CHAPTER 17 SPECIAL INSPECTIONS AND TESTS

SECTION 1701
GENERAL

1701.1 Scope.

The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

SECTION 1702
NEW MATERIALS

1702.1 General.

New building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and in the approved rules to determine character, quality and limitations of use.

SECTION 1703
APPROVALS

1703.1 Approved agency.

An approved agency responsible for laboratory testing or special inspections, or both, must comply with the qualification, certification and experience requirements of ASTM E329 or the alternatives listed herein.

1703.1.1 Independence.

An approved agency shall be objective and competent. The agency shall also disclose possible conflicts of interest so that objectivity can be confirmed. The special inspector and their agents shall be independent from the person, persons or contractor responsible for the physical *construction* of the project requiring special inspections.

1703.1.2 Equipment.

A n *approved agency* shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated.

1703.1.3 Personnel.

An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests or inspections, or both. Upon request by the building official, documentation shall be provided demonstrating the applicable agency's accreditation as noted in ASTM E329 and individuals' resumes indicating pertinent training, certifications and other qualifications for special inspection personnel associated with the proposed *construction* requiring special inspections. The building official may prescribe the manner of qualification documentation and frequency of updating information regarding agency or individual inspector approval.

Firms providing special inspection services or individual inspectors seeking approval of alternative certifications or qualifications, or both, listed in ASTM E329 may submit documentation demonstrating equivalency. This documentation may include evidence of meeting other recognized standards or alternative certifications to demonstrate that the minimum qualifications, certification and experience intended by ASTM E329 have been met. The building official may, if satisfied that equivalency has been demonstrated, approve the credentials of the firm or individual.

1703.2 Written approval.

Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be *approved* in writing after satisfactory completion of the required tests and submission of required test reports.

1703.3 Record of approval.

For any material, appliance, equipment, system or method of construction that has been*approved*, a record of such approval, including the conditions and limitations of the approval, shall be kept on file in the *building official's* office and shall be available for public review at appropriate times.

1703.4 Performance.

Specific information consisting of test reports conducted by an*approved agency* in accordance with the appropriate referenced standards, or other such information as necessary, shall be provided for the *building official* to determine that the product, material or assembly meets the applicable code requirements.

1703.4.1 Research and investigation.

Sufficient technical data shall be submitted to the*building official* to substantiate the proposed use of any product, material or assembly. If it is determined that the evidence submitted is satisfactory proof of performance for the use intended, the *building official* shall approve the use of the product, material or assembly subject to the requirements of this code. The costs, reports and investigations required under these provisions shall be paid by the *owner* or the *owner's* authorized agent.

1703.4.2 Research reports.

Supporting data, where necessary to assist in the approval of products, materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

1703.5 Labeling.

Products, materials or assemblies required to be*labeled* shall be*labeled* in accordance with the procedures set forth in Sections 1703.5.1 through 1703.5.4.

1703.5.1 Testing.

An *approved agency* shall test a representative sample of the product, material or assembly being*labeled* to the relevant standard or standards. The *approved agency* shall maintain a record of the tests performed. The record shall provide sufficient detail to verify compliance with the test standard.

1703.5.2 Inspection and identification.

The *approved agency* shall periodically perform an inspection, which shall be in-plant if necessary, of the product or material that is to be *labeled*. The inspection shall verify that the labeled product, material or assembly is representative of the product, material or assembly tested.

1703.5.3 Label information.

The *label* shall contain the manufacturer's identification, model number, serial number or definitive information describing the performance characteristics of the product, material or assembly and the *approved agency's* identification.

1703.5.4 Method of labeling.

Information required to be permanently identified on the product, material or assembly shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

1703.6 Evaluation and follow-up inspection services.

Where structural components or other items regulated by this code are not visible for inspection after completion of a prefabricated assembly, the *owner* or the *owner's* authorized agent shall submit a report of each prefabricated assembly. The report shall indicate the complete details of the assembly, including a description of the assembly and its components, the basis upon which the assembly is being evaluated, test results and similar information and other data as necessary for the *building official* to determine conformance to this code. Such a report shall be *approved* by the *building official*.

1703.6.1 Follow-up inspection.

The *owner* or the *owner's* authorized agent shall provide for *special inspections* of *fabricated items* in accordance with Section 1704.2.5.

1703.6.2 Test and inspection records.

Copies of necessary test and *special inspection* records shall be filed with the *building official*.

SECTION 1704
SPECIAL INSPECTIONS AND TESTS, CONTRACTOR RESPONSIBILITY AND STRUCTURAL OBSERVATION

1704.1 General.

Special inspections and tests, statements of special inspections, responsibilities of contractors, submittals to the *building official* and *structural observations* shall meet the applicable requirements of this section.

1704.2 Special inspections.

Where application is made for *construction* as described in this section, the *owner* shall employ one or more special inspectors to provide inspections and tests during *construction* on the types of work listed under Section 1705. All individuals or agents performing special inspection functions shall operate under the direct supervision of a *registered design professional* (RDP) in responsible charge of special inspection activities, also known as the "special inspector." The special inspector shall ensure that the individuals under their charge are performing only those special inspections or laboratory testing that are consistent with their knowledge, training and certification for the specified inspection or laboratory testing.

Exceptions:

1. The building official shall be permitted to waive special inspections and tests.
2. Special inspections and tests are not required for:
   2.1. One story *buildings* under 20 feet (6096 mm) in height which do not exceed 5,000 square feet (465 m^2) in *building* area; or
   2.2. Alterations to Group U structures which do not increase loads in accordance with Sections 603.7.3 and 603.7.4 of the *Virginia Existing Building Code*.
3. Unless otherwise required by the building official, special inspections and tests are not required for occupancies in Group R-3, R-4 or R-5 and occupancies in Group U that are accessory to a residential occupancy including those listed in Section 312.1.
4. Special inspections and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame *construction* provisions of Section 2211.1.2 or the conventional light-frame *construction* provisions of Section 2308.
5. The contractor is permitted to employ the approved agencies where the contractor is also the *owner*.

1704.2.1 Special inspector qualifications.

Prior to the start of the construction, the *approved agencies* shall provide written documentation to the *building official* demonstrating the competence and relevant experience or training of the *special inspectors* who will perform the *special inspections* and tests during construction. Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of special inspection or testing activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

The *registered design professional in responsible charge* and engineers of record involved in the design of the project are permitted to act as an *approved agency* and their personnel are permitted to act as *special inspectors* for the work designed by them, provided they qualify as *special inspectors*.

1704.2.2 Access for special inspection.

The construction or work for which *special inspection* or testing is required shall remain accessible and exposed for *special inspection* or testing purposes until completion of the required *special inspections* or tests.

1704.2.3 Statement of special inspections.

The permit applicant shall submit a statement of special inspections prepared by the *RDP* in responsible charge in accordance with Section 111.1. This statement shall be in accordance with Section 1704.3.

Exception: The statement of special inspections is permitted to be prepared by a qualified person approved by the building official for *construction* not designed by a *registered design professional*.

1704.2.4 Report requirement.

Approved agencies shall keep records of *special inspections* and tests. The *approved agency* shall submit reports of *special inspections* and tests to the *building official* and to the *registered design professional in responsible charge*. Reports shall indicate that work inspected or tested was or was not completed in conformance to *approved construction documents*. Discrepancies shall be brought to the immediate attention of the contractor for correction. If they are not

corrected, the discrepancies shall be brought to the attention of the *building official* and to the *registered design professional in responsible charge* prior to the completion of that phase of the work. A final report documenting required *special inspections* and tests, and correction of any discrepancies noted in the inspections or tests, shall be submitted at a point in time agreed upon prior to the start of work by the *owner* or the *owner's* authorized agent to the *building official*.

1704.2.5 Special inspection of fabricated items.

Where fabrication of structural, load-bearing or lateral load-resisting members or assemblies is being conducted on the premises of a fabricator's shop, *special inspections* of the *fabricated items* shall be performed during fabrication, except where the fabricator has been *approved* to perform work without *special inspections* in accordance with Section 1704.2.5.1.

1704.2.5.1 Fabricator approval.

Special inspections during fabrication are not required where the work is done on the premises of a fabricator *approved* to perform such work without *special inspection*. Approval shall be based on review of the fabricator's written fabrication procedures and quality control manuals that provide a basis for control of materials and workmanship, with periodic auditing of fabrication and quality control practices by an *approved agency* or the *building official*. At completion of fabrication, the *approved fabricator* shall submit a *certificate of compliance* to the *owner* or the *owner's* authorized agent for submittal to the *building official* as specified in Section 1704.5 stating that the work was performed in accordance with the *approved construction documents*.

1704.3 Statement of special inspections.

Where *special inspections* or tests are required by Section 1705, the *registered design professional in responsible charge* shall prepare a statement of *special inspections* in accordance with Section 1704.3.1 for submittal by the applicant in accordance with Section 1704.2.3.

Exception: The statement of *special inspections* is permitted to be prepared by a qualified person *approved* by the *building official* for construction not designed by a *registered design professional*.

1704.3.1 Content of statement of special inspections.

The statement of *special inspections* shall identify the following:

1. The materials, systems, components and work required to have *special inspections* or tests by the *building official* or by the *registered design professional* responsible for each portion of the work.
2. The type and extent of each *special inspection*.
3. The type and extent of each test.
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.12, 1705.13 and 1705.14.
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection*, periodic *special inspection* or performed in accordance with the notation used in the referenced standard where the inspections are defined.

1704.3.2 Seismic requirements in the statement of special inspections.

Where Section 1705.13 or 1705.14 specifies *special inspections* or tests for seismic resistance, the statement of *special inspections* shall identify the *designated seismic systems* and *seismic force-resisting systems* that are subject to the *special inspections* or tests.

1704.3.3 Wind requirements in the statement of *special inspections*.

Where Section 1705.12 specifies *special inspection* for wind resistance, the statement of *special inspections* shall identify the *main windforce-resisting systems* and wind-resisting components that are subject to *special inspections*.

1704.4 Contractor responsibility.

Each contractor responsible for the construction of a main wind- or *seismic force-resisting* system, *designated seismic system* or a wind- or seismic force-resisting component listed in the statement of *special inspections* shall submit a written statement of responsibility to the *building official* and the *owner* or the *owner's* authorized agent prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain acknowledgement of awareness of the special requirements contained in the statement of *special inspections*.

1704.5 Submittals to the building official.

In addition to the submittal of reports of *special inspections* and tests in accordance with Section 1704.2.4, reports and certificates shall be submitted by the *owner* or the *owner's* authorized agent to the *building official* for each of the following:

1. *Certificates of compliance* for the fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of an *approved fabricator* in accordance with Section 1704.2.5.1.
2. *Certificates of compliance* for the seismic qualification of nonstructural components, supports and attachments in

accordance with Section 1705.14.2.

3. *Certificates of compliance* for *designated seismic systems* in accordance with Section 1705.14.3.
4. Reports of preconstruction tests for shotcrete in accordance with ACI 318.
5. *Certificates of compliance* for open web *steel joists* and joist girders in accordance with Section 2207.5.
6. Reports of material properties verifying compliance with the requirements of AWS D1.4 for weldability as specified in Section 26.6.4 of ACI 318 for reinforcing bars in concrete complying with a standard other than ASTM A706 that are to be welded.
7. Reports of mill tests in accordance with Section 20.2.2.5 of ACI 318 for reinforcing bars complying with ASTM A615 and used to resist earthquake-induced flexural or axial forces in the special moment frames, special structural walls or coupling beams connecting special structural walls of *seismic force-resisting* systems in structures assigned to *Seismic Design Category* B, C, D, E or F.

1704.6 Structural observations.

Where required by the provisions of Section 1704.6.1, the *owner* or the *owner's* authorized agent shall employ a *registered design professional* to perform *structural observations*. The structural observer shall visually observe representative locations of structural systems, details and load paths for general conformance to the approved construction documents. *Structural observation* does not include or waive the responsibility for the inspections in Section 110 or the *special inspections* in Section 1705 or other sections of this code. Prior to the commencement of observations, the structural observer shall submit to the *building official* a written statement identifying the frequency and extent of *structural observations*. At the conclusion of the work included in the permit, the structural observer shall submit to the *building official* a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

1704.6.1 Structural observations for structures.

Structural observations shall be provided for those structures where one or more of the following conditions exist:

1. The structure is classified *as Risk Category III or* IV.
2. The structure is a *high-rise building*.
3. The structure is assigned to *Seismic Design Category* E, and is greater than two stories above the grade plane.
4. Such observation is required by the *registered design professional* responsible for the structural design.
5. Such observation is specifically required by the *building official*.

SECTION 1705
REQUIRED SPECIAL INSPECTIONS AND TESTS

1705.1 General.

Special inspections and tests of elements and nonstructural components of buildings and structures shall meet the applicable requirements of this section.

1705.1.1 Special cases.

Special inspections and tests shall be required for proposed work that is, in the opinion of the *building official*, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

1705.2 Steel construction.

The *special inspections* and nondestructive testing of steel construction in buildings, structures, and portions thereof shall be in accordance with this section.

Exception: *Special inspections* of the steel fabrication process shall not be required where the fabrication process for the entire building or structure does not include any welding, thermal cutting or heating operation of any kind. In such cases, the fabricator shall be required to submit a detailed procedure for material control that demonstrates the fabricator's ability to maintain suitable records and procedures such that, at any time during the fabrication process, the material specification and grade for the main stress-carrying elements are capable of being determined. Mill test reports shall be identifiable to the main stress-carrying elements where required by the *approved construction documents*.

1705.2.1 Structural steel.

Special inspections and nondestructive testing of *structural steel elements* in buildings, structures and portions thereof shall be in accordance with the quality assurance inspection requirements of AISC 360.

Exception: *Special inspection* of railing systems composed of *structural steel elements* shall be limited to welding inspection of welds at the base of cantilevered rail posts.

1705.2.2 Cold-formed steel deck.

Special inspections and qualification of welding *special inspectors* for cold-formed steel floor and *roof deck* shall be in accordance with the quality assurance inspection requirements of SDI QA/QC.

1705.2.3 Open-web steel joists and joist girders.

Special inspections of open-web *steel joists* and joist girders in buildings, structures and portions thereof shall be in accordance with Table 1705.2.3.

TABLE 1705.2.3
REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]
1. Installation of open-web steel joists and joist girders.			
a. End connections – welding or bolted.	—	X	SJI specifications listed in Section 2207.1.
b. Bridging – horizontal or diagonal.	—	—	—
1.Standard bridging.	—	X	SJI specifications listed in Section 2207.1.
2.Bridging that differs from the SJI specifications listed in Section 2207.1.	—	X	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see Section 1705.13.

1705.2.4 Cold-formed steel trusses spanning 60 feet or greater.

Where a cold-formed steel truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent *individual truss member* restraint/bracing are installed in accordance with the *approved* truss submittal package.

1705.3 Concrete construction.

Special inspections and tests of concrete construction shall be performed in accordance with this section and Table 1705.3.

Exceptions: *Special inspections* and tests shall not be required for:

1. Isolated spread concrete footings of buildings three stories or less above *grade plane* that are fully supported on earth or rock.
2. Continuous concrete footings supporting walls of buildings three stories or less above *grade plane* that are fully supported on earth or rock where:
   2.1. The footings support walls of *light-frame construction*.
   2.2. The footings are designed in accordance with Table 1809.7.
   2.3. The structural design of the footing is based on a specified compressive strength, f'_c, not more than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the compressive strength specified in the *approved construction documents* or used in the footing construction.
3. *Nonstructural concrete* slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 MPa).
4. Concrete foundation walls constructed in accordance with Table 1807.1.6.2.
5. Concrete patios, driveways and sidewalks, on grade.

TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	—
2. Reinforcing bar welding: a. Verify weldability of reinforcing bars other than ASTM A706; b. Inspect single-pass fillet welds, maximum $^5/_{16}''$; and c. Inspect all other welds.	— — X	X X —	AWS D1.4 ACI 318: 26.6.4	—
3. Inspect anchors cast in concrete.	—	X	ACI 318: 17.8.2	—
4. Inspect anchors post-installed in hardened concrete members[b] a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. b. Mechanical anchors and adhesive anchors not defined in 4.a.	X —	— X	ACI 318: 17.8.2.4 ACI 318: 17.8.2	—
5. Verify use of required design mix.	—	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2

6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C31 ASTM C172 ACI 318: 26.5, 26.12	—
7. Inspect concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 26.5	—
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: 26.5.3-26.5.5	—
9. Inspect prestressed concrete for: a. Application of prestressing forces; and b. Grouting of bonded prestressing tendons.	X X	— —	ACI 318: 26.10	—
10. Inspect erection of precast concrete members.	—	X	ACI 318: 26.9	—
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connections and reinforcement in the field for: a. Installation of the embedded parts b. Completion of the continuity of reinforcement across joints. c. Completion of connections in the field.	X X X	— — —	ACI 318: 26.13.1.3 ACI 550.5	—
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	—	X	ACI 318: 26.13.1.3	—
13. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 26.11.2	—
14. Inspect formwork for shape, location and dimensions of the concrete member being formed, shoring and reshoring.	—	X	ACI 318: 26.11.1.2(b)	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see Section 1705.13.

b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

1705.3.1 Welding of reinforcing bars.

Special inspections of welding and qualifications of *special inspectors* for reinforcing bars shall be in accordance with the requirements of AWS D1.4 for *special inspection* and of AWS D1.4 for *special inspector* qualification.

1705.3.2 Material tests.

In the absence of sufficient data or documentation providing evidence of conformance to quality standards for materials in Chapters 19 and 20 of ACI 318, the *building official* shall require testing of materials in accordance with the appropriate standards and criteria for the material in Chapters 19 and 20 of ACI 318.

1705.4 Masonry construction.

Special inspections and tests of masonry construction shall be performed in accordance with the quality assurance program requirements of TMS 402 and TMS 602.

Exception: *Special inspections* and tests shall not be required for:

1. Empirically designed masonry, *glass unit masonry* or masonry *veneer* designed in accordance with Section 2109, Section 2110 or Chapter 14, respectively, where they are part of a structure classified as *Risk Category* I, II or III.

2. Masonry foundation walls constructed in accordance with Table 1807.1.6.3(1), 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4).
3. Masonry fireplaces, masonry heaters or masonry chimneys installed or constructed in accordance with Section 2111, 2112 or 2113, respectively.

1705.4.1 Glass unit masonry and masonry veneer in Risk Category IV.

Special inspections and tests for glass unit masonry or masonry veneer designed in accordance with Section 2110 or Chapter 14, respectively, where they are part of a structure classified as *Risk Category* IV shall be performed in accordance with TMS 602 Level 2.

1705.4.2 Vertical masonry foundation elements.

Special inspections and tests of vertical masonry foundation elements shall be performed in accordance with Section 1705.4.

1705.5 Wood construction.

Special inspections of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2.5. *Special inspections* of site-built assemblies shall be in accordance with this section.

1705.5.1 High-load diaphragms.

High-load *diaphragms* designed in accordance with Section 2306.2 shall be installed with *special inspections* as indicated in Section 1704.2. The *special inspector* shall inspect the wood structural panel sheathing to ascertain whether it is of the grade and thickness shown on the *approved* construction documents. Additionally, the *special inspector* must verify the *nominal size* of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agrees with the *approved construction documents*.

1705.5.2 Metal-plate-connected wood trusses spanning 60 feet or greater.

Where a truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

1705.5.3 Mass timber construction.

Special inspections of *mass timber* elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.3.

TABLE 1705.5.3
REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

	TYPE		CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1.	Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.		—	X
2.	Inspect erection of mass timber construction.		—	X
3.	Inspection of connections where installation methods are required to meet design loads.			
	Threaded fasteners	Verify use of proper installation equipment.	—	X
		Verify use of pre-drilled holes where required.	—	X
		Inspect screws, including diameter, length, head type, spacing, installation angle and depth.	—	X
	Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.		X	—
	Adhesive anchors not defined in preceding cell.		—	X
	Bolted connections.		—	X
	Concealed connections.		—	X

1705.6 Soils.

Special inspections and tests of existing site soil conditions, fill placement and load-bearing requirements shall be performed in accordance with this section and Table 1705.6. The *approved* geotechnical report and the *construction documents* prepared by the *registered design professionals* shall be used to determine compliance.

Exception: Where Section 1803 does not require reporting of materials and procedures for fill placement, the *special inspector* shall verify that the in-place dry density of the compacted fill is not less than 90 percent of the maximum dry density at optimum moisture content determined in accordance with ASTM D1557.

TABLE 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	—	X
2. Verify excavations are extended to proper depth and have reached proper material.	—	X
3. Perform classification and testing of compacted fill materials.	—	X
4. During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill.	X	—
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	—	X

1705.7 Driven deep foundations.

Special inspections and tests shall be performed during installation of driven *deep foundation* elements as specified in Table 1705.7. The approved geotechnical report and the construction documents prepared by the *registered design professionals* shall be used to determine compliance.

TABLE 1705.7
REQUIRED SPECIAL INSPECTIONS AND TESTS OF DRIVEN DEEP FOUNDATION ELEMENTS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify element materials, sizes and lengths comply with the requirements.	X	—
2. Determine capacities of test elements and conduct additional load tests, as required.	X	—
3. Inspect driving operations and maintain complete and accurate records for each element.	X	—
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X	—
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	In accordance with Section 1705.2	
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	In accordance with Section 1705.3	
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	In accordance with Statement of Special Inspections	

1705.8 Cast-in-place deep foundations.

Special inspections and tests shall be performed during installation of cast-in-place *deep foundation* elements as specified in Table 1705.8. The *approved* geotechnical report and the *construction documents* prepared by the *registered design professionals* shall be used to determine compliance.

TABLE 1705.8
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspect drilling operations and maintain complete and accurate records for each element.	X	—
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes.	X	—
3. For concrete elements, perform tests and additional *special inspections* in accordance with Section 1705.3.	In accordance with Section 1705.3	

1705.9 Helical pile foundations.

Continuous special inspections shall be performed during installation of *helical pile* foundations. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by the *registered design professional* in responsible charge. The *approved* geotechnical report and the *construction documents* prepared by the *registered design professional* shall be used to determine compliance.

1705.10 Structural integrity of deep foundation elements.

Whenever there is a reasonable doubt as to the structural integrity of a *deep foundation* element, an engineering assessment shall be required. The engineering assessment shall include tests for defects performed in accordance with ASTM D4945, ASTM D5882, ASTM D6760 or ASTM D7949, or other *approved method*.

1705.11 Fabricated items.

Special inspections of *fabricated items* shall be performed in accordance with Section 1704.2.5.

1705.12 Special inspections for wind resistance.

Special inspections for wind resistance specified in Sections 1705.12.1 through 1705.12.3, unless exempted by the exceptions to Section 1704.2, are required for buildings and structures constructed in the following areas:

1. In wind Exposure Category B, where *V* is 150 miles per hour (67 m/sec) or greater.
2. In wind Exposure Category C or D, where *V* is 140 mph (62.6 m/sec) or greater.

1705.12.1 Structural wood.

Continuous special inspection is required during field gluing operations of elements of the *main windforce-resisting system*. *Periodic special inspection* is required for nailing, bolting, anchoring and other fastening of elements of the *main windforce-resisting system*, including wood *shear walls*, wood *diaphragms, drag struts*, braces and *hold-downs*.

Exception: *Special inspections* are not required for wood *shear walls*, shear panels and *diaphragms*, including nailing, bolting, anchoring and other fastening to other elements of the *main windforce-resisting system*, where the lateral resistance is provided by structural sheathing and the specified fastener spacing at panel edges is more than 4 inches (102 mm) on center.

1705.12.2 Cold-formed steel light-frame construction.

Periodic special inspection is required for welding operations of elements of the *main windforce-resisting system*. *Periodic special inspection* is required for screw attachment, bolting, anchoring and other fastening of elements of the *main windforce-resisting system*, including shear walls, braces, *diaphragms, collectors* (*drag struts*) and *hold-downs*.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and *diaphragms*, including screwing, bolting, anchoring and other fastening to components of the windforce-resisting system, where either of the following applies:

1. The sheathing is *gypsum board* or *fiberboard*.
2. The sheathing is *wood structural panel* or steel sheets on only one side of the *shear wall*, shear panel or *diaphragm* assembly and the specified fastener spacing at the panel or sheet edges is more than 4 inches (102 mm) on center (o.c.).

1705.12.3 Wind-resisting components.

Periodic special inspection is required for fastening of the following systems and components:

1. *Roof covering*, *roof deck* and roof framing connections.
2. Exterior wall covering and wall connections to roof and floor *diaphragms* and framing.

1705.13 Special inspections for seismic resistance.

Special inspections for seismic resistance shall be required as specified in Sections 1705.13.1 through 1705.13.9, unless exempted by the exceptions of Section 1704.2.

Exception: The *special inspections* specified in Sections 1705.13.1 through 1705.13.9 are not required for structures designed and constructed in accordance with one of the following:

1. The structure consists of *light-frame construction*; the design spectral response acceleration at short periods, S_{DS}, as determined in Section 1613.2.4, does not exceed 0.5; and the *building height* of the structure does not exceed 35 feet (10 668 mm).
2. The *seismic force-resisting* system of the structure consists of *reinforced masonry* or reinforced concrete; the design spectral response acceleration at short periods, S_{DS}, as determined in Section 1613.2.4, does not exceed 0.5; and the *building height* of the structure does not exceed 25 feet (7620 mm).
3. The structure is a detached one- or two-family dwelling not exceeding two *stories above grade plane* and does not have any of the following horizontal or vertical irregularities in accordance with Section 12.3 of ASCE 7:
   3.1. Torsional or extreme torsional irregularity.

3.2. Nonparallel systems irregularity.

3.3. Stiffness-soft story or stiffness-extreme soft story irregularity.

3.4. Discontinuity in lateral strength-weak story irregularity.

1705.13.1 Structural steel.

Special inspections for seismic resistance shall be in accordance with Section 1705.13.1.1 or 1705.13.1.2, as applicable.

1705.13.1.1 Seismic force-resisting systems.

Special inspections of structural steel in the *seismic force-resisting* systems in buildings and structures assigned to *Seismic Design Category* B, C, D, E or F shall be performed in accordance with the quality assurance requirements of AISC 341.

Exceptions:

1. In buildings and structures assigned to *Seismic Design Category* B or C, *special inspections* are not required for structural steel *seismic force-resisting* systems where the response modification coefficient, R, designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1, has been used for design and detailing.
2. In structures assigned to *Seismic Design Category* D, E, or F, *special inspections* are not required for structural steel *seismic force-resisting systems* where design and detailing in accordance with AISC 360 is permitted by ASCE 7, Table 15.4-1.

1705.13.1.2 Structural steel elements.

Special inspections of *structural steel elements* in the *seismic force-resisting* systems of buildings and structures assigned to *Seismic Design Category* B, C, D, E or F other than those covered in Section 1705.13.1.1, including struts, *collectors*, chords and foundation elements, shall be performed in accordance with the quality assurance requirements of AISC 341.

Exceptions:

1. In buildings and structures assigned to *Seismic Design Category* B or C, *special inspections* of *structural steel elements* are not required for *seismic force-resisting* systems with a response modification coefficient, R, of 3 or less.
2. In structures assigned to *Seismic Design Category* D, E, or F, *special inspections* of *structural steel elements* are not required for *seismic force-resisting systems* where design and detailing other than AISC 341 is permitted by ASCE 7, Table 15.4-1. *Special inspection* shall be in accordance with the applicable referenced standard listed in ASCE 7, Table 15.4-1.

1705.13.2 Structural wood.

For the *seismic force-resisting systems* of structures assigned to *Seismic Design Category* C, D, E or F:

1. *Continuous special inspection* shall be required during field gluing operations of elements of the *seismic force-resisting system*.
2. *Periodic special inspection* shall be required for nailing, bolting, anchoring and other fastening of elements of the *seismic force-resisting system*, including wood *shear walls*, wood *diaphragms*, *drag struts*, braces, shear panels and *hold-downs*.

Exception: *Special inspections* are not required for wood *shear walls*, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the *seismic force-resisting system*, where the lateral resistance is provided by structural sheathing, and the specified fastener spacing at the panel edges is more than 4 inches (102 mm) on center.

1705.13.3 Cold-formed steel light-frame construction.

For the *seismic force-resisting* systems of structures assigned to *Seismic Design Category* C, D, E or F, *periodic special inspection* shall be required for both:

1. Welding operations of elements of the *seismic force-resisting system*.
2. Screw attachment, bolting, anchoring and other fastening of elements of the *seismic force-resisting system*, including shear walls, braces, *diaphragms, collectors* (*drag struts*) and *hold-downs*.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and *diaphragms*, including screw installation, bolting, anchoring and other fastening to components of the *seismic force-resisting system*, where either of the following applies:

1. The sheathing is gypsum board or *fiberboard*.
2. The sheathing is *wood structural panel* or steel sheets on only one side of the *shear wall*, shear panel or *diaphragm* assembly and the specified fastener spacing at the panel or sheet edge is more than 4 inches (102 mm) on center.

1705.13.4 Designated seismic systems.

For structures assigned to *Seismic Design Category* C, D, E or F, the *special inspector* shall examine *designated seismic systems* requiring seismic qualification in accordance with Section 13.2.2 of ASCE 7 and verify that the label, anchorage and mounting conform to the *certificate of compliance*.

1705.13.5 Architectural components.

Periodic special inspection is required for the erection and fastening of exterior cladding, interior and exterior nonbearing walls and interior and exterior *veneer* in structures assigned to *Seismic Design Category* D, E or F.

Exception: *Periodic special inspection* is not required for the following:

1. Exterior cladding, interior and exterior nonbearing walls and interior and exterior *veneer* 30 feet (9144 mm) or less in height above grade or walking surface.
2. Exterior cladding and interior and exterior *veneer* weighing 5 psf (0.24 kN/m^2) or less.
3. Interior nonbearing walls weighing 15 psf (0.72 kN/m^2) or less.

1705.13.5.1 Access floors.

Periodic *special inspection* is required for the anchorage of access floors in structures assigned to *Seismic Design Category* D, E or F.

1705.13.6 Plumbing, mechanical and electrical components.

Periodic special inspection of plumbing, mechanical and electrical components shall be required for the following:

1. Anchorage of electrical equipment for emergency and standby power systems in structures assigned to *Seismic Design Category* C, D, E or F.
2. Anchorage of other electrical equipment in structures assigned to *Seismic Design Category* E or F.
3. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units in structures assigned to *Seismic Design Category* C, D, E or F.
4. Installation and anchorage of ductwork designed to carry hazardous materials in structures assigned to *Seismic Design Category* C, D, E or F.
5. Installation and anchorage of vibration isolation systems in structures assigned to *Seismic Design Category* C, D, E or F where the *approved construction documents* require a nominal clearance of $^1/_4$ inch (6.4 mm) or less between the equipment support frame and restraint.
6. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic sprinkler systems are installed in structures assigned to *Seismic Design Category* C, D, E or F to verify one of the following:
   6.1. Minimum clearances have been provided as required by Section 13.2.3 ASCE/SEI 7.
   6.2. A nominal clearance of not less than 3 inches (76 mm) has been provided between automatic sprinkler system drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.

Where flexible sprinkler hose fittings are used, *special inspection* of minimum clearances is not required.

1705.13.7 Storage racks.

Steel storage racks and steel cantilevered storage racks that are 8 feet (2438 mm) in height or greater and assigned to *Seismic Design Category* D, E or F shall be provided with periodic special inspection as required by Table 1705.13.7.

TABLE 1705.13.7
REQUIRED INSPECTIONS OF STORAGE RACK SYSTEMS

TYPE	CONTINUOUS INSPECTION	PERIODIC INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	—	X	—	—
2. Fabricated storage rack elements.	—	X	—	Section 1704.2.5
3. Storage rack anchorage installation.	—	X	ANSI/MH16.1 Section 7.3.2	—
4. Completed storage rack system, to indicate compliance with the approved construction documents.	—	X	—	—

1705.13.8 Seismic isolation systems.

Periodic special inspection shall be provided for seismic isolation systems in seismically isolated structures assigned to *Seismic Design Category* B, C, D, E or F during the fabrication and installation of isolator units and energy dissipation devices.

1705.13.9 Cold-formed steel special bolted moment frames.

Periodic special inspection shall be provided for the installation of cold-formed steel special bolted moment frames in the *seismic force-resisting systems* of structures assigned to *Seismic Design Category* D, E or F.

1705.14 Testing for seismic resistance.

Testing for seismic resistance shall be required as specified in Sections 1705.14.1 through 1705.14.4, unless exempted from *special inspections* by the exceptions of Section 1704.2.

1705.14.1 Structural steel.

Nondestructive testing for seismic resistance shall be in accordance with Section 1705.14.1.1 or 1705.14.1.2, as applicable.

1705.14.1.1 Seismic force-resisting systems.

Nondestructive testing of structural steel in the *seismic force-resisting systems* in buildings and structures assigned to *Seismic Design Category* B, C, D, E or F shall be performed in accordance with the quality assurance requirements of AISC 341.

Exceptions:

1. In buildings and structures assigned to *Seismic Design Category* B or C, nondestructive testing is not required for structural steel *seismic force-resisting systems* where the response modification coefficient, R, designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1, has been used for design and detailing.
2. In structures assigned to *Seismic Design Category* D, E, or F, nondestructive testing is not required for structural steel *seismic force-resisting systems* where design and detailing in accordance with AISC 360 is permitted by ASCE 7, Table 15.4-1.

1705.14.1.2 Structural steel elements.

Nondestructive testing of *structural steel elements* in the *seismic force-resisting systems* of buildings and structures assigned to *Seismic Design Category* B, C, D, E or F other than those covered in Section 1705.14.1.1, including struts, *collectors*, chords and foundation elements, shall be performed in accordance with the quality assurance requirements of AISC 341.

Exceptions:

1. In buildings and structures assigned to *Seismic Design Category* B or C, nondestructive testing of *structural steel elements* is not required for *seismic force-resisting systems* with a response modification coefficient, R, of 3 or less.
2. In structures assigned to *Seismic Design Category* D, E or F, nondestructive testing of *structural steel elements* is not required for *seismic force-resisting systems* where design and detailing other than AISC 341 is permitted by ASCE 7, Table 15.4-1. Nondestructive testing of *structural steel elements* shall be in accordance with the applicable referenced standard listed in ASCE 7, Table 15.4-1.

1705.14.2 Nonstructural components.

For structures assigned to *Seismic Design Category* B, C, D, E or F, where the requirements of Section 13.2.1 of ASCE 7 for nonstructural components, supports or attachments are met by seismic qualification as specified in Item 2 therein, the *registered design professional* shall specify on the *approved construction documents* the requirements for seismic qualification by analysis, testing or experience data. *Certificates of compliance* for the seismic qualification shall be submitted to the *building official* as specified in Section 1704.5.

1705.14.3 Designated seismic systems.

For structures assigned to *Seismic Design Category* C, D, E or F and with *designated seismic systems* that are subject to the requirements of Section 13.2.2 of ASCE 7 for certification, the *registered design professional* shall specify on the *approved construction documents* the requirements to be met by analysis, testing or experience data as specified therein. *Certificates of compliance* documenting that the requirements are met shall be submitted to the *building official* as specified in Section 1704.5.

1705.14.4 Seismic isolation systems.

Seismic isolation systems in seismically isolated structures assigned to *Seismic Design Category* B, C, D, E or F shall be tested in accordance with Section 17.8 of ASCE 7.

[BF] 1705.15 Sprayed fire-resistant materials.

Special inspections and tests of sprayed fire-resistant materials applied to floor, roof and wall assemblies and structural

members shall be performed in accordance with Sections 1705.15.1 through 1705.15.6. *Special inspections* shall be based on the fire-resistance design as designated in the *approved construction documents*. The tests set forth in this section shall be based on samplings from specific floor, roof and wall assemblies and structural members. *Special inspections* and tests shall be performed during construction with an additional visual inspection after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems and suspension systems for ceilings, and before concealment where applicable. The required sample size shall not exceed 110 percent of that specified by the referenced standards in Sections 1705.15.4.1 through 1705.15.4.9.

[BF] 1705.15.1 Physical and visual tests.

The *special inspections* and tests shall include the following to demonstrate compliance with the listing and the *fire-resistance rating*:

1. Condition of substrates.
2. Thickness of application.
3. Density in pounds per cubic foot (kg/m^3).
4. Bond strength adhesion/cohesion.
5. Condition of finished application.

[BF] 1705.15.2 Structural member surface conditions.

The surfaces shall be prepared in accordance with the *approved* fire-resistance design and the written instructions of *approved* manufacturers. The prepared surface of structural members to be sprayed shall be inspected by the *special inspector* before the application of the sprayed fire-resistant material.

[BF] 1705.15.3 Application.

The substrate shall have a minimum ambient temperature before and after application as specified in the written instructions of *approved* manufacturers. The area for application shall be ventilated during and after application as required by the written instructions of *approved* manufacturers.

[BF] 1705.15.4 Thickness.

Not more than 10 percent of the thickness measurements of the sprayed fire-resistant materials applied to floor, roof and wall assemblies and structural members shall be less than the thickness required by the *approved* fire-resistance design, and none shall be less than the minimum allowable thickness required by Section 1705.15.4.1.

[BF] 1705.15.4.1 Minimum allowable thickness.

For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus 1/4 inch (6.4 mm). For design thicknesses less than 1 inch (25 mm), the minimum allowable individual thickness shall be the design thickness minus 25 percent. Thickness shall be determined in accordance with ASTM E605. Samples of the sprayed fire-resistant materials shall be selected in accordance with Sections 1705.15.4.2 and 1705.15.4.3.

[BF] 1705.15.4.2 Floor, roof and wall assemblies.

The thickness of the sprayed fire-resistant material applied to floor, roof and wall assemblies shall be determined in accordance with ASTM E605, making not less than four measurements for each 1,000 square feet (93 m^2) of the sprayed area, or portion thereof, in each story.

[BF] 1705.15.4.3 Cellular decks.

Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area.

[BF] 1705.15.4.4 Fluted decks.

Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area, including one each of the following: valley, crest and sides. The average of the measurements shall be reported.

[BF] 1705.15.4.5 Structural members.

The thickness of the sprayed fire-resistant material applied to structural members shall be determined in accordance with ASTM E605. Thickness testing shall be performed on not less than 25 percent of the structural members on each floor.

[BF] 1705.15.4.6 Beams and girders.

At beams and girders thickness measurements shall be made at nine locations around the beam or girder at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.7 Joists and trusses.

At joists and trusses, thickness measurements shall be made at seven locations around the joist or truss at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.8 Wide-flanged columns.

At wide-flanged columns, thickness measurements shall be made at 12 locations around the column at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.9 Hollow structural section and pipe columns.

At hollow structural section and pipe columns, thickness measurements shall be made at not fewer than four locations around the column at each end of a 12-inch (305 mm) length.

[BF] 1705.15.5 Density.

The density of the sprayed fire-resistant material shall be not less than the density specified in the *approved* fire-resistance design. Density of the sprayed fire-resistant material shall be determined in accordance with ASTM E605. The test samples for determining the density of the sprayed fire-resistant materials shall be selected as follows:

1. From each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m^2) or portion thereof of the sprayed area in each story.
2. From beams, girders, trusses and columns at the rate of not less than one sample for each type of structural member for each 2,500 square feet (232 m^2) of floor area or portion thereof in each *story*.

[BF] 1705.15.6 Bond strength.

The cohesive/adhesive bond strength of the cured sprayed fire-resistant material applied to floor, roof and wall assemblies and structural members shall be not less than 150 pounds per square foot (psf) (7.18 kN/m^2). The cohesive/adhesive bond strength shall be determined in accordance with the field test specified in ASTM E736 by testing in-place samples of the sprayed fire-resistant material selected in accordance with Sections 1705.15.6.1 through 1705.15.6.3.

[BF] 1705.15.6.1 Floor, roof and wall assemblies.

The test samples for determining the cohesive/adhesive bond strength of the sprayed fire-resistant materials shall be selected from each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m^2) of the sprayed area, or portion thereof, in each *story*.

[BF] 1705.15.6.2 Structural members.

The test samples for determining the cohesive/adhesive bond strength of the sprayed fire-resistant materials shall be selected from beams, girders, trusses, columns and other structural members at the rate of not less than one sample for each type of structural member for each 2,500 square feet (232 m^2) of floor area or portion thereof in each *story*.

[BF] 1705.15.6.3 Primer, paint and encapsulant bond tests.

Bond tests to qualify a primer, paint or encapsulant shall be conducted where the sprayed fire-resistant material is applied to a primed, painted or encapsulated surface for which acceptable bond-strength performance between these coatings and the fire-resistant material has not been determined. A bonding agent *approved* by the SFRM manufacturer shall be applied to a primed, painted or encapsulated surface where the bond strengths are found to be less than required values.

[BF] 1705.16 Mastic and intumescent fire-resistant coatings.

Special inspections and tests for mastic and *intumescent fire-resistant coatings* applied to structural elements and decks shall be performed in accordance with AWCI 12-B. *Special inspections* and tests shall be based on the fire-resistance design as designated in the *approved construction documents*. *Special inspections* and tests shall be performed during construction. Additional visual inspection shall be performed after the rough installation and, where applicable, prior to the concealment of electrical, automatic sprinkler, mechanical and plumbing systems.

1705.17 Exterior insulation and finish systems (EIFS).

Special inspections shall be required for all EIFS applications.

Exceptions:

1. *Special inspections* shall not be required for EIFS applications installed over a water-resistive barrier with a means of draining moisture to the exterior.
2. *Special inspections* shall not be required for EIFS applications installed over masonry or concrete walls.

1705.17.1 Water-resistive barrier coating.

A *water-resistive barrier* coating complying with ASTM E2570 requires *special inspection* of the *water-resistive barrier* coating where installed over a sheathing substrate.

[BF] 1705.18 Fire-resistant penetrations and joints.

(Section deleted.)

[BF] 1705.18.1 Penetration firestops.

(Section deleted.)

[BF] 1705.18.2 Fire-resistant joint systems.

(Section deleted.)

[F] 1705.19 Testing for smoke control.

Smoke control systems shall be tested by a *special inspector*.

[F] 1705.19.1 Testing scope.

The test scope shall be as follows:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements and detection and control verification.

[F] 1705.19.2 Qualifications.

Approved agencies for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

1705.20 Sealing of mass timber.

Periodic *special inspections* of sealants or adhesives shall be conducted where sealant or adhesive required by Section 703.7 is applied to *mass timber building elements* as designated in the *approved* construction documents.

SECTION 1706
DESIGN STRENGTHS OF MATERIALS

1706.1 Conformance to standards.

The *design strengths* and permissible stresses of any structural material that are identified by a manufacturer's designation as to manufacture and grade by mill tests, or the strength and stress grade is otherwise confirmed to the satisfaction of the *building official*, shall conform to the specifications and methods of design of accepted engineering practice or the *approved* rules in the absence of applicable standards.

1706.2 New materials.

For materials that are not specifically provided for in this code, the *design strengths* and permissible stresses shall be established by tests as provided for in Section 1707.

SECTION 1707
ALTERNATIVE TEST PROCEDURE

1707.1 General.

In the absence of *approved* rules or other *approved* standards, the *building official* shall make, or cause to be made, the necessary tests and investigations; or the *building official* shall accept duly authenticated reports from *approved agencies* in respect to the quality and manner of use of new materials or assemblies as provided for in Section 112.2. The cost of all tests and other investigations required under the provisions of this code shall be borne by the *owner* or the *owner's* authorized agent.

SECTION 1708
IN-SITU LOAD TESTS

1708.1 General.

Whenever there is a reasonable doubt as to the stability or load-bearing capacity of a completed building, structure or portion thereof for the expected *loads*, an engineering assessment shall be required. The engineering assessment shall involve either a structural analysis or an in-situ load test, or both. The structural analysis shall be based on actual material properties and other as-built conditions that affect stability or load-bearing capacity, and shall be conducted in accordance with the applicable design standard. The in-situ load tests shall be conducted in accordance with Section 1708.2. If the building, structure or portion thereof is found to have inadequate stability or load-bearing capacity for the expected *loads*, modifications to ensure structural adequacy or the removal of the inadequate construction shall be required.

1708.2 In-situ load tests.

In-situ load tests shall be conducted in accordance with Section 1708.2.1 or 1708.2.2 and shall be supervised by a *registered design professional*. The test shall simulate the applicable loading conditions specified in Chapter 16 as necessary to address the concerns regarding structural stability of the building, structure or portion thereof.

1708.2.1 Load test procedure specified.

Where a referenced material standard contains an applicable load test procedure and acceptance criteria, the test procedure and acceptance criteria in the standard shall apply. In the absence of specific *load factors* or acceptance criteria, the *load factors* and acceptance criteria in Section 1708.2.2 shall apply.

1708.2.2 Load test procedure not specified.

In the absence of applicable load test procedures contained within a material standard referenced by this code or acceptance criteria for a specific material or method of construction, such *existing structure* shall be subjected to an approved test procedure developed by a *registered design professional* that simulates applicable loading and deformation conditions. For components that are not a part of the *seismic force-resisting* system, at a minimum the test load shall be equal to the specified factored design *loads*. For materials such as wood that have strengths that are dependent on load duration, the test load shall be adjusted to account for the difference in load duration of the test compared to the expected duration of the design *loads* being considered. For statically loaded components, the test load shall be left in place for a period of 24 hours. For components that carry dynamic *loads* (for example, machine supports or fall arrest anchors), the load shall be left in place for a period consistent with the component's actual function. The structure shall be considered to have successfully met the test requirements where the following criteria are satisfied:

1. Under the design *load*, the deflection shall not exceed the limitations specified in Section 1604.3.
2. Within 24 hours after removal of the test load, the structure shall have recovered not less than 75 percent of the maximum deflection.
3. During and immediately after the test, the structure shall not show evidence of failure.

SECTION 1709
PRECONSTRUCTION LOAD TESTS

1709.1 General.

Where proposed construction is not capable of being designed by *approved* engineering analysis, or where proposed construction design method does not comply with the applicable material design standard, the system of construction or the structural unit and the connections shall be subjected to the tests prescribed in Section 1709. The *building official* shall accept certified reports of such tests conducted by an *approved* testing agency, provided that such tests meet the requirements of this code and *approved* procedures.

1709.2 Load test procedures specified.

Where specific load test procedures, *load factors* and acceptance criteria are included in the applicable referenced standards, such test procedures, *load factors* and acceptance criteria shall apply. In the absence of specific test procedures, *load factors* or acceptance criteria, the corresponding provisions in Section 1709.3 shall apply.

1709.3 Load test procedures not specified.

Where load test procedures are not specified in the applicable referenced standards, the load-bearing and deformation capacity of structural components and assemblies shall be determined on the basis of a test procedure developed by a *registered design professional* that simulates applicable loading and deformation conditions. For components and assemblies that are not a part of the *seismic force-resisting* system, the test shall be as specified in Section 1709.3.1. Load tests shall simulate the applicable loading conditions specified in Chapter 16.

1709.3.1 Test procedure.

The test assembly shall be subjected to an increasing superimposed load equal to not less than two times the superimposed design load. The test load shall be left in place for a period of 24 hours. The tested assembly shall be considered to have successfully met the test requirements if the assembly recovers not less than 75 percent of the maximum deflection within 24 hours after the removal of the test load. The test assembly shall then be reloaded and subjected to an increasing superimposed load until either structural failure occurs or the superimposed load is equal to two and one-half times the load at which the deflection limitations specified in Section 1709.3.2 were reached, or the load is equal to two and one-half times the superimposed design load. In the case of structural components and assemblies for which deflection limitations are not specified in Section 1709.3.2, the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to two and one-half times the desired superimposed design load. The allowable superimposed design load shall be taken as the least of:

1. The load at the deflection limitation given in Section 1709.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

1709.3.2 Deflection.

The deflection of structural members under the design *load* shall not exceed the limitations in Section 1604.3.

1709.4 Wall and partition assemblies.

Load-bearing wall and partition assemblies shall sustain the test load both with and without window framing. The test load shall include all design load components. Wall and partition assemblies shall be tested both with and without door and window framing.

1709.5 Exterior window and door assemblies.

The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1709.5.1 or 1709.5.2. For exterior windows and doors tested in accordance with Section 1709.5.1 or 1709.5.2, required design wind pressures determined from ASCE 7 shall be permitted to be converted to allowable stress design by multiplying by 0.6.

Exception: Structural wind load design pressures for window or door assemblies other than the size tested in accordance with Section 1709.5.1 or 1709.5.2 shall be permitted to be different than the design value of the tested assembly, provided that such pressures are determined by accepted engineering analysis or validated by an additional test of the window or door assembly to the alternative allowable design pressure in accordance with Section 1709.5.2. Components of the alternate size assembly shall be the same as the tested or labeled assembly. Where engineering analysis is used, it shall be performed in accordance with the analysis procedures of AAMA 2502.

1709.5.1 Exterior windows and doors.

Exterior windows and sliding doors shall be tested and *labeled* as conforming to AAMA/WDMA/CSA101/I.S.2/A440. The

label shall state the name of the manufacturer, the approved labeling agency and the product designation as specified in AAMA/WDMA/CSA101/I.S.2/A440. Exterior side-hinged doors shall be tested and *labeled* as conforming to AAMA/WDMA/CSA101/I.S.2/A440 or comply with Section 1709.5.2. Products tested and *labeled* as conforming to AAMA/WDMA/CSA 101/I.S.2/A440 shall not be subject to the requirements of Sections 2403.2 and 2403.3.

1709.5.2 Exterior windows and door assemblies not provided for in Section 1709.5.1.

Exterior window and door assemblies shall be tested in accordance with ASTM E330. Exterior window and door assemblies containing glass shall comply with Section 2403. The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

1709.5.2.1 Garage doors and rolling doors.

Garage doors and rolling doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the pass/fail criteria of ANSI/DASMA 108. Garage doors and rolling doors shall be labeled with a permanent label identifying the door manufacturer, the door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

1709.5.3 Windborne debris protection.

Protection of exterior glazed openings in buildings located in *windborne debris regions* shall be in accordance with Section 1609.2.

1709.5.3.1 Impact protective systems testing and labeling.

Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E1886 and ASTM E1996 and for design wind pressure for compliance with ASTM E330. Required design wind pressures shall be determined in accordance with ASCE 7, and for the purposes of this section, multiplied by 0.6 to convert to *allowable stress design*.

Impact protective systems shall have a permanent label applied in accordance with Section 1703.5.4, identifying the manufacturer, product designation, performance characteristics, and approved inspection agency.

1709.6 Skylights and sloped glazing.

Skylights and sloped glazing shall comply with the requirements of Chapter 24.

1709.7 Test specimens.

Test specimens and construction shall be representative of the materials, workmanship and details normally used in practice. The properties of the materials used to construct the test assembly shall be determined on the basis of tests on samples taken from the load assembly or on representative samples of the materials used to construct the load test assembly. Required tests shall be conducted or witnessed by an *approved agency*.