

## CHAPTER 17

# STRUCTURAL TESTS AND SPECIAL INSPECTIONS

### SECTION BC 1701 GENERAL

**1701.1 Scope.** The provisions of this chapter shall govern the inspection of quality, workmanship and requirements for construction. Materials, inspection and testing shall conform to the applicable standards listed in this code or in the rules of the department. See Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to materials, testing and inspections.

**1701.2 New materials.** See Chapter 1 of Title 28 of the *Administrative Code* for additional provisions.

**1701.3 Used materials.** See Chapter 1 of Title 28 of the *Administrative Code*.

### SECTION BC 1702 DEFINITIONS

**1702.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**APPROVED AGENCY.** See Chapter 1 of Title 28 of the *Administrative Code*.

**APPROVED FABRICATOR.** An established and qualified person, firm or corporation approved by the commissioner to custom manufacture or build products or assemblies regulated by this code.

**CERTIFICATE OF COMPLIANCE.** A certificate stating that materials meet specified standards or that work was done in compliance with approved construction documents and other applicable provisions of law and with respect to specified service equipment, a certificate issued by the department authorizing the operation of such equipment.

**FABRICATED ITEM.** Products and assemblies regulated by this code that are custom manufactured, or built prior to their incorporation into the work at the job site. Fabricated items shall not include listed, labeled or approved products or assemblies.

**INSPECTION CERTIFICATE.** An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of the approved agency that indicates that the product or material has been inspected and evaluated by such approved agency. An inspection certificate shall also mean a certificate issued by the department upon satisfactory completion of an inspection or test.

**LABEL.** An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indicates that a representative sample of the product or material has been tested and evaluated by an approved agency for com-

pliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

**MANUFACTURER'S DESIGNATION.** An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules.

**MARK.** An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material.

**SPECIAL INSPECTION.** Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections, to ensure compliance with approved construction documents and referenced standards as required by this chapter or elsewhere in this code or its referenced standards.

**SPECIAL INSPECTION, CONTINUOUS.** The full-time observation of work requiring special inspection by a special inspector who is continuously present in the area where the work is being performed.

**SPECIAL INSPECTION, PERIODIC.** The intermittent observation of work requiring special inspection by a special inspector who is present in the area where the work has been or is being performed and at the completion of the work. All work requiring special inspection shall remain accessible and exposed until approved by the special inspector.

**SPECIAL INSPECTOR.** See Chapter 1 of Title 28 of the *Administrative Code*.

**SPRAYED FIRE-RESISTANT MATERIALS.** Cementitious or fibrous materials that are spray applied to provide fire-resistant protection of the substrates.

**SUPERINTENDENT OF CONSTRUCTION.** See Chapter 1 of Title 28 of the *Administrative Code*.

### SECTION BC 1703 APPROVALS

See Chapter 1 of Title 28 of the *Administrative Code*.

### SECTION BC 1704 SPECIAL INSPECTIONS

**1704.1 General.** Where application is made for construction as described in this section, one or more special inspectors shall be employed by the owner to provide inspections during construction on the types of work listed under Section 1704 and elsewhere in this code. The special inspector shall be acceptable to the registered design professional of record.

**Exception:** Special inspections are not required for building components unless the design involves the practice of professional engineering or architecture as defined by the

Education Law of the State of New York and applicable regulations governing the professional registration and certification of engineers or architects.

**1704.1.1 Building permit requirement.** The permit applicant shall submit a statement of special inspections as a condition for permit issuance on forms supplied by the department. This statement shall include a complete list of materials and work requiring special inspections by this section, the inspections to be performed and a list of the individuals or approved agencies to be retained for conducting the special inspections listed on the approved plans. Within each category of work, multiple special inspectors may be employed.

**1704.1.1.1 Required notification to special inspectors.**

The permit holder shall notify the relevant special inspectors in writing at least 72 hours before the commencement of any work requiring special inspection.

**1704.1.1.2 Identification of design professionals providing design documents for certain construction operations.**

The registered design professionals responsible for the production of design, sequence of construction operations or shop drawings for projects that require design as defined in Chapter 33, shall file documentation of their intent to perform those duties on forms supplied by the department.

**1704.1.2 Report requirement.** Special inspectors shall keep records of inspections for a period of 6 years from the date of project sign-off. Such records shall be supplied to the commissioner upon request. The commissioner may require that special inspection reports be filed with the department and/or that such reports be otherwise made accessible for review. Reports shall indicate that work inspected was done in conformance with approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor and, when applicable, to the superintendent of construction, for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the owner, and the registered design professional of record prior to the completion of that phase of the work. Special inspection reports and records of special inspections shall be in the form and format supplied by the commissioner.

**1704.1.2.1 Hazardous conditions.** The special inspector shall report conditions noted as hazardous to life, safety or health, to the immediate attention of the commissioner.

**1704.1.2.2 Approval of partially completed work.** Reports of partially completed work shall be accepted when such reports indicate the code-compliant status of completed work and the condition of the remaining work.

**1704.2 Inspection of fabricators.** Where fabrication of structural members, and other regulated products is performed on the premises of a fabricator's shop, special inspection of the fabricated items shall be required as provided in Sections

1704.2.1 through 1704.2.2 and in Chapter 1 of Title 28 of the *Administrative Code*.

**1704.2.1 Fabrication and implementation procedures.**

The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

**Exception:** Special inspections as required by Section 1704.2 shall not be required where the fabricator is approved in accordance with Section 1704.2.2 and with Chapter 1 of Title 28 of the *Administrative Code*.

**1704.2.2 Fabricator approval.** Special inspections required by this code are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval of fabricators shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved agency.

**1704.2.2.1 Fabricator's certificate of compliance.** For all fabricated items, the approved fabricator shall submit a certificate of compliance to the department stating that the work was performed in accordance with the approved construction documents, referenced standards and applicable provisions of law.

**1704.3 Steel construction.** The special inspections for steel elements of buildings and structures shall be as required by Section 1704.3 and Table 1704.3. Where required, special inspection of steel shall also comply with Section 1715.

**Exceptions:**

1. Special inspection of the steel fabrication process shall not be required where the fabricator does not perform any welding, thermal cutting or heating operation of any kind as part of the fabrication process. 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, grade and mill test reports for the main stress-carrying elements are capable of being determined.
2. The special inspector need not be continuously present during welding of the following items, provided the materials, welding procedures and qualifications of welders are verified prior to the start of the work; periodic inspections are made of the work in progress and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.
  - 2.1. Single-pass fillet welds not exceeding  $5/16$  inch (7.9 mm) in size.
  - 2.2. Floor and roof deck welding.

- 2.3. Welded studs when used for structural diaphragm.
- 2.4. Welded sheet steel for cold-formed steel framing members such as studs and joists.
- 2.5. Welding of stairs and railing systems.

**1704.3.1 Welding.** Welding inspection shall be in compliance with AWS D1.1.

**1704.3.2 Details.** The special inspector shall perform an inspection of the steel frame to verify compliance with the details shown on the approved construction documents, such as bracing, stiffening, member locations and proper application of joint details at each connection, including connections designed for seismic effects.

**1704.3.3 High-strength bolts.** Installation of high-strength bolts shall be inspected in accordance with this section.

**1704.3.3.1 General.** While the work is in progress, the special inspector shall determine that the requirements for bolts, nuts, washers and paint; bolted parts and installation and tightening in such standards are met. For bolts requiring pretensioning, the special inspector shall observe the preinstallation testing and calibration procedures when such procedures are required by the installation method or by project plans or specifications; determine that all plies of connected materials have been drawn together and properly snugged and monitor the installation of bolts to verify that the selected procedure for installation is properly used to tighten bolts. For joints required to be tightened only to the snug-tight condition, the special inspector need only verify that the connected materials have been drawn together and properly snugged.

**1704.3.3.2 Periodic monitoring.** Monitoring of bolt installation for pretensioning is permitted to be performed on a periodic basis when using the turn-of-nut method with matchmarking techniques, the direct tension indicator method or the alternate design fastener (twist-off bolt) method. Joints designated as snug tight need be inspected only on a periodic basis.

**1704.3.3.3 Continuous monitoring.** Monitoring of bolt installation for pretensioning using the calibrated wrench method or the turn-of-nut method without matchmarking shall be performed on a continuous basis.

**1704.3.4 Cold-formed steel construction.** Cold-formed steel used structurally shall be subject to the special inspection requirements of Section 1704.3 and Table 1704.3. In addition, the following requirements shall be inspected for compliance by the special inspector:

1. The special inspector shall check for compliance with the requirements of Section 2209.1.3.

2. Temporary bracing, shoring, jacks, etc., shall not be removed until the special inspector determines that they are no longer needed.

**1704.4 Concrete construction.** The special inspections and verifications for concrete construction shall be as required by this section and Table 1704.4.

**Exception:** Special inspections shall not be required for the following when specifically exempted on the approved construction documents:

1. Concrete placement of less than 50 cubic yards (38 m<sup>3</sup>) provided that the concrete is nonstructural and is not subject to the durability requirements of Section 1904. In such case, testing may be waived by the registered design professional who prepared the structural construction documents.
2. 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).
3. Concrete foundation(s) for lightweight fences and recreational equipment.
4. Concrete patios, site furnishings, garden walls, driveways, sidewalks and similar construction.

**1704.4.1 Materials.** In the absence of sufficient data or documentation providing evidence of conformance to quality standards for materials in Chapter 3 of ACI 318, the commissioner shall require testing of materials in accordance with the appropriate standards and criteria for the material in Chapter 3 of ACI 318. Weldability of reinforcement, except that which conforms to ASTM A 706, shall be determined in accordance with the requirements of Section 1903.5.2.

**1704.4.2 Concrete construction.** When the specified compressive strength of concrete in a column is greater than 1.4 times that specified for a floor system, the special inspections for concrete construction shall also comply with the requirements of Section 1908.2.1.

**1704.5 Masonry construction.** Masonry construction shall be inspected and evaluated in accordance with the requirements of this section, depending on the structural occupancy category of the building or structure or nature of occupancy, as defined by this code (see Table 1604.5 and Section 1616.2).

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

1. Empirically designed masonry, glass unit masonry or masonry veneer designed by Section 2109, 2110 or ACI 530/ASCE 5/TMS 402, Chapters 5, 6 or 7, when they are part of nonessential buildings (see Table 1604.5 and Section 1616.2).
2. Masonry foundation walls constructed in accordance with Table 1805.5(1), 1805.5(2), 1805.5(3) or 1805.5(4).

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**TABLE 1704.3  
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD <sup>a</sup>	BC REFERENCE
1. Material verification of high-strength bolts, nuts and washers:				
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	—	X	Applicable ASTM material specifications; AISC 335, Section A3.4; AISC LRFD, Section A3.3	—
b. Manufacturer's certificate of compliance required.	—	X	—	—
2. Inspection of high-strength bolting:				
a. Bearing-type connections.	—	X Note b	AISC LRFD Section M2.5	1704.3.3
b. Slip-critical connections.	X	X		
3. Material verification of structural steel:				
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	—	—	ASTM A 6 or ASTM A 568	1708.4
b. Manufacturers' certified mill test reports.	—	—	ASTM A 6 or ASTM A 568	
4. Material verification of weld filler materials:				
a. Identification markings to conform to AWS specification in the approved construction documents.	—	—	AISC, ASD, Section A3.6; AISC LRFD, Section A3.5	—
b. Manufacturer's certificate of compliance required.	—	—	—	—
5. Inspection of welding:				
a. Structural steel:	—	—		
1) Complete and partial penetration groove welds.	X	—	AWS D1.1	1704.3.1
2) Multipass fillet welds.	X	—		
3) Single-pass fillet welds $> 5/16''$	X	—		
4) Single-pass fillet welds $\leq 5/16''$	—	X		
5) Floor and roof deck welds.	—	X	AWS D1.3	—
b. Reinforcing steel:	—	—		
1) Verification of weldability of reinforcing steel other than ASTM A 706.	—	X	AWS D1.4 ACI 318: 3.5.2	1903.5.2
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	X	—		
3) Shear reinforcement.	X Note a	—		
4) Other reinforcing steel.	—	X		
6. Inspection of steel frame joint details for compliance with approved construction documents:		X		
a. Details such as bracing and stiffening.	—	—	—	1704.3.2
b. Member locations.	—	—		
c. Application of joint details at each connection.	—			

For SI: 1 inch = 25.4 mm.

- a. A minimum of 10 percent of shear studs shall be verified for strength of welded connection. If failure is evident on one or more, then the strength of all shear studs shall be verified.
- b. Turn of the nut bolting shall be continuously inspected. Exception: Periodic inspection shall be acceptable when the contractor's procedures have been established and verified for compliance by the special inspector.

**TABLE 1704.4  
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	BC REFERENCE
1. Inspection of reinforcing steel, including prestressing tendons and placement.	—	X	ACI 318:3.5, 7.1 – 7.7	1903.5, 1907.1, 1907.7, 1914.4
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5b.	—	—	AWS D1.4 ACI 318:3.5.2	1903.5.2
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	—	—	1912.5
4. Verifying use of required design mix.	—	X	ACI 318: Ch. 4, 5.2-5.4	1904, 1905.2-1905.4, 1914.2, 1914.3
5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8 (Note a, b)	1905.6, 1914.10
6. Inspection of concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 5.9, 5.10	1905.9, 1905.10, 1914.6, 1914.7, 1914.8
7. Inspection for maintenance of specified curing temperature and techniques.	—	X	ACI 318: 5.11-5.13	1905.11, 1905.13, 1914.9
8. Inspection of prestressed concrete: A. Application of prestressing forces B. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	X X	—	ACI 318: 18.20 ACI 318:18.18.4	—
9. Erection of precast concrete members.	—	X	ACI 318: Ch. 16	—
10. Verification of 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: 6.2	1906.2

a. Standard sampling rate shall be in accordance with Section 1905.6.2.

b. Four-inch by 8-inch cylinders may be accepted in lieu of 6-inch by 12-inch cylinders at the option of the engineer of record.

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**1704.5.1 Empirically designed masonry, glass unit masonry and masonry veneer in essential facilities.** The minimum inspection program for masonry designed by Chapter 14, Section 2109 or 2110, or by Chapter 5, 6 or 7 of ACI 530/ASCE 5/TMS 402, in essential facilities listed in Table 1604.5 and Section 1616.2, shall comply with Table 1704.5.1.

**1704.5.2 Masonry facilities less than three stories in height and engineered masonry in nonessential facilities.** The minimum special inspection program for masonry designed by Section 2106, 2107 or 2108, or by chapters other than Chapters 5, 6 or 7 of ACI 530/ASCE 5/TMS 402, in nonessential facilities (see Table 1604.5 and Section 1616.2), shall comply with Table 1704.5.1.

**TABLE 1704.5.1  
LEVEL 1 SPECIAL INSPECTION**

INSPECTION TASK	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
	Continuous during task listed	Periodically during task listed	IBC section	ACI 530/ASCE 5/TMS 402 <sup>a</sup>	ACI 530.1/ASCE 6/TMS 602 <sup>a</sup>
1. As masonry construction begins, the following shall be verified to ensure compliance:					
a. Proportions of site-prepared mortar.		X			Art. 2.6A
b. Construction of mortar joints.		X			Art. 3.3B
c. Location of reinforcement, connectors, prestressing tendons and anchorage.	—	X	—	—	Art. 3.4, 3.6A
d. Prestressing technique.	—	X	—	—	Art. 3.6B
e. Grade and size of prestressing tendons and anchorages.	—	X	—	—	Art. 2.4B, 2.4H
2. The inspection program shall verify:					
a. Size and location of structural elements.	—	X	—	—	Art. 3.3G
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	—	X	—	Sec. 4.3.1.6, 2.1.4, 3.1.6	—
c. Specified size, grade and type of reinforcement.	—	X	—	Sec. 1.12	Art. 2.4, 3.4
d. Welding of reinforcing bars.	X	—	—	Sec. 2.1.10.6.2, 3.2.3.4(b)	—
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	—	X	Sec. 2104.3, 2104.4	—	Art. 1.8C, 1.8D
f. Application and measurement of prestressing force.	—	X	—	—	Art. 3.6B
3. Prior to grouting, the following shall be verified to ensure compliance:					
a. Grout space is clean.		X		—	Art. 3.2D
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.		X		Sec. 1.12	Art. 3.4
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.	—	X	—	—	Art. 2.6B
d. Construction of mortar joints.		X		—	Art. 3.3B
4. Grout placement shall be verified to ensure compliance with code and construction document provisions.	X	—	—	—	Art 3.5
a. Grouting of prestressing bonded tendons.	X	—	—	—	Art. 3.6C
5. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	X	—	Sec. 2105.2.2, 2105.3	—	Art. 1.4
6. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	—	X	—	—	Art. 1.5

For SI: °C = (°F - 32)/1.8.

a. The specific standards referenced are those listed in Chapter 35.

**1704.5.3 Structural and veneer masonry in facilities three stories or more in height and engineered masonry in essential facilities.** The minimum special inspection program for masonry designed by Section 2106, 2107 or 2108, or by chapters other than Chapters 5, 6 or 7 of ACI 530/ASCE 5/TMS 402, in essential facilities (see Table 1604.5 and Section 1616.2), shall comply with Table 1704.5.3.

**1704.6 Wood construction.** Special inspections of the fabrication process of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2. Special inspections of site-built assemblies shall be in accordance with Section 1704.1.

**1704.6.1 Fabrication of high-load diaphragms.** High-load diaphragms using values from Table 2306.3.2 shall be installed with special inspections as indicated in Section 1704.1. 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 spacing between fasteners in each line and at edge margins agrees with the approved construction documents.

**1704.6.2 Other structural wood construction.** Special inspection of structural wood construction shall be performed in accordance with Chapter 1.

**1704.6.3 Metal-plate-connected wood trusses.** In addition to the requirements of Section 1704.1, metal-plate-connected wood trusses shall be subject to special inspection in accordance with Section 1704.6.3.1.

**1704.6.3.1 Erection.** The use of all metal-plate-connected wood trusses shall be subject to special inspection for compliance with the approved construction documents.

**TABLE 1704.5.3  
LEVEL 2 SPECIAL INSPECTION**

INSPECTION TASK	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
	Continuous during task listed	Periodically during task listed	BC section	ACI 530/ASCE 5/TMS 402	ACI 530.1/ASCE 6/TMS 602
1. From the beginning of masonry construction, the following shall be verified to ensure compliance:					
a. Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons.	—	X	—	—	Art. 2.6A
b. Placement of masonry units and construction of mortar joints.	—	X	—	—	Art. 3.3B
c. Placement of reinforcement, connectors and prestressing tendons and anchorages.	—	X	—	Sec. 1.12	Art. 3.4, 3.6A
d. Grout space prior to grouting.	X	—	—	—	Art. 3.2D
e. Placement of grout.	X	—	—	—	Art. 3.5
f. Placement of prestressing grout.	X	—	—	—	Art. 3.6C
2. The inspection program shall verify:					
a. Size and location of structural elements.	—	X	—	—	Art. 3.3G
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	X	—	—	Sec. 1.2.2(e), 2.1.4, 3.1.6	—
c. Specified size, grade and type of reinforcement.	—	X	—	Sec. 1.12	Art. 2.4, 3.4
d. Welding reinforcement.	X	—	—	Sec. 2.1.10.6.2, 3.2.3.4(b)	—
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	—	X	Sec. 2104.3, 2104.4	—	Art. 1.8C, 1.8D
f. Application and measurement of prestressing force.	X	—	—	—	Art. 3.6B
3. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	X	—	Sec. 2105.2.2, 2105.3	—	Art. 1.4
4. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	—	X	—	—	Art. 1.5

ments, the requirements of Sections 1704.1, and the following:

1. All installed materials shall be clean, straight and otherwise undamaged. Members and parts shall not be stretched, bent, or otherwise distorted unless such forming is in the integral part of the design. The special inspector shall ensure that damaged members are not used for construction.
2. Profiles of members used structurally shall conform to the dimensions specified in the approved construction documents. The installation shall be inspected for compliance with the approved construction documents regarding locations, positions, beam separators, bearing surfaces, fasteners, screws, bolts and bracing, as applicable.
3. Temporary bracing, shoring, jacks, etc., shall not be removed until the special inspector determines that they are no longer needed.
4. Where prefabricated metal-plate-connected wood trusses are utilized, such prefabricated wood structural elements and assemblies shall also comply with Section 1704.2. Where any metal-plate connectors are utilized in site-built assemblies, such connections and assemblies shall be subject to special inspection for compliance with the requirements of the approved construction documents and manufacturers' instructions.

**1704.6.4 Prefabricated wood I-joists.** The fabrication of prefabricated wood I-joists shall be subject to special inspections in accordance with Section 1704.2 and the requirements of Section 2303.1.2.

**1704.6.4.1 Erection.** The erection of prefabricated wood I-joists shall be subject to special inspection for compliance with the approved construction documents, the requirements of Sections 1704.1, and the following:

1. All installed materials shall be clean, straight and otherwise undamaged. Members and parts shall not be stretched, bent, or otherwise distorted unless such forming is in the integral part of the design. The special inspector shall ensure that damaged members are not used for construction.
2. Profiles of members used structurally shall conform to the dimensions specified in the approved construction documents. The installation shall be inspected for compliance with the approved construction documents regarding locations, positions, beam separators, bearing surfaces, fasteners, screws, bolts and bracing, as applicable.
3. The size, location, and number of penetrations shall be inspected for compliance with the approved construction documents and manufacturers' instructions.
4. Temporary bracing, shoring, jacks, etc., shall not be removed until the special inspector determines that they are no longer needed.

**1704.7 Soils.** The special inspections for existing site soil conditions, fill placement and load-bearing requirements shall be performed in accordance with Sections 1704.7.1 through 1704.7.3. The approved soils report, required by Section 1802.2, shall be used to determine compliance.

**1704.7.1 Site preparation.** Immediately prior to placement of the footings, foundations, fill or other supporting materials the special inspector shall determine that the site has been prepared in accordance with the approved soils report.

**1704.7.2 During fill placement.** During placement and compaction of the fill material, the special inspector shall determine that the material being used and the maximum lift thickness comply with the approved report, as specified in Section 1803.5.

**1704.7.3 Evaluation of in-place density.** The special inspector shall determine, at the approved frequency, that the in-place dry density of the compacted fill complies with the approved report.

**1704.7.4 Special inspection of soils investigations, borings and test pits.** Boring operations shall be subject to continuous special inspection to verify compliance with Section 1802. Soil sample recovery operations for test pits shall be subject to continuous special inspection to verify compliance with Section 1802.

**Exception:** Existing boring, test pit and soil investigation records that have been deemed acceptable to the commissioner in accordance with Section 1802.4.2 are not subject to special inspection.

**1704.7.4.1 Boring and/or test pit report.** The special inspector's report shall include statements attesting to the following: that borings were performed in accordance with the procedures established in Section 1802.5, that 50 percent or more of the borings were witnessed directly by the registered design professional designated for this special inspection, the identification of those borings, the name and address of the individual(s) that witnessed any other borings, the borings and/or test pits so inspected were made and carried to the depths indicated; that to the best of the special inspector's knowledge and belief, the description and classification of the soils are a true description of the samples recovered from the respective borings and/or test pits; that such samples were recovered at the levels indicated; and that the boring and/or test pit work progressed in such manner that the samples recovered are reasonably representative of the subsurface conditions.

**1704.8 Pile foundations.** A special inspector shall be present when pile foundations are being installed and during tests. The special inspector shall make and submit to the commissioner records of the installation of each pile and results of load tests. Records shall include the cutoff and tip elevation of each pile relative to a permanent reference. A special inspector shall verify that pile installation procedures are in accordance with Section 1808.

**1704.9 Pier foundations.** Special inspection is required for all pier foundations designed in accordance with Section 1808.2.2.‡

**Exception:** Piers for support of lightweight fences, recreational equipment, site furnishings and similar construction, unless special inspection is specifically noted as required on the approved construction documents.

**1704.9.1 Underpinning operations.** Special inspection is required for underpinning operations in accordance with Sections 1704.19 and 1814.

**1704.10 Wall panels, curtain walls and veneers.** Special inspection is required for exterior architectural wall panels and the anchoring of veneers designed for installation on buildings above a height of 40 feet (12 192 mm). Special inspection of masonry veneer on such structures shall be in accordance with Section 1704.5.

**1704.10.1 Special inspection for wall panels, curtain walls and veneers.** The special inspector shall become familiar with and retain a copy of the construction documents, shop drawings, instructions for the sequence of component installation, samples and/or mock-ups, if supplied. The special inspector shall field check the site conditions at the time the structure is prepared for component installation to verify: that the supporting structure is properly aligned and within design tolerances, that required inserts are properly installed, that framing components are properly sized, aligned, and without structural defects or weakness, that anchors are properly placed, welded, bolted and finished as applicable, that weeps, flashings and tubes are in place and properly drained, that joinery and end dams are properly sealed per plans, that sealing materials with sufficient elongation capability are provided, that gaskets meet specifications, that materials are installed to compensate for horizontal and vertical movement in accordance with the design and the manufacturers' guidelines and that any other observations pertinent to safety of performance of the wall system have been performed.

**1704.10.2 Unsafe wall conditions.** The special inspector shall report any immediate hazards to the department.

**1704.11 Sprayed fire-resistant materials.** Special inspections for sprayed fire-resistant materials applied to structural elements and decks shall be in accordance with Sections 1704.11.1 through 1704.11.5. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents.

**1704.11.1 Structural member surface conditions.** The surfaces shall be prepared in accordance with the approved fire-resistance design and the approved manufacturer's written instructions. The prepared surface of structural members to be sprayed shall be inspected before the application of the sprayed fire-resistant material.

**1704.11.2 Application.** The substrate shall have a minimum ambient temperature before and after application as specified in the approved manufacturer's written instructions. The area for application shall be ventilated during and after application as required by the manufacturer's written instructions.

**1704.11.3 Thickness.** The average thickness of the sprayed fire-resistant materials applied to structural elements shall not be less than the thickness required by the approved fire-resistant design. Individual measured thickness, which exceeds the thickness specified in a design by  $\frac{1}{4}$  inch (6.4mm) or more, shall be recorded as the thickness specified in the design plus  $\frac{1}{4}$  inch (6.4 mm). For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus  $\frac{1}{4}$  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 E 605. Samples of the sprayed fire-resistant materials shall be selected in accordance with Sections 1704.11.3.1 and 1704.11.3.2.

**1704.11.3.1 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 E 605, taking the average of not less than four measurements for each 1,000 square feet (93 m<sup>2</sup>) of the sprayed area on each floor or part thereof.

**1704.11.3.2 Structural framing members.** The thickness of the sprayed fire-resistant material applied to structural members shall be determined in accordance with ASTM E 605. Thickness testing shall be performed on not less than 25 percent of the structural members on each floor.

**1704.11.4 Density.** The density of the sprayed fire-resistant material shall not be less than the density specified in the approved fire-resistant design. Density of the sprayed fire-resistant material shall be determined in accordance with ASTM E 605.

**1704.11.5 Bond strength.** The cohesive/adhesive bond strength of the cured sprayed fire-resistant material applied to structural elements shall not be less than 150 pounds per square foot (psf) (7.18 kN/m<sup>2</sup>). The cohesive/adhesive bond strength shall be determined in accordance with the field test specified in ASTM E 736 by testing in-place samples of the sprayed fire-resistant material selected in accordance with Sections 1704.11.5.1 and 1704.11.5.2.

**1704.11.5.1 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 10,000 square feet (929 m<sup>2</sup>) or part thereof of the sprayed area in each story.

**1704.11.5.2 Structural framing members.** The test samples for determining the cohesive/adhesive bond strength of the sprayed fire-resistant materials shall be selected from beams, girders, joists, trusses and columns at the rate of not less than one sample for each type of structural framing member for each 10,000 square feet (929 m<sup>2</sup>) of floor area or part thereof in each story.

**1704.11.6 Inspection of existing sprayed fire-resistant materials during alterations in office spaces and spaces classified in Occupancy Group B.** In office spaces and

spaces classified in Occupancy Group B, where an alteration exposes any required sprayed fire-resistant materials on structural members or where, pursuant to an alteration, persons are required to enter or access areas in which such sprayed fire-resistant materials are capable of being observed, the existing required sprayed fire-resistant materials shall be subject to special inspection. Such inspection shall require a determination, based on visual inspection, (i) that the existing sprayed fire-resistant materials as originally applied or installed comply with the applicable requirements of this code, including those for installation methods, materials, thickness and coverage; and (ii) that, since their original application, the integrity of the existing sprayed fire-resistant materials has not been compromised, damaged or displaced by the current alteration or by any prior alteration or other event.

**1704.12 Exterior insulation and finish systems (EIFS).** Special inspections shall be required for all EIFS applications installed more than 15 feet (4572 mm)‡ above adjacent finished grades.

**1704.12.1** The special inspection shall include verification of: compliance with approved construction documents for attachment to structure, installation of waterproofing membranes, weeps, drains, mold prevention features and conformance with the manufacturers' installation guidelines.

**1704.13 Special cases.** Special inspections shall be required for proposed work that is, in the opinion of the commissioner, 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.

**1704.14 Special inspection for smoke control.** Smoke control systems shall be tested by a special inspector in accordance with Sections 1704.14.1 and 909.

**1704.14.1 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.

**1704.15 Special inspection for mechanical systems.** Mechanical systems regulated by Sections 107 and 507 and Chapters 10, 11 and 12 of the *New York City Mechanical Code* shall be inspected for conformance with the approved construction documents.

**1704.15.1 Tests for mechanical systems.** Tests of mechanical systems shall be performed in accordance with Sections

507.16, 1011, 1108 and 1208 of the *New York City Mechanical Code*.

**Exception:** Listed and labeled self-contained factory-built equipment and appliances deemed to meet the design, manufacture and factory test requirements of this code shall be field tested in accordance with the manufacturers' installation and operational test standards.

**1704.15.2 Special inspection of mechanical systems.** Inspections of mechanical systems shall include the following as applicable to the system:

1. Visual certification that required components of such systems are complete in accordance with the manufacturers' installation guidelines and the approved construction documents;
2. Supports, hangers, seismic bracing, and vibration isolation equipment are properly spaced and anchored to supporting structure;
3. Installation of required signage and safety instructions;
4. Electrical components are installed and electrical sign-off issued;
5. Ventilation balancing report is complete and in accordance with design documents;
6. Required labeling, operational instructions and safety signage properly posted;
7. All related special inspections for such systems are complete;
8. Noise-producing mechanical equipment located within 100 feet (30 480 mm) of habitable room windows shall be tested at the equipment for compliance with the design STC rating of the equipment; and
9. Required fire and smoke dampers are installed and functioning properly.

**Exception:** Systems and equipment exempt from service equipment certificate of compliance in accordance with Section 28-116.4.1 of the *Administrative Code*.

**1704.16 Special inspection for fuel storage and fuel-piping systems.** Fuel-oil storage equipment, including tanks, pumps, valves,‡ transfer, return, fill and vent piping, hangers and bracing, fill and vent terminals, and related systems regulated by Section 1308 of the *New York City Mechanical Code*, shall be inspected for conformance with the approved construction documents and the manufacturers' installation standards. Testing of fuel storage tanks and piping shall be performed in accordance with Section 1308.1 of the *New York City Mechanical Code*.

**Exceptions:**

1. Testing for listed fuel oil storage tanks 660 gallons (2498 L) or less in capacity, supplied with a label or manufacturer's certification attesting that the tank was factory tested to a testing standard indicated in

Section 1308.1 of the *New York City Mechanical Code*

2. Systems and equipment exempt from service equipment certificate of compliance in accordance with Section 28-116.4.1 of the *Administrative Code*.

**1704.17 High-pressure-steam piping.** High-pressure-steam piping regulated by Section 1210 of the *New York City Mechanical Code*, shall be subject to special inspection in accordance with this section.

**1704.17.1 Welding.** The special inspector shall verify the qualifications of the welder and the quality of the welding materials and equipment prior to welding operations. The special inspector shall review the proposed welding procedures for compliance with applicable standards listed in Section 1210.4 of the *New York City Mechanical Code*.

**1704.17.2 Welding operations.** The special inspector shall perform periodic inspection of the pipe joining and welding operations in accordance with the above. Radiographic testing shall be applied to connections as indicated in Section 1210.4.9 of the *New York City Mechanical Code*. Unacceptable connections and installations shall be rejected.

**1704.17.3 Testing of high-pressure-steam piping.** Hydrostatic testing shall be performed on the completed installation of new and altered systems in accordance with Section 1210.4.10 of the *New York City Mechanical Code*.

**Exception:** Testing requirements shall not apply to alteration or repairs to existing high-pressure-steam piping systems in which the integrity of the piping is not affected. Such alterations shall be visually inspected for compliance with the approved construction documents.

**1704.18 High-pressure-gas piping.** High-pressure-gas piping regulated in Section 406 of the *New York City Fuel Gas Code* shall be subject to periodic special inspection in accordance with this section.

**1704.18.1 Welding.** The special inspector shall verify the qualifications of the welder, the quality of the welding materials and equipment prior to welding operations. The special inspector shall review the proposed welding procedures for compliance with applicable standards listed in Section 406 of the *New York City Fuel Gas Code*.

**1704.18.2 Welding operations.** The special inspector shall perform periodic special inspection for the pipe joining and welding operations in accordance with the above. Radiographic testing shall be performed to the connections as indicated in Section 406.4 of the *New York City Fuel Gas Code*.

**1704.18.3 Testing of high-pressure-gas piping.** Pressure testing shall be performed on the completed installation of new and altered systems in accordance with Section 406.4 of the *New York City Fuel Gas Code*.

**1704.19 Structural safety during construction operations.** Construction work consisting of structural alterations, excavation, underpinning, and demolition work that requires “design” as defined in Chapter 33, including earth shoring, underpin-

ning, protection of adjacent structures and buildings, shall be subject to special inspection in accordance with this section. All alterations to existing structures in which loads are transferred from one structural system of structural elements to another, such as installation of columns or girders, replacement of existing bearing walls, the creation of openings or slots in existing walls, girders or floors, alteration of arches, rigid frames, trusses in frame buildings, or where the stability or integrity of a structural system is to be temporarily diminished shall be subject to special inspections in accordance with this section.

**Exception:** Construction operations not requiring “design” as defined in Chapter 33.

**1704.19.1 General.** Prior to commencement of work, the special inspector shall review the contractor’s proposed sequence of operations and determine the areas of work that require design. A written statement shall be prepared, mutually acceptable to the contractor and the special inspector, indicating:

1. The portions of work requiring design as defined in Chapter 33.
2. The names and addresses of the licensed professionals that have been engaged to supply design documents for applicable work.
3. The approximate dates for delivery of design documents.
4. A schedule of periodic special inspections, at agreed intervals, including adequate frequency to assure the contractor’s continued compliance with the proposed designs and sequence of construction operations.

**1704.19.2 Site structural safety design documents.** Design documents, including shop drawings, sketches and written descriptions of proposed work regarding site structural safety in construction operations shall be prepared by a registered design professional in the employ of the owner or the contractor. Such designs may be revised at any time by the registered design professional. Copies of the special inspection log book, the design documents and revisions thereof, shall be maintained at the job site, and at the office of the special inspector, available for use and review at all reasonable times, until the structural work is complete. In the case of alteration to existing structures, the design documents shall be reviewed by the registered design professional of record.

**1704.19.3 Inspection for structural safety in construction operations.** The special inspector shall visit the jobsite at agreed intervals, assess the ongoing work and verify that operations conform with the design documents. Deficiencies shall be reported as required by Section 1704.2. In the event unsafe conditions are discovered, the commissioner and the registered design professional employed by the contractor shall be immediately notified.

**1704.19.4 Records of structural safety inspections in construction operations.** The special inspection logbook

shall be maintained at the special inspector's office and shall contain the following information:

1. Project identification, application number and address.
2. Date and time of each inspection.
3. Names of personnel who performed each inspection.
4. Dates of off-site meetings, names of the participants and a summary of the conversations.
5. Any significant observations or instructions given related to any of the following:
  - 5.1. Deviations from the design documents.
  - 5.2. Anticipated field conditions.
  - 5.3. Proper execution of the work.
  - 5.4. Safe jobsite conditions.
  - 5.5. Precautions taken to maintain safe conditions, if work is stopped for any reason.

**1704.19.5 Special requirements for work in occupied multiple dwellings.** When alteration or construction operations are performed at occupied multiple dwellings, the special inspector shall periodically verify compliance with a tenant protection plan as provided for in Chapter 1 of Title 28 of the *Administrative Code*.

**1704.20 Site storm drainage disposal and detention facilities.** Storm water detention facilities, roof retention facilities and dry-well systems shall be inspected for conformance with the approved construction documents. Minor variations, based on actual site conditions, shall be acceptable at the discretion of the registered design professional of record. Verification shall include:

1. Materials of construction.
2. Bedding of pipe and facilities.
3. Placement and installation of fill materials.
4. Volume of drywell and detention facilities.
5. Installation of volume flow control devices.
6. Workmanship and quality of installation.
7. Overall conformance with the approved construction documents. Hydrostatic testing of the detention system shall be required when the system is designed as watertight.

**1704.20.1 Soil percolation tests.** Soil percolation tests shall be performed at the site of a proposed individual on-site private sewage disposal system installation to determine the suitability of the soil and site. Such test shall be performed under the supervision of a special inspector. The results of the percolation tests shall be filed on forms provided by the department, stating the suitability of the site and the capacity of the subsoil for the proposed use. The registered design professional of record for the dry-well system shall be notified immediately if the results of the percolation test demonstrate that the approved system may not function as designed.

**1704.21 Sprinkler system special inspection.** New and altered sprinkler system shall be inspected in accordance with Section 903. The permit holder responsible for the sprinkler work shall perform all required acceptance tests, complete and sign the appropriate contractor's material and test certifications. The special inspector shall witness all required tests and shall verify that all installations of all materials, fittings, hangers, assemblies and signage are in accordance with the approved construction documents, and that the contractor has transmitted required maintenance literature and instruction to the owner. The special inspector shall verify that the material and test certification forms have been transmitted to the Fire Department and the Department of Buildings‡.

**Exception:** Special inspection of the hydrostatic test shall not be required when such test is witnessed by the department.

**1704.22 Standpipe system special inspection.** New and altered standpipe systems shall be inspected in accordance with Section 905. The permit holder responsible for the standpipe work shall perform all required acceptance tests, and complete and sign the appropriate contractor's material and test certifications. The special inspector shall witness all required tests, verify that installation of all materials, fittings, hangers, assemblies and signage are in accordance with the approved construction documents and that the contractor has transmitted required maintenance literature and instruction to the owner. The special inspector shall verify that the material and test certification forms have been transmitted to the Fire Department and the Department of Buildings‡.

**Exception:** Special inspection of the hydrostatic test shall not be required when such test is witnessed by the department.

**1704.23 Heating systems.** Special inspection shall be required for new and altered boilers and heating systems. All boilers and heating systems, including chimney connectors, shall be inspected for compliance with the approved construction documents. New heating systems shall be tested in accordance with Section 1011 of the *New York City Mechanical Code*. Alterations to heating systems shall be subjected to applicable tests for the altered portions of the system and to verification of its satisfactory operation within the existing system.

**Exception:** Tests and inspections need not duplicate any tests or inspections previously certified by the commissioner or a duly authorized insurance company.

**1704.24 Chimneys.** New and altered chimneys shall be subject to special inspection. The chimney shall be inspected to verify compliance with the approved construction documents, and proper clearance or isolation from adjacent combustible construction. Testing of the chimney shall be performed in accordance with Section 810 of the *New York City Mechanical Code*.

**Exception:** A pressurized smoke test need not be performed on an existing negative pressure chimney if the lining of such chimney is not affected by alterations and the registered design professional specifies on the approved construction documents that such test does not need to be performed on such chimney.

**1704.25 Through-penetration firestop systems, concealed draftstop and fireblock systems.** All through-penetration firestopping, draftstopping and fireblocking shall be subject to periodic special inspection prior to concealment to determine compliance with the approved construction documents. Listed systems shall be inspected for compliance with their listing.

**Exception:** Through-penetration firestop systems may be inspected in accordance with ASTM E 2174-04 when authorized by the registered design professional of record and when the contractor applies the procedures established in that standard.

**1704.26 Aluminum construction.** The special inspections for structural aluminum elements of buildings and structures shall be as required by Section 1704.26.1 †.

**1704.26.1 Welding operations.** All welding operations of aluminum elements shall be subject to special inspection for compliance with this code, AA ASM-35, Parts 1A and 1B of the *Aluminum Design Manual*, and AWS D1.2.

**Exception:** Welding operations in connections where the calculated stresses in the welds are less than 50 percent of the basic allowable values.

**SECTION BC 1708  
RESERVED**

**SECTION BC 1709  
RESERVED**

**SECTION BC 1710  
DESIGN STRENGTHS OF MATERIALS**

**1710.1 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 commissioner shall conform to the specifications and methods of design of accepted engineering practice or the rules of the department in the absence of applicable standards.

**1710.2 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 1711.

**SECTION BC 1711  
ALTERNATIVE TEST PROCEDURE**

**1711.1 General.** In the absence of rules or other approved standards, and upon special application by a registered design professional the commissioner shall make, or cause to be made, the necessary tests and investigations; or the commissioner 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 Article 113 of Chapter 1 of Title 28 of the *Administrative Code*. The cost of all tests and other investigations required under the provisions of this code shall be borne by the permit applicant.

**SECTION BC 1712  
TEST SAFE LOAD**

**1712.1 Where required.** 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 1714. The commissioner 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.

**SECTION BC 1713  
IN-SITU LOAD TESTS**

**1713.1 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 mate-

**SECTION BC 1705  
RESERVED**

**SECTION BC 1706  
RESERVED**

**SECTION BC 1707  
SPECIAL INSPECTIONS FOR SEISMIC  
RESISTANCE**

1707.1 Reserved.

1707.2 Reserved.

1707.3 Reserved.

1707.4 Reserved.

1707.5 Reserved.

1707.6 Reserved.

**1707.7 Mechanical and electrical components.** Periodic special inspection is required during the anchorage of electrical equipment for emergency power systems in structures assigned to Seismic Design Category C or D. Periodic special inspection is required during the installation of piping systems intended to carry flammable, combustible or highly toxic contents and their associated mechanical units in structures assigned to Seismic Design Category C or D. Periodic special inspection is required during the installation of HVAC ductwork that will contain hazardous materials in structures assigned to Seismic Design Category C or D.

**1707.8 Seismic isolation system.** There shall be periodic special inspection during the fabrication and installation of isolator units and energy dissipation devices if used as part of the seismic isolation system.

rial properties and other as-built conditions that affect stability or load-bearing capacity, and shall be conducted in accordance with the applicable design standard. If the structural assessment determines that the load-bearing capacity is less than that required by the code, load tests shall be conducted in accordance with Section 1713.2. 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.

**1713.2 Test standards.** Structural components and assemblies shall be tested in accordance with the appropriate material standards listed in Chapter 35. In the absence of a standard that contains an applicable load test procedure, the test procedure shall be developed by a registered design professional and approved. The test procedure shall simulate loads and conditions of application that the completed structure or portion thereof will be subjected to in normal use.

**1713.3 In-situ load tests.** In-situ load tests shall be conducted in accordance with Section 1713.3.1 or 1713.3.2 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.

**1713.3.1 Load test procedure specified.** Where a standard listed in Chapter 35 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 1713.3.2 shall apply.

**1713.3.2 Load test procedure not specified.** In the absence of applicable load test procedures contained within a standard referenced by this code or acceptance criteria for a specific material or method of construction, such existing structure shall be subjected to a 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-load-resisting system, the test load shall be equal to two times the unfactored design loads. The test load shall be left in place for a period of 24 hours. 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 BC 1714 PRECONSTRUCTION LOAD TESTS

**1714.1 General.** In evaluating the physical properties of materials and methods of construction that are not capable of being

designed by approved engineering analysis or do not comply with applicable material design standards listed in Chapter 35, the structural adequacy shall be predetermined based on the load test criteria established in this section.

**1714.2 Load test procedures specified.** Where specific load test procedures, load factors and acceptance criteria are included in the applicable design standards listed in Chapter 35, 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 1714.3 shall apply.

**1714.3 Load test procedures not specified.** Where load test procedures are not specified in the applicable design standards listed in Chapter 35, 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-load-resisting system, the test shall be as specified in Section 1714.3.1. Load tests shall simulate the applicable loading conditions specified in Chapter 16.

**1714.3.1 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 1714.3.2 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 1714.3.2, 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 lesser of:

1. The load at the deflection limitation given in Section 1714.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

**1714.3.2 Deflection.** The deflection of structural members under the design load shall not exceed the limitations in Section 1604.3.

**1714.4 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.

**1714.5 Exterior window and door assemblies.** The design pressure rating of exterior windows and doors in buildings

shall be determined in accordance with Section 1714.5.1 or 1714.5.2.

**Exception:** Structural wind load design pressures for window units smaller than the size tested in accordance with Section 1714.5.1 or 1714.5.2 shall be permitted to be higher than the design value of the tested unit provided such higher pressures are determined by accepted engineering analysis. All components of the small unit shall be the same as the tested unit. Where such calculated design pressures are used, they shall be validated by an additional test of the window unit having the highest allowable design pressure.

**1714.5.1 Aluminum, vinyl and wood exterior windows and glass doors.** Aluminum, vinyl and wood exterior windows and glass doors shall be labeled as conforming to AAMA/NWWDA 101/I.S.2 or 101/I.S.2/NAFS. The label shall state the name of the manufacturer, the approved labeling agency and the product designation as specified in AAMA/NWWDA 101/I.S.2 or 101/I.S.2/NAFS. Products tested and labeled as conforming to AAMA/NWWDA 101/I.S.2 or 101/I.S.2/NAFS shall not be subject to the requirements of Sections 2403.2 and 2403.3.

**1714.5.2 Exterior windows and door assemblies not provided for in Section 1714.5.1.** Exterior window and door assemblies shall be tested in accordance with ASTM E 330. 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.

**1714.6 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.

## SECTION BC 1715 MATERIAL AND TEST STANDARDS

### 1715.1 Test standards for joist hangers and connectors.

**1715.1.1 Test standards for joist hangers.** The vertical load-bearing capacity, torsional moment capacity and deflection characteristics of joist hangers shall be determined in accordance with ASTM D 1761, using lumber having a specific gravity of 0.49 or greater, but not greater than 0.55, as determined in accordance with AFPA NDS for the joist and hangers.

**1715.1.2 Vertical load capacity for joist hangers.** The vertical load capacity for the joist hanger shall be determined by testing three joist hanger assemblies as specified in ASTM D 1761. If the ultimate vertical load for any one of the tests varies more than 20 percent from the average ultimate vertical load, at least three additional tests shall be conducted. The allowable vertical load for a normal duration of

loading of the joist hanger shall be the lowest value determined from the following:

1. The lowest ultimate vertical load from any test divided by three (where three tests are conducted and each ultimate vertical load does not vary more than 20 percent from the average ultimate vertical load).
2. The average ultimate vertical load for all tests divided by six (where six or more tests are conducted).
3. The vertical load at which the vertical movement of the joist with respect to the header is 0.125 inch (3.2 mm) in any test.
4. The allowable design load for nails or other fasteners utilized to secure the joist hanger to the wood members.
5. The allowable design load for the wood members forming the connection.

### 1715.1.3 Torsional moment capacity for joist hangers.

The torsional moment capacity for the joist hanger shall be determined by testing at least three joist hanger assemblies as specified in ASTM D 1761. The allowable torsional moment for normal duration of loading of the joist hanger shall be the average torsional moment at which the lateral movement of the top or bottom of the joist with respect to the original position of the joist is 0.125 inch (3.2 mm).

### 1715.1.4 Design value modifications for joist hangers.

Allowable design values for joist hangers that are determined by Item 4 or 5 in Section 1715.1.2 shall be permitted to be modified by the appropriate duration of loading factors as specified in AFPA NDS but shall not exceed the direct loads as determined by Item 1, 2 or 3 in Section 1715.1.2. Allowable design values determined by Item 1, 2 or 3 in Sections 1715.1.2 and 2305.1 shall not be modified by duration of loading factors.

### 1715.2 Concrete and clay roof tiles.

**1715.2.1 Overturning resistance.** Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with SBCCI SSTD 11 and Chapter 15.

**1715.2.2 Wind tunnel testing.** When roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI SSTD 11 and Chapter 15.

