

CHAPTER 17

SPECIAL INSPECTIONS AND TESTS

SECTION 1701 GENERAL

1701.1 Scope. The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

1701.2 New materials. 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.

1701.3 Used materials. The use of second-hand materials that meet the minimum requirements of this code for new materials shall be permitted.

SECTION 1702 DEFINITIONS

1702.1 Definitions. The following terms are defined in Chapter 2:

APPROVED AGENCY.

APPROVED FABRICATOR.

CERTIFICATE OF COMPLIANCE.

DESIGNATED SEISMIC SYSTEM.

FABRICATED ITEM.

INSPECTION CERTIFICATE.

INTUMESCENT FIRE-RESISTANT COATINGS.

MAIN WINDFORCE-RESISTING SYSTEM.

MASTIC FIRE-RESISTANT COATINGS.

SPECIAL INSPECTION.

Continuous special inspection.

Periodic special inspection.

SPECIAL INSPECTOR.

SPRAYED FIRE-RESISTANT MATERIALS.

STRUCTURAL OBSERVATION.

SECTION 1703 APPROVALS

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. 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 also disclose 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/or 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 Approved record. 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 open to public inspection at appropriate times.))~~

1703.4 Performance. Specific information consisting of test reports conducted by an approved testing 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 material meets the applicable code requirements.

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 material or assembly. If it is determined

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that the evidence submitted is satisfactory proof of performance for the use intended, the *building official* shall approve the use of the material or assembly subject to the requirements of this code. The costs, reports and investigations required under these provisions shall be paid by the applicant.

1703.4.2 Research reports. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

1703.5 Labeling. Where materials or assemblies are required by this code to be *labeled*, such materials and assemblies shall be *labeled* by an *approved agency* in accordance with Section 1703. Products and materials 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 or material 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 or material is representative of the product or material tested.

1703.5.3 Label information. The *label* shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or material's performance characteristics and *approved agency's* identification.

1703.5.4 Method of labeling. Information required to be permanently identified on the product 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 applicant 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 applicant 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 inspection records shall be filed with the *building official*.

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.

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 10 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 revoca-

tion 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, CONTRACTOR RESPONSIBILITY AND STRUCTURAL OBSERVATIONS

1704.1 General. This section provides minimum requirements for special inspections, the statement of special inspections, contractor responsibility and structural observations.

1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the *registered design professional in responsible charge* acting as the owner's agent shall employ one or more *approved agencies* to perform inspections during construction on the types of work listed under Section 1705. 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 inspections are in addition to the inspections identified in Section 110.

Exceptions:

1. *Special inspections* 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* 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 are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.7 or the conventional light-frame construction provisions of Section 2308.

1704.2.1 Special inspector qualifications. The special inspector shall provide written documentation to the *building official* demonstrating his or her competence and relevant experience or training. Experience or training shall be considered relevant when the documented experience or training is related in complexity to the same type of *special inspection* 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 the special inspector 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.

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 is required is ~~((shall remain))~~ accessible and exposed for special inspection purposes until completion of the required special inspections.

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 2211.7 or the conventional light-frame construction provisions of Section 2308.

~~((1704.2.4 Report requirement. Special inspectors shall keep records of inspections. The special inspector shall furnish inspection reports to the *building official*, and to the *registered design professional in responsible charge*. Reports shall indicate that work inspected 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 correction of any discrepancies noted in the inspections shall be submitted at a~~

point in time agreed upon prior to the start of work by the applicant and the *building official*.)

1704.2.4 Responsibilities.

1704.2.4.1 Responsibilities of special inspectors 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 his/her 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 his/her 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*.

1704.2.5 Inspection of fabricators. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, *special inspection* of the fabricated items shall be required by this section and as required elsewhere in this code.

1704.2.5.1 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 1704.2.5 shall not be required where the fabricator is *approved* in accordance with Section 1704.2.5.2.

1704.2.5.2 Fabricator approval. *Special inspections* required by Section 1705 are not required where the work is done on the premises of a fabricator registered and *approved according to the provisions of this chapter* to perform such work without *special inspection*. (~~Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.~~)

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1704.2.5.2.1 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.

1704.2.5.2.2 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.

1704.2.5.2.3 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.*

1704.2.5.2.3.1 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.*

1704.2.5.2.3.2 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.

1704.2.5.2.3.3 Order. *The building official shall issue an order within 10 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.*

1704.2.5.2.4 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*

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building official is authorized to revoke registration for cause.

1704.2.5.2.5 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 inspection* or testing is required by Section 1705, the *registered design professional in responsible charge* shall prepare a statement of special inspections in accordance with Section 1704.3.1 for submittal by the applicant in accordance with Section 1704.2.3.

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

1704.3.1 Content of statement of special inspections. The statement of special inspections shall identify the following:

1. The materials, systems, components and work required to have *special inspection* or testing by the building official or by the *registered design professional* responsible for each portion of the work.
2. The type and extent of each *special inspection*.
3. The type and extent of each test.
4. Additional requirements for *special inspection* or testing for seismic or wind resistance as specified in Sections 1705.10, 1705.11 and 1705.12.
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection* or periodic *special inspection*.

1704.3.2 Seismic requirements in the statement of special inspections. Where Section 1705.11 or 1705.12 specifies special inspection, testing or qualification for seismic resistance, the statement of special inspections shall identify the designated seismic systems and seismic force-resisting systems that are subject to *special inspection*.

1704.3.3 Wind requirements in the statement of special inspections. Where Section 1705.10 specifies special inspection for wind requirements, the statement of special inspections shall identify the main windforce-resisting systems and wind-resisting components subject to *special inspection*.

~~(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-resisting component listed in the statement of special inspections shall submit a written statement of responsibility to the building official and the owner 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 inspection*.)~~

1704.5 Structural observations. Where required by the provisions of Section 1704.5.1 or 1704.5.2, the owner shall employ a *registered design professional* to perform structural observations as defined in Section 202.

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 which, to the best of the structural observer's knowledge, have not been resolved.

1704.5.1 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 in accordance with Table 1604.5.
2. The height of the structure is greater than 75 feet (22 860 mm) above the base.
3. The structure is assigned to *Seismic Design Category* E, is classified as *Risk Category* I or II in accordance with Table 1604.5, and is greater than two stories above grade plane.
4. When so designated by the *registered design professional* responsible for the structural design.
5. The structure includes five stories of wood-frame construction.
6. When such observation is specifically required by the building official.

1704.5.2 Structural observations for wind requirements. Structural observations shall be provided for those structures sited where V_{asd} as determined in accordance with Section 1609.3.1 exceeds 110 mph (49 m/sec), where one or more of the following conditions exist:

1. The structure is classified as *Risk Category* III or IV in accordance with Table 1604.5.
2. The *building height* of the structure is greater than 75 feet (22 860 mm).
3. When so designated by the *registered design professional* responsible for the structural design.
4. When such observation is specifically required by the building official.

SECTION 1705 REQUIRED VERIFICATION AND INSPECTION

1705.1 General. Verification and inspection of elements of buildings and structures shall be as required by this section.

1705.1.1 Special cases. *Special inspections* 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.

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1705.2 Steel construction. The *special inspections* for steel elements of buildings and structures shall be as required in this section.

Exception: *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, 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 when required by the approved construction documents-)~~

1705.2.1 Structural steel. Special inspection for structural steel shall be in accordance with the quality assurance inspection requirements of AISC 360.

1705.2.2 Steel construction other than structural steel. Special inspection for steel construction other than structural steel shall be in accordance with Table 1705.2.2 and this section.

1705.2.2.1 Welding. Welding inspection and welding inspector qualification shall be in accordance with this section.

1705.2.2.1.1 Cold-formed steel. Welding inspection and welding inspector qualification for cold-formed steel floor and roof decks shall be in accordance with AWS D1.3.

1705.2.2.1.2 Reinforcing steel. Welding inspection and welding inspector qualification for reinforcing steel shall be in accordance with AWS D1.4 and ACI 318.

1705.2.2.2 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.

**TABLE 1705.2.2
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD ^a
1. Material verification of cold-formed steel deck:			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	—	X	Applicable ASTM material standards
b. Manufacturer's certified test reports.	—	X	
2. Inspection of welding:			
a. Cold-formed steel deck:			
1) 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: Section 3.5.2
2) Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.	X	—	
3) Shear reinforcement.	X	—	
4) Other reinforcing steel.	—	X	
<u>c. Cold-formed steel framing.</u>	—	<u>X</u>	<u>AWS D1.3</u>
<u>d. Seismic force resisting systems.</u>	—	<u>X</u>	<u>AWS D1.8</u>

For SI: 1 inch = 25.4 mm.

a. Where applicable, see also Section 1705.11, Special inspections for seismic resistance.

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1705.3 Concrete construction. The *special inspections* and verifications for concrete construction shall be as required by this section and Table 1705.3.

Exception: *Special inspections* 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; or

2.3. The structural design of the footing is based on a specified compressive strength, f'_c , no greater than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the compressive strength specified in the *construction documents* or used in the footing construction.

3. Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 MPa).
4. Concrete foundation walls constructed in accordance with Table 1807.1.6.2.
5. Concrete patios, driveways and sidewalks, on grade.

**TABLE 1705.3
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD ^a	IBC REFERENCE
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	—	X	ACI 318: 3.5, 7.1-7.7	1910.4
2. Inspection of reinforcing steel welding in accordance with Table 1705.2.2, Item 2b.	—	—	AWS D1.4 ACI 318: 3.5.2	—
3. Inspection of anchors cast in concrete (where allowable loads have been increased or where strength design is used).	—	X	ACI 318: <u>D.9.2</u> ((8.1.3, 21.1.8))	((1908.5.7)) 1909.1
4. Inspection of anchors post-installed in hardened concrete members ^b .	((—))	((X))	((ACI 318: 3.8.6, 8.1.3, 21.1.8))	1909.1
<u>a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.</u>	X	=	<u>ACI 318: D.9.2.4</u>	
<u>b. Mechanical anchors and adhesive anchors not defined in 4a.</u>	=	X	<u>ACI 318: D.9.2</u>	
5. Verifying use of required design mix.	—	X	ACI 318: Ch. 4, 5.2-5.4	1904.2, 1910.2, 1910.3
6. 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	1910.10
7. Inspection of concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 5.9, 5.10	1910.6, 1910.7, 1910.8
8. Inspection for maintenance of specified curing temperature and techniques.	—	X	ACI 318: 5.11-5.13	1910.9
9. Inspection of prestressed concrete: <ol style="list-style-type: none"> 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	—
10. Erection of precast concrete members.	—	X	ACI 318: Ch. 16	—
11. 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	—
12. Inspect formwork for <u>general conformity to approved plans for size and shape</u> ((location and dimensions)) of the concrete member being formed.	—	X	ACI 318: 6.1.1	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see also Section 1705.11, 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 D.9.2 in ACI (355.2) 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 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 *building official* 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 3.5.2 of ACI 318.

1705.3.2 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 6,000 psi (41.4 Mpa);
4. Concrete mixes containing alternative materials addressed in Section 1705.3.1; 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 1905.1.11 or if a mix has been granted continuous approval by the *building official*.

1705.4 Masonry construction. Masonry construction shall be inspected and verified in accordance with TMS 402/ACI 530/ASCE 5 and TMS 602/ACI 530.1/ASCE 6 quality assurance program requirements.

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

1. Empirically designed masonry, glass unit masonry or masonry veneer designed by Section 2109, 2110 or Chapter 14, respectively, where they are part of structures classified as *Risk Category* I, II or III in accordance with Section 1604.5.
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. The minimum *special inspection* program for empirically

designed masonry, glass unit masonry or masonry veneer designed by Section 2109, 2110 or Chapter 14, respectively, in structures classified as *Risk Category* IV, in accordance with Section 1604.5, shall comply with TMS 402/ACI 530/ASCE 5 Level B Quality Assurance.

1705.4.2 Vertical masonry foundation elements. *Special inspection* shall be performed in accordance with Section 1705.4 for vertical masonry foundation elements.

1705.5 Wood construction. *Special inspections* of the fabrication process 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* building plans. 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* building plans.

1705.5.2 Metal-plate-connected wood trusses spanning 60 feet or greater. Where a truss clear span is 60 feet (18 288 mm) or greater, the special inspector shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

1705.6 Soils. *Special inspections* for existing site soil conditions, fill placement and load-bearing requirements shall be as required by 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 determine 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 D 1557.

TABLE 1705.6
REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
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, observe subgrade and verify that site has been prepared properly.	—	X

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

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

1705.9 Helical pile foundations. *Special inspections* shall be performed continuously 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 Special inspections for wind resistance.** *Special inspections* itemized in Sections 1705.10.1 through

1705.10.3, 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.

1705.10.1 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 components within the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.

Exception: *Special inspection* is not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other components of the main windforce-resisting system, where the fastener spacing of the sheathing is more than 4 inches (102 mm) on center.

**TABLE 1705.7
REQUIRED VERIFICATION AND INSPECTION OF DRIVEN DEEP FOUNDATION ELEMENTS**

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
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. Observe 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 inspections in accordance with Section 1705.2.	—	—
6. For concrete elements and concrete-filled elements, perform additional inspections in accordance with Section 1705.3.	—	—
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	—	—

**TABLE 1705.8
REQUIRED VERIFICATION AND INSPECTION OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS**

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
1. Observe 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 additional inspections in accordance with Section 1705.3.	—	—

1705.10.2 Cold-formed steel light-frame construction.

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

Exception: *Special inspection* is not required for cold-formed steel light-frame shear walls, braces, diaphragms, collectors (drag struts) and hold-downs where either of the following apply:

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.).

1705.10.3 Wind-resisting components. Periodic special inspection is required for the following systems and components:

1. Roof cladding.
2. Wall cladding.

1705.11 Special inspections for seismic resistance. *Special inspections* itemized in Sections 1705.11.1 through 1705.11.8, unless exempted by the exceptions of Section 1704.2, are required for the following:

1. The seismic force-resisting systems in structures assigned to *Seismic Design Category C, D, E or F* in accordance with Sections 1705.11.1 through 1705.11.3, as applicable.
2. Designated seismic systems in structures assigned to *Seismic Design Category C, D, E or F* in accordance with Section 1705.11.4.
3. Architectural, mechanical and electrical components in accordance with Sections 1705.11.5 and 1705.11.6.
4. Storage racks in structures assigned to *Seismic Design Category D, E or F* in accordance with Section 1705.11.7.
5. Seismic isolation systems in accordance with Section 1705.11.8.

Exception: Special inspections itemized in Sections 1705.11.1 through 1705.11.8 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 1613.3.4, 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 1613.3.4, 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.

1705.11.1 Structural steel. *Special inspection* for structural steel shall be in accordance with the quality assurance requirements of AISC 341.

Exception: *Special inspections* of structural steel in structures assigned to *Seismic Design Category C* that are not specifically detailed for seismic resistance, with a response modification coefficient, R , of 3 or less, excluding cantilever column systems.

1705.11.2 Structural wood. Continuous special inspection is required during field gluing operations of elements of the seismic force-resisting system. Periodic special inspection is required for nailing, bolting, anchoring and other fastening of components within the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

Exceptions:

1. *Special inspection* is not required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other components of the seismic force-resisting system other than adhesive-grouted anchor bolts, where the fastener spacing of the sheathing is more than 4 inches (102 mm) on center (o.c.).
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).

1705.11.3 Cold-formed steel light-frame construction. Periodic special inspection is required during welding operations of elements of the seismic force-resisting system. Periodic special inspection is required for screw attachment, bolting, anchoring and other fastening of components within the seismic force-resisting system, includ-

ing shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.

Exception: *Special inspection* is not required for cold-formed steel light-frame shear walls, braces, diaphragms, collectors (drag struts) and hold-downs where either of the following apply:

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) o.c.

1705.11.4 Designated seismic systems. The special inspector shall examine designated seismic systems requiring seismic qualification in accordance with Section 1705.12.3 and verify that the *label*, anchorage or mounting conforms to the *certificate of compliance*.

1705.11.5 Architectural components. Periodic *special inspection* is required during 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*.

Exceptions:

1. *Special inspection* is not required for 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. *Special inspection* is not required for exterior cladding and interior and exterior veneer weighing 5 psf (24.5 N/m²) or less.
3. *Special inspection* is not required for interior nonbearing walls weighing 15 psf (73.5 N/m²) or less.

1705.11.5.1 Access floors. Periodic *special inspection* is required for the anchorage of access floors in structures assigned to *Seismic Design Category D, E or F*.

1705.11.6 Mechanical and electrical components. *Special inspection* for mechanical and electrical components shall be as follows:

1. Periodic special inspection is required during the anchorage of electrical equipment for emergency and standby power systems in structures assigned to *Seismic Design Category C, D, E or F*;
2. Periodic special inspection is required during the anchorage of other electrical equipment in structures assigned to *Seismic Design Category E or F*;
3. Periodic special inspection is required during the 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. Periodic special inspection is required during the installation and anchorage of ductwork designed to

carry hazardous materials in structures assigned to *Seismic Design Category C, D, E or F*; and

5. Periodic special inspection is required during the installation and anchorage of vibration isolation systems in structures assigned to *Seismic Design Category C, D, E or F* where the *construction documents* require a nominal clearance of 1/4 inch (6.4 mm) or less between the equipment support frame and restraint.

1705.11.7 Storage racks. Periodic *special inspection* is required for the anchorage of storage racks 8 feet (2438 mm) or greater in height in structures assigned to *Seismic Design Category D, E or F*.

1705.11.8 Seismic isolation systems. Periodic special inspection shall be provided for seismic isolation systems during the fabrication and installation of isolator units and energy dissipation devices.

1705.12 Testing and qualification for seismic resistance. The testing and qualification specified in Sections 1705.12.1 through 1705.12.4, unless exempted from *special inspections* by the exceptions of Section 1704.2 are required as follows:

1. The seismic force-resisting systems in structures assigned to *Seismic Design Category C, D, E or F* shall meet the requirements of Sections 1705.12.1 and 1705.12.2, as applicable.
2. Designated seismic systems in structures assigned to *Seismic Design Category C, D, E or F* and subject to the certification requirements of ASCE 7 Section 13.2.2 shall comply with Section 1705.12.3.
3. Architectural, mechanical and electrical components in structures assigned to *Seismic Design Category C, D, E or F* and where the requirements of ASCE 7 Section 13.2.1 are met by submittal of manufacturer's certification, in accordance with Item 2 therein, shall comply with Section 1705.12.3.
4. The seismic isolation system in seismically isolated structures shall meet the testing requirements of Section 1705.12.4.

1705.12.1 Concrete reinforcement. Where reinforcement complying with ASTM A 615 is used to resist earthquake-induced flexural and axial forces in special moment frames, special structural walls and coupling beams connecting special structural walls, in structures assigned to *Seismic Design Category B, C, D, E or F*, the reinforcement shall comply with Section 21.1.5.2 of ACI 318. Certified mill test reports shall be provided for each shipment of such reinforcement. Where reinforcement complying with ASTM A 615 is to be welded, chemical tests shall be performed to determine weldability in accordance with Section 3.5.2 of ACI 318.

1705.12.2 Structural steel. Testing for structural steel shall be in accordance with the quality assurance requirements of AISC 341.

Exception: Testing for structural steel in structures assigned to *Seismic Design Category C* that are not specifically detailed for seismic resistance, with a response

modification coefficient, R , of 3 or less, excluding cantilever column systems.

1705.12.3 Seismic certification of nonstructural components. The *registered design professional* shall specify on the construction documents the requirements for certification by analysis, testing or experience data for nonstructural components and designated seismic systems in accordance with Section 13.2 of ASCE 7, where such certification is required by Section 1705.12.

1705.12.4 Seismic isolation systems. Seismic isolation systems shall be tested in accordance with Section 17.8 of ASCE 7.

1705.13 Sprayed fire-resistant materials. *Special inspections* for sprayed fire-resistant materials applied to floor, roof and wall assemblies and structural members shall be in accordance with Sections 1705.13.1 through 1705.13.6. *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* shall be performed after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems and suspension systems for ceilings, where applicable.

1705.13.1 Physical and visual tests. The *special inspections* shall include the following tests and observations 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.

1705.13.2 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 before the application of the sprayed fire-resistant material.

1705.13.3 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.~~)

1705.13.4 Thickness. No 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, but in no case less than the minimum allowable thickness required by Section 1705.13.4.1.

1705.13.4.1 Minimum allowable thickness. For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus $\frac{1}{4}$ inch (6.4 mm). For design thick-

nesses 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 1705.13.4.2 and 1705.13.4.3.

1705.13.4.2 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 E 605, 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*.

1705.13.4.3 Cellular decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. A minimum of four measurements shall be made, located symmetrically within the square area.

1705.13.4.4 Fluted decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. A minimum of 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.

1705.13.4.5 Structural 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.

1705.13.4.6 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.

1705.13.4.7 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.

1705.13.4.8 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.

1705.13.4.9 Hollow structural section and pipe columns. At hollow structural section and pipe columns, thickness measurements shall be made at a minimum of four locations around the column at each end of a 12-inch (305 mm) length.

1705.13.5 Density. The density of the sprayed fire-resistant material shall not be 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 E 605. 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

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feet (232 m²) 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 m²) of floor area or portion thereof in each *story*.

1705.13.6 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 not be less than 150 pounds per square foot (psf) (7.18 kN/m²). 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 1705.13.6.1 through 1705.13.6.3.

1705.13.6.1 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 m²) of the sprayed area, or portion thereof, in each *story*.

1705.13.6.2 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 m²) of floor area or portion thereof in each *story*.

1705.13.6.3 Primer, paint and encapsulant bond tests. Bond tests to qualify a primer, paint or encapsulant shall be conducted when 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.

1705.14 Mastic and intumescent fire-resistant coatings. *Special inspections* for mastic and intumescent fire-resistant coatings applied to structural elements and decks shall be in accordance with AWCI 12-B. *Special inspections* shall be based on the fire-resistance design as designated in the *approved construction documents*.

~~(1705.15 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.~~

~~**1705.15.1 Water resistive barrier coating.** A *water resistive barrier* coating complying with ASTM E 2570 requires *special inspection* of the *water resistive barrier* coating when installed over a sheathing substrate.)~~

1705.16 Fire-resistant penetrations and joints. In high-rise buildings or in buildings assigned to *Risk Category* III or IV in accordance with Section 1604.5, 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 714.3.1.2, 714.4.1.2, 715.3 and 715.4 shall be in accordance with Section 1705.16.1 or 1705.16.2.

1705.16.1 Penetration firestops. Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.3.1.2 and 714.4.1.2 shall be conducted by an approved inspection agency in accordance with ASTM E 2174.

1705.16.2 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 inspection agency in accordance with ASTM E 2393.

[F] **1705.17 Special inspection for smoke control.** Smoke control systems shall be inspected and tested according to standards specified by the building official ((~~tested by a special inspector~~)).

~~((F) 1705.17.1 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] **1705.17.2 Qualifications.** ~~*Special inspection* agencies for smoke control 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

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 ((104.14)) 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 applicant.

SECTION 1708 TEST SAFE LOAD

1708.1 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 1710. 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.

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SECTION 1709 IN-SITU LOAD TESTS

1709.1 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. 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 1709.2. 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.

1709.2 Test standards. Structural components and assemblies shall be tested in accordance with the appropriate referenced standards. 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.

1709.3 In-situ load tests. In-situ load tests shall be conducted in accordance with Section 1709.3.1 or 1709.3.2 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.

1709.3.1 Load test procedure specified. Where a referenced 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 1709.3.2 shall apply.

1709.3.2 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 1710 PRECONSTRUCTION LOAD TESTS

1710.1 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 the applicable referenced standards, the structural adequacy shall be predetermined based on the load test criteria established in this section.

1710.2 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 1710.3 shall apply.

1710.3 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 1710.3.1. Load tests shall simulate the applicable loading conditions specified in Chapter 16.

1710.3.1 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

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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 1710.3.2 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 1710.3.2, 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 1710.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

1710.3.2 Deflection. The deflection of structural members under the design load shall not exceed the limitations in Section 1604.3.

1710.4 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.

1710.5 Exterior window and door assemblies. The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1710.5.1 or 1710.5.2.

Exceptions:

1. Structural wind load design pressures for window units smaller than the size tested in accordance with Section 1710.5.1 or 1710.5.2 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.

[W] 2. Custom exterior windows and doors manufactured by small business are exempt from all testing requirements in Section 1710 if they meet the applicable provisions of Chapter 24.

1710.5.1 Exterior windows and doors. Exterior windows and sliding doors shall be tested and labeled as conforming to AAMA/WDMA/CSA 101/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/CSA 101/I.S.2/A440. Exterior side-hinged doors shall be tested and *labeled* as conforming to AAMA/WDMA/CSA 101/I.S.2/A440 or comply with Sec-

tion 1710.5.2. 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.

1710.5.2 Exterior windows and door assemblies not provided for in Section 1710.5.1. Exterior window and door assemblies shall be tested in accordance with ASTM E 330. Structural performance of garage doors and rolling doors shall be determined in accordance with either ASTM E 330 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.

1710.6 Skylights and sloped glazing. Unit skylights and tubular daylighting devices (TDDs) shall comply with the requirements of Section 2405. All other skylights and sloped glazing shall comply with the requirements of Chapter 24.

1710.7 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*.

SECTION 1711 MATERIAL AND TEST STANDARDS

1711.1 Joist hangers. Testing of joist hangers shall be in accordance with Sections 1711.1.1 through 1711.1.3, as applicable.

1711.1.1 General. 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 AF&PA NDS for the joist and headers.

Exception: The joist length shall not be required to exceed 24 inches (610 mm).

1711.1.2 Vertical load capacity for joist hangers. The vertical load-bearing capacity for the joist hanger shall be determined by testing a minimum of 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-bearing of the joist hanger shall be the lowest value determined from the following:

1. The lowest ultimate vertical load for a single hanger 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 a single hanger from all tests divided by three (where six or more tests are conducted).
3. The average from all tests of the vertical loads that produce a vertical movement of the joist with respect to the header of $\frac{1}{8}$ inch (3.2 mm).
4. The sum of the allowable design loads for nails or other fasteners utilized to secure the joist hanger to the wood members and allowable bearing loads that contribute to the capacity of the hanger.
5. The allowable design load for the wood members forming the connection.

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1711.1.2.1 Design value modifications for joist hangers. Allowable design values for joist hangers that are determined by Item 4 or 5 in Section 1711.1.2 shall be permitted to be modified by the appropriate load duration factors as specified in AF&PA NDS but shall not exceed the direct loads as determined by Item 1, 2 or 3 in Section 1711.1.2. Allowable design values determined by Item 1, 2 or 3 in Section 1711.1.2 shall not be modified by load duration factors.

1711.1.3 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 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 $\frac{1}{8}$ inch (3.2 mm).

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1711.2 Concrete and clay roof tiles. Testing of concrete and clay roof tiles shall be in accordance with Sections 1711.2.1 and 1711.2.2, as applicable.

1711.2.1 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.

1711.2.2 Wind tunnel testing. Where concrete and clay 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.

