# CHAPTER 17

# SPECIAL INSPECTIONS AND TESTS

**User notes:**

***About this chapter:*** *Chapter 17 provides a variety of procedures and criteria for testing materials and assemblies, and labeling materials and assemblies. Its key purposes are to establish where additional inspections/observations and testing must be provided, and the submittals and verifications that must be provided to the building official. This chapter expands on the inspections of Chapter 1 by requiring special inspection by a qualified individual where indicated and, in some cases, structural observation by a registered design professional. Quality assurance measures that verify proper assembly of structural components and the suitability of the installed materials are intended to provide a building that, once constructed, complies with the minimum structural and fire-resistance code requirements as well as the approved design. To determine this compliance often requires frequent inspections and testing at specific stages of construction.*

***Code development reminder:*** *Code change proposals to sections preceded by the designation [BF] will be considered by the IBC—Fire Safety Code Development Committee during the 2018 (Group A) Code Development Cycle. Sections preceded by the designation [F] will be considered by the International Fire Code Development Committee during the 2018 (Group A) Code Development Cycle. All other code change proposals will be considered by the IBC—Structural Code Development Committee during the Group B cycle. See explanation on page iv.*

## 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

**[S] 1703.1 Approved agency.** Whenever tests or certification of any material or fabricated assembly are required by this code, the tests or certification shall be made by an agency approved by the *building official* to conduct the tests or provide the certification. The *building official* is authorized to establish rules and regulations setting forth conditions and provisions for approval of agencies and for the conduct of any agency so approved. An approved agency shall provide all information as necessary for the *building official* to determine that the agency meets the applicable requirements specified in Sections 1703.1.1 through 1703.1.3. The *building official* is authorized to suspend or revoke approval of an agency upon evidence of failure of the agency to properly conduct any test, certify any material, or to perform any inspection in a manner required by this code.

**1703.1.1 Independence.** An *approved agency* shall be objective, competent and independent from the contractor responsible for the work being inspected. The agency shall disclose to the *building official* and the *registered design professional in responsible charge* possible conflicts of interest so that objectivity can be confirmed.

**1703.1.2 Equipment.** An *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 and *special inspections*. Unless otherwise *approved* by the *building official*, all *special inspectors* shall be registered with the Washington Association of Building Officials. A registered civil or structural engineer or registered architect is permitted to serve as a *special inspector* when approved by the *building official.*

**1703.1.4 Approval of tests and inspections.** *Special inspectors* and inspection and testing agencies shall not conduct any inspections or tests until the *building official* has authorized the inspection or test in writing. The *special inspectors* or inspection/testing agency approved by the *building official* shall not be changed without obtaining prior approval of the *registered design professional in responsible charge* or the owner, and the *building official.*

((~~**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.

**[S] 1703.4.1 Research and investigation.** ((~~Sufficient~~)) If *approved* by the *building official*, 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.

**[S] 1703.7 Preconstruction conference.** For projects requiring *special inspection*, the owner or the owner's agent shall arrange a conference with the project contractor, the design team, the *special inspection* agency and the *building official* prior to commencing work on any portion of construction requiring *special inspection*. The purpose of the conference is to identify and clarify the *special inspection* requirements of the project.

**[S] 1703.8 Revocation of registration or approval to inspect.** The *building official* is authorized to revoke, suspend or refuse to renew registration or approval of inspection agencies, *special inspectors* and nonregistered *special inspectors*, including inspectors registered by the Washington Association of Building Officials. This may be done upon evidence submitted to the *building official* of incompetence, of willful or negligent failure to observe or report violations of the *Seattle Building Code* or of any other failure to perform properly and effectively the duties required by this code or other duties assumed by an inspection agency or nonregistered *special inspector*. The inspection agency or *special inspector* shall be notified in writing of the *building official*'s decision to revoke, suspend or refuse to renew registration or approval. The notice shall be served in the manner set forth in RCW 4.28.080 for service of a summons or sent by first class mail. For purposes of this section, service is complete at the time of personal service, or if mailed, three days after the date of mailing. When the last day of the period so computed is a Saturday, Sunday or City holiday, the period runs until 5 p.m. on the next business day.

**1703.8.1 Review by the building official for revocation of registration.** Any *person* aggrieved by a notice of revocation issued pursuant to Section 1703.8 may obtain a review of the notice by making a request in writing to the *building official* within three business days of the date of service of the notice of revocation.

**1703.8.1.1 Review procedure.** The review shall occur within five business days after receipt by the *building official* of the request for review unless otherwise agreed by the *person* requesting the review. Any *person* aggrieved by or interested in the notice of revocation may submit additional information to the *building official* for consideration as part of the review at any time prior to the review. The review will be made by a representative of the *building official* who will review all additional information received and may also request a site visit.

**1703.8.1.2 Decision.** After the review, the *building official* shall:

1. Sustain the notice of revocation and set or modify the date the revocation will take effect;
2. Withdraw the notice of revocation;
3. Continue the review to a date certain; or
4. Modify the notice of revocation and set or modify the date the revocation will take effect.

**1703.8.1.3 Order.** The *building official* shall issue an order containing the decision within ten days after the review is completed and shall cause the order to be sent by regular first class mail to the *persons* requesting the review, any other *person* on whom the notice of revocation was served and any other *person* who requested a copy before issuance of the order of the *building official*. The order of the *building official* is the final order of the City and all parties are bound by the final order.

## 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.

**[S] 1704.2 Special inspections and tests.** Where application is made to the *building official* for construction as specified in Section ((~~105~~)) 106, the owner or the owner's authorized agent, other than the contractor, shall employ one or more *approved agencies* to provide *special inspections* and tests during construction on the types of work specified in Section 1705 and identify the *approved agencies* to the *building official*. The *building official* may require additional *special inspectors* if the *building official* determines they are needed due to the magnitude or complexity of the job. These *special inspections* and tests are in addition to the inspections by the *building official* that are identified in Section ((~~110~~)) 108.

**Exceptions:**

1. *Special inspections* and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as *approved* by the *building official.*
2. Unless otherwise required by the *building official*, *special inspections* and tests are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.
3. *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.
4. The contractor is permitted to employ the *approved agencies* where the contractor is also the owner.

**[S] 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. Unless otherwise *approved* by the *building official*, all *special inspectors* shall be registered with the Washington Association of Building Officials. 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 the *approved agency* and their personnel are permitted to act as special inspectors for the work designed by them, provided they qualify as special inspectors.

**1704.2.1.1 Registration of special inspectors.**

**1704.2.1.1.1 Application for registration.** Criteria for registration of *special inspectors* shall be established by the *building official* by rule.

**1704.2.1.1.2 Issuance of certificate of registration.** If the *building official* is satisfied that the applicant is qualified, a Certificate of Registration or a Limited Certificate of Registration shall be issued that specifies the types of inspection the applicant has been authorized to perform. Valid registration from the Washington Association of Building Officials is permitted to substitute for registration by the *building official.*

**1704.2.1.1.3 Renewal of special inspector's registration.** A Certificate of Registration or Limited Certificate of Registration is valid for the period of time to be determined by the *building official* by rule. Upon application for renewal of a Certificate of Registration, the *building official* is permitted to re-examine the applicant to ascertain his/her fitness to perform the inspection of the type or types for which the application was made.

**1704.2.1.1.4 Revocation.** *Special inspectors'* certifications are subject to revocation according to Section 1703.8.

**[S] 1704.2.2 Access for special inspection.** ((~~The~~)) It is the duty of the *person* requesting *special inspections* to provide that construction or work for which *special inspection* or testing is required ((~~shall remain~~)) is 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 applicant shall submit a statement of *special inspections* ((~~in accordance with Section 107.1~~)) as a condition for permit issuance. This statement shall be in accordance with Section 1704.3.

**Exception:** A statement of *special inspections* is 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.

**((~~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.*~~))

**[S] 1704.2.4 Responsibilities.**

**1704.2.4.1 Responsibilities of special inspector.** The *special inspector* is responsible for conducting all *special inspections* for which the *special inspector* was employed and notified and for carrying out the duties of a *special inspector* as specified in Section 1704.

**1704.2.4.1.1 Specific duties.** Registered *special inspectors* are regularly authorized deputies of the *building official* and are subject to all duties imposed by the *building official*, in addition to the following:

1. The registered *special inspector* shall be present during the execution of all assigned work. The registered *special inspector* shall report to the job sufficiently in advance of construction to become familiar with the plans and to inspect all materials to be used or concealed within the work. The *special inspector* shall inspect the construction, erection, placing, or other use of materials; and shall observe whether there is compliance with the *approved* design as to all of the foregoing. During the execution of all assigned work, the registered *special inspector* shall not undertake or engage in any other task or occupation that interferes with the proper performance of the inspection duties.
2. The registered *special inspector* shall not approve the placing of foundation concrete or pile caps prior to the approval of the soil condition or pile driving reports by the engineer who performed the *special inspection* for the pile installation.
3. The registered *special inspector* shall be employed only by an *approved* inspection or testing agency.
4. The registered *special inspector* shall not inspect work performed, or material supplied, by any contractor, subcontractor or material vendor with whom the inspector is employed.
5. If any registered *special inspector* is negligent in the performance of the inspector's duties, the *building official* is permitted to stop the work.

**1704.2.4.1.2 Daily reports.** The registered *special inspector* shall immediately report all irregularities, substitution of materials and violations to the contractor for correction, then if uncorrected, to the *registered design professional in responsible charge* and to the *building official.* At the conclusion of each inspection, the registered *special inspector* shall submit a report to the *registered design professional in responsible charge* and owner relative to the portion of the work inspected, stating whether the work requiring *special inspection* was, to the best of the *special inspector's* knowledge, in conformance with the *approved* plans and specifications and the applicable workmanship provisions of this code and related standards. The report shall be signed by the registered *special inspector.* One copy of the report shall be submitted to the *building official* by the *approved* inspection or testing agency no later than one week from the date of the inspection and shall be filed in the records of the agency's office. One copy of the report shall be left at the job

site by the *special inspector*. The *special inspector* shall also provide, as directed by the *building official* or by the *registered design professional in responsible charge* or owner, such other information as is required during the *special inspector's* assigned employment.

**1704.2.4.1.3 Final report.** The inspection or testing agency shall submit a final signed report listing the scope of required inspection and stating whether all work requiring *special inspection* was, to the best of the agency's knowledge, inspected and reported as specified on *construction documents*.

**1704.2.4.2 Responsibility of owner.** The owner or an authorized agent is responsible for notifying the *special inspector* when construction activity is scheduled that requires *special inspection*. If the owner designates another *person* to notify the *special inspector*, the owner retains the responsibility to assure that the *special inspections* are conducted and required reports submitted to the *building official*. The *approved* testing agency shall notify the *building official* and the *registered design professional in responsible charge* or owner of the commencement of inspection of a job and shall specify the type of inspection for which the special inspector has been engaged. This notification shall be made prior to commencement of inspection. The *approved* testing agency shall notify the *building official* prior to commencement of each day's inspection thereafter. The *building official* is permitted to require that every request for *special inspection* be filed at least one working day before the *special inspection* is desired. The request shall be made in writing or by telephone at the option of the *building official.*

**1704.2.4.3 Posting special inspection record.** The *building official* is permitted to require that work requiring *special inspection* not be commenced until the permit holder or the permit holder's agent posts an inspection log in a conspicuous place on the premises. The record shall be posted in a position which allows the *special inspector* to conveniently enter his/her identification, the date, and type of inspection performed. This record shall be maintained there by the permit holder until final approval has been granted by the *building official.*

**[S] 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. *Special inspection*s are not required for steel members and assemblies produced by fabricators that are registered in the Washington Association of Building Officials (WABO) Steel Fabricator Registration Program.

**Note:** The City of Seattle does not register fabricators for products that are within the scope of the WABO registration program.

**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 according to the provisions of this chapter 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*.~~))

**1704.2.5.1.1 Application for registration.** Application for registration as an *approved* fabricator shall be made to the *building official* by plants engaged in the manufacture of:

1. Prestressed or precast concrete structural products, and premixed concrete.
2. Unit masonry products.
3. Engineered wood products.
4. Prefabricated or assembly-line-produced metal products.
5. Other prefabricated products as the *building official* designates.

**1704.2.5.1.2 Requirements for registration.** The *building official* is authorized to examine manufacturing plants that submit applications for registration and shall issue certificates of registration if the plants have complied with the following requirements:

1. Develop and submit a detailed fabrication procedural manual reflecting key quality control procedures that will provide a basis for inspection control of the fabricating process.
2. Have the fabricator's quality control capabilities, operation of equipment and personnel as outlined in the fabrication procedural manual verified by an *approved* inspection or quality control agency.
3. Agree to have periodic plant inspections conducted by an approved inspection or quality control agency to monitor the effectiveness of the quality control program and to allow unannounced audits of the plant by the *building official.*

4. Agree to require the inspection or quality control agency to notify the *building official* in writing of any changes to the procedural manual.
5. Agree to submit a Certificate of Compliance, if required by the *building official*, that work was performed in accordance with the *approved* plans and specifications to the *building official* and to the *registered design professional in responsible charge*.
6. Pay a registration fee determined by the *building official* in accordance with provisions of the *Fee Subtitle*.

**1704.2.5.1.3 Review by the building official for denial of registration of fabricators.** The fabricator may request in writing a review before the *building official* to reconsider the decision to deny registration. The request shall be filed in writing with the *building official*.

**1704.2.5.1.3.1 Review procedure.** The review shall occur no later than 15 working days from receipt of the written request unless otherwise agreed by the *person* requesting the review. Any *person* affected by the decision to deny registration may submit additional information to the *building official* for consideration as part of the review at any time prior to the review. The review will be made by a representative of the *building official* who will review all additional information received. The reviewer may request clarification of the information and a site visit.

**1704.2.5.1.3.2 Decision.** After the review, the *building official* shall:

1. Sustain the denial of registration;
2. Withdraw the denial of registration;
3. Modify the decision to deny registration; or
4. Continue the review to a date certain.

**1704.2.5.1.3.3 Order.** The *building official* shall issue an order within ten days after the review is completed and shall send it by regular first class mail to the *person* or *persons* requesting the review and any other *person* who requested a copy.

**1704.2.5.1.4 Renewal of registration.** Registration of *approved* fabricators is valid for one year from the date of issuance and is subject to renewal annually. Registration may be renewed upon application, contingent on compliance with quality control procedures during the past year and payment of a fee in accordance with provisions of the *Fee Subtitle*. The *building official* is authorized to revoke registration for cause.

**1704.2.5.1.5 Fees.** Fees for examination and registration of *special inspectors* are determined by the *building official* in accordance with the *Fee Subtitle*.

**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*.

**[S] 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*, if required by the *building official*.
3. The type and extent of each test, if required by the *building official*.
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.11, 1705.12 and 1705.13.
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 1705.12 or 1705.13 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 1705.11 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*.

**[S] ((~~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 1705.13.2.
3. *Certificates of compliance* for *designated seismic systems* in accordance with Section 1705.13.3.
4. Reports of preconstruction tests for shotcrete in accordance with Section 1908.5.
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.

**[S] 1704.6 Structural observations.** Where required by the provisions of Section 1704.6.1, 1704.6.2 or 1704.6.3, the owner or the owner's authorized agent shall employ a *registered design professional* to perform structural observations. Structural observation does not include or waive the responsibility for the inspections in Section ((~~110~~)) 108 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 IV*.
2. The structure is a *high-rise building.*
3. Such observation is required by the *registered design professional* responsible for the structural design.
4. The structure includes five *stories* of wood-frame construction.

((~~4~~)) 5. Such observation is specifically required by the *building official.*

**1704.6.2 Structural observations for seismic resistance.** Structural observations shall be provided for those structures assigned to *Seismic Design Category* D, E or F where one or more of the following conditions exist:

1. The structure is classified as *Risk Category* III or IV.
2. The structure is assigned to *Seismic Design Category* E, is classified as *Risk Category* I or II, and is greater than two *stories above* the *grade plane*.

**1704.6.3 Structural observations for wind resistance.** Structural observations shall be provided for those structures sited where *V* is 130 mph (58 m/sec) or greater and the structure is classified as *Risk Category* III or IV.

## 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.

**[S] 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 1705.12, Special inspections for seismic resistance.

**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.

**Exception:** *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.

**[S] 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 | 1908.4 |
| 2. Reinforcing bar welding:<br>a. Verify weldability of reinforcing bars other than ASTM A706;<br>b. Inspect single-pass fillet welds, maximum 5/16″; and<br>c. Inspect all other welds. | —<br><br><br>X | X<br><br>X | AWS D1.4<br>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]<br>a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.<br>b. Mechanical anchors and adhesive anchors not defined in 4.a. | X | <br><br><br>X | ACI 318: 17.8.2.4<br><br>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, 1908.2, 1908.3 |
| 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 C172<br>ASTM C31<br>ACI 318: 26.5, 26.12 | 1908.10 |
| 7. Inspect concrete and shotcrete placement for proper application techniques. | X | — | ACI 318: 26.5 | 1908.6, 1908.7, 1908.8 |
| 8. Verify maintenance of specified curing temperature and techniques. | — | X | ACI 318: 26.5.3-26.5.5 | 1908.9 |
| 9. Inspect prestressed concrete for:<br>a. Application of prestressing forces; and<br>b. Grouting of bonded prestressing tendons. | X<br>X | —<br>— | ACI 318: 26.10 | — |
| 10. Inspect erection of precast concrete members. | — | X | ACI 318: 26.9 | — |
| 11. 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 | — |
| 12. Inspect formwork for general conformity to approved plans for size and shape, ((~~location and dimensions~~)) of the concrete member being formed. | — | X | ACI 318: 26.11.1.2(b) | — |

For SI: 1 inch = 25.4 mm.

a. Where applicable, see Section 1705.12, Special inspections for seismic resistance.

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.

**[S] 1705.3.3 Inspection during concrete mixing.** *Special inspections* are required during mixing of concrete under one of the following circumstances:

1. Concrete mixes prepared in a batch plant that is not certified by The City of Seattle;
2. All structural lightweight concrete mixes;
3. Concrete mixes with $f'_c$ greater than 6000 psi (41.4 Mpa);
4. Concrete mixes containing alternative materials addressed in Section 1705.3.2; or
5. Other unusual circumstances as determined by the *building official.*

**Exception:** Inspection during the mixing of concrete is not required if the proportions of ingredients are established in accordance with Table 1905.1.10 or if a mix has been granted continuous approval by the *building official.*

**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, 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 Empirically designed masonry, glass unit masonry and masonry veneer in Risk Category IV.** *Special inspections* and tests for empirically designed masonry, glass unit masonry or masonry veneer designed in accordance with Section 2109, 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.*

**[S] 1705.5.2 Metal-plate-connected wood trusses. ((~~spanning 60 feet or greater.~~))** Special inspections of wood trusses with overall heights of 60 inches (1524 mm) or greater shall be performed to verify that the installation of the permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package. ((~~Where a truss~~)) For wood trusses with a clear span ((~~is~~)) of 60 feet (18 288 mm) or greater, the special inspector shall verify during construction that the temporary installation restraint/bracing ((~~and the permanent individual truss member restraint/bracing are~~)) is installed in accordance with the approved truss submittal package.

**[W] 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.

**[W] 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 and sequence of mass timber construction. | | X |
| 3. Inspection of connections where installation methods are required to meet design loads. | | |
| 3.1. Threaded fasteners. | | |
| 3.1.1. Verify use of proper installation equipment. | | X |
| 3.1.2. Verify use of predrilled holes where required. | | X |
| 3.1.3. Inspect screws, including diameter, length, head type, spacing, installation angle, and depth. | | X |

**[W] TABLE 1705.5.3**
**REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION**

| TYPE | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION |
|---|---|---|
| 3.2. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads. | X | |
| 3.3. Adhesive anchors not defined in 3.2. | | X |
| 3.4. Bolted connections. | | X |
| 3.5. Concealed connection. | | 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. During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the *approved* geotechnical report.

**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. Verify use of proper materials, 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. | — | — |
| 6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3. | — | — |
| 7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge. | — | — |

**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. | — | — |

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

**1705.11 Special inspections for wind resistance.** *Special inspections* for wind resistance specified in Sections 1705.11.1 through 1705.11.3, 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 $V_{asd}$ as determined in accordance with Section 1609.3.1 is 120 miles per hour (52.8 m/sec) or greater.
2. In wind Exposure Category C or D, where $V_{asd}$ as determined in accordance with Section 1609.3.1 is 110 mph (49 m/sec) or greater.

**[W] 1705.11.1 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 ((~~specified~~)) lateral resistance is provided by sheathing of wood structural panels, and the fastener spacing ((~~at panel edges~~)) of the sheathing is more than 4 inches (102 mm) on center.

**1705.11.2 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 fastener spacing of the sheathing is more than 4 inches (102 mm) on center (o.c.).

**1705.11.3 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.

**1705.12 Special inspections for seismic resistance.** *Special inspections* for seismic resistance shall be required as specified in Sections 1705.12.1 through 1705.12.9, unless exempted by the exceptions of Section 1704.2.

**Exception:** The *special inspections* specified in Sections 1705.12.1 through 1705.12.9 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.

**1705.12.1 Structural steel.** *Special inspections* for seismic resistance shall be in accordance with Section 1705.12.1.1 or 1705.12.1.2, as applicable.

**1705.12.1.1 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.

**1705.12.1.2 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 1705.12.1.1, 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.

**[W][S] 1705.12.2 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.

**Exceptions:**

1. *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 other than adhesive-grouted anchor bolts, where the lateral resistance is provided by sheathing of wood structural panels, and the fastener spacing of the sheathing is more than 4 inches (102 mm) on center.
2. *Special inspection* is not required for Group R-3 structures for other than structural insulated panels used as shear walls.
3. *Special inspection* is not required in Group R-1 and R-2 structures three *stories* and less in height for other than structural insulated panels used as shear walls.
4. *Special inspection* is not required for adhesive-grouted anchor bolts in Group R-1 and R-2 buildings if wood shear-wall fastener spacing is 4 inches (102 mm) or more on center (o.c.) and hold down capacities are less than 5,000 pounds (22.2 kN).

**1705.12.3 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 fastener spacing of the sheathing is more than 4 inches (102 mm) on center.

**1705.12.4 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*.

**1705.12.5 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 (24.5 $N/m^2$) or less.
3. Interior nonbearing walls weighing 15 psf (73.5 $N/m^2$) or less.

**1705.12.5.1 Access floors.** Periodic *special inspection* is required for the anchorage of access floors in structures assigned to *Seismic Design Category* D, E or F.

**[W] 1705.12.6 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 fire sprinkler systems are installed in *Risk Category IV* 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 be provided between fire protection 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.

**1705.12.7 Storage racks.** *Periodic special inspection* is required for the anchorage of storage racks that are 8 feet (2438 mm) or greater in height in structures assigned to *Seismic Design Category* D, E or F.

**1705.12.8 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.

**1705.12.9 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.

**1705.13 Testing for seismic resistance.** Testing for seismic resistance shall be required as specified in Sections 1705.13.1 through 1705.13.4, unless exempted from *special inspections* by the exceptions of Section 1704.2.

**1705.13.1 Structural steel.** Nondestructive testing 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.** 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.

**1705.13.1.2 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 1705.13.1.1, 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, 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.

**1705.13.2 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.

**1705.13.3 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.

**1705.13.4 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] 1705.14 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 1705.14.1 through 1705.14.6. *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 after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems and suspension systems for ceilings, where applicable.

**[BF] 1705.14.1 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] 1705.14.2 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.

**[S][BF] 1705.14.3 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] 1705.14.4 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 1705.14.4.1.

**[BF] 1705.14.4.1 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 1705.14.4.2 and 1705.14.4.3.

**[BF] 1705.14.4.2 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] 1705.14.4.3 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] 1705.14.4.4 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] 1705.14.4.5 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] 1705.14.4.6 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] 1705.14.4.7 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] 1705.14.4.8 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] 1705.14.4.9 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] 1705.14.5 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] 1705.14.6 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 1705.14.6.1 through 1705.14.6.3.

**[BF] 1705.14.6.1 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] 1705.14.6.2 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] 1705.14.6.3 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] 1705.15 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*.

**[S] ((~~1705.16 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.~~

~~**1705.16.1 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.~~))

**[W] 1705.16 Sealing of mass timber.** Periodic special inspections of sealants or adhesives shall be conducted where sealant or adhesive required by Section 703.9 is applied to mass timber building elements as designated in the approved construction documents.

**[BF] 1705.17 Fire-resistant penetrations and joints.** In *high-rise buildings* or in buildings assigned to *Risk Category* III or IV, *special inspections* for *through-penetrations*, membrane penetration firestops, *fire-resistant joint systems* and perimeter fire barrier systems that are tested and *listed* in accordance with Sections 714.4.1.2, 714.5.1.2, 715.3 and 715.4 shall be in accordance with Section 1705.17.1 or 1705.17.2.

**[BF] 1705.17.1 Penetration firestops.** Inspections of penetration firestop systems that are tested and *listed* in accordance with Sections 714.4.1.2 and 714.5.1.2 shall be conducted by an *approved agency* in accordance with ASTM E2174.

**[BF] 1705.17.2 Fire-resistant joint systems.** Inspection of fire-resistant joint systems that are tested and *listed* in accordance with Sections 715.3 and 715.4 shall be conducted by an *approved agency* in accordance with ASTM E2393.

**[S][F] 1705.18 Testing for smoke control.** Smoke control systems shall be inspected and tested ((~~by a special inspector~~)) according to standards specified by the *building official*.

**((~~[F] 1705.18.1 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] 1705.18.2 Qualifications.** *Approved agencies* for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.~~))

## 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

**[S] 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 ((~~104.11~~)) 104.4

or 104.5. 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 lesser 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.

**[W] 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 Sections 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.

**Exceptions:**

1. Structural wind load design pressures for window units smaller than the size tested in accordance with Section 1709.5.1 or 1709.5.2 shall be permitted to be higher than the design value of the tested unit provided such higher pressures are determined by accepted engineering analysis. 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.
2. Custom exterior windows and doors manufactured by *small business* are exempt from all testing requirements in Section 1709 if they meet the applicable provisions of Chapter 24.

**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. Structural performance of garage doors and rolling doors shall be determined in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108. 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.

**1709.6 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*.