properties of products. Committee C11 promotes the use of C1629/C1629M, as well as many other of its standards, as reference documents in building codes throughout North America.

Standards developed by ASTM Committee C14 on Glass and Glass Products are used extensively in building construction. Two of the more popular C14 standards are the specification for flat glass (C1036), which addresses the quality requirements of flat, transparent, clear and tinted glass; and the specification for heat-strengthened and fully tempered flat glass (C1048), which covers requirements for heat-strengthened and fully tempered coated and uncoated flat glass used in general building construction. As buildings are constructed or enhanced and improved, ASTM will continue to be a dedicated partner in meeting the needs of construction industry stakeholders around the world.

## Additional Building Updates

Sealant manufacturers have the ability to evaluate new products and their changes related to weather by using a test method for measuring the time dependent modulus of sealants using stress relaxation (C1735), a standard from Committee C24 on Building Seals and Sealants.

Committee D07 on Wood has developed a standard describing how to conduct a standard fire resistance test for evaluating floor/ceiling assemblies, a practice for calculating the superimposed load on wood-frame floor-ceiling assemblies for standard fire resistance tests (D7746).

A proposed standard is under way in Committee C18 on Dimension Stone: a practice for dimension stone test specimen preparation, to help ensure consistency

in specimens and as a result, more comparable results from specimen testing. A specification for mortars for the repair of historic masonry (C1713), which is under the jurisdiction of Committee C12 on Mortars and Grouts for Unit Masonry, covers materials that are visually, chemically and physically compatible with original in-situ materials.

Standards from the committees covered in this piece represent some of the ASTM International work in this industry sector. Additional ASTM committees also develop standards that help ensure quality in the building envelope and its man-made and natural foundation.



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