



DEPARTMENT OF ADMINISTRATIVE SERVICES
OFFICE OF EDUCATION AND DATA MANAGEMENT

Special Inspections

*Presented by
Harwood W. Loomis
Licensed Building Official, Licensed Architect
for the*

*Office of Education and Data Management
Spring 2016 Career Development Series*



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WHICH IS YOU?





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OR THIS?



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Would you like some assistants ...

... if you didn't have to pay them?



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Pop Quiz:

Special Inspections are only required for threshold buildings.

- True
- False

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Pop Quiz:

Special Inspections are only required for threshold buildings.

- True
- False

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Special inspections are based on Chapter 17 of the IBC; they apply to any building or structure for which a permit is issued under the IBC.

Threshold buildings are a Connecticut-specific definition, found in Chapter 1. The primary impact of the threshold buildings amendment is the requirement for third-party structural review.

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Connecticut amendment to IBC 2012:

(Add) **107.7.1 Requirements for proposed structures or additions that exceed the threshold limits.** Pursuant to section 29-276b of the Connecticut General Statutes, if a proposed structure or addition to an existing structure will exceed the threshold limit set forth in Section 107.7 of this code, the building official of the municipality in which the structure or addition will be located shall require that an independent structural engineering consultant review the structural plans and design specifications of the structure or addition to be constructed to determine compliance with the requirements of this code to the extent necessary to assure the stability and integrity of the primary structural support systems of such structure or addition. Any modifications of approved structural plans or design specifications shall require shop drawings to the extent necessary to determine compliance with the requirements of this code and shall be reviewed by such consultant. Any fees relative to such review requirements shall be paid by the owner of the proposed building project.

If a structure or addition exceeds the threshold limit, the architect of record, professional engineer of record responsible for the design of the structure or addition and the general contractor shall sign a statement of professional opinion affirming that the completed construction is in substantial compliance with the approved plans and design specifications. If fabricated structural load-bearing members or assemblies are used in the construction, the professional engineer responsible for the design of such members or assemblies shall sign a statement of professional opinion affirming that the completed fabrication is in substantial compliance with the approved design specifications.

The building official of the municipality in which the structure or addition will be located shall satisfy himself that each architect, professional engineer, including each professional engineer responsible for the design of fabricated structural load-bearing members or assemblies, general contractor and major subcontractor involved in the project holds a license to engage in the work or occupation for which the appropriate building permit has been issued.

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(Add) **107.7.1 Requirements for proposed structures or additions that exceed the threshold limits.** Pursuant to section 29-276b of the Connecticut General Statutes, if a proposed structure or addition to an existing structure will exceed the threshold limit set forth in Section 107.7 of this code, **the building official** of the municipality in which the structure or addition will be located **shall require that an independent structural engineering consultant review the structural plans and design specifications of the structure or addition to be constructed to determine compliance with the requirements of this code to the extent necessary to assure the stability and integrity of the primary structural support systems of such structure or addition.** Any modifications of approved structural plans or design specifications shall require shop drawings to the extent necessary to determine compliance with the requirements of this code and shall be reviewed by such consultant. Any fees relative to such review requirements shall be paid by the owner of the proposed building project.

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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. These inspections are in addition to the inspections identified in Section 110.

(Source: IBC 2012)

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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.

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Why have Special Inspections?

- The old, "traditional" system wasn't working.
- Collapses:
 - 1978: Hartford Civic Center collapse
 - 1981: Kansas City Hyatt Regency catwalk failure
 - 1987: L'Ambience Plaza, Bridgeport, collapse

The code community and the engineering profession decided that there was a need for more involvement and oversight by the engineers during construction. The result was what we know as Special Inspections.

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CHAPTER 17 IS YOUR FRIEND!



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 questionable suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and to 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.
Perceive special inspection.
SPECIAL INSPECTOR.
SPRAYED FIRE-RESISTANT MATERIALS.
STRUCTURAL OBSERVATION.

SECTION 1703
APPROVALS

1703.1 Approved agency. An approved agency shall provide all information as necessary for the building official to determine that the agency meets the applicable requirements.

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, to the best possible extent, conform to their objectives and standards.

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.

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 in 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 concerning 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 technical data shall be submitted to the building official to substantiate the proposed use of any 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 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 1703.5. Products and materials required to be labeled shall be labeled in accordance with the provisions 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 test performed. The record shall provide sufficient detail to verify compliance with the test standard.



How does it work?

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Chapter 1: Permit application

105.3 Application for permit. To obtain a *permit*, the applicant shall first file an application therefor in writing on a form furnished by the department of building safety for that purpose. Such application shall:

1. Identify and describe the work to be covered by the *permit* for which application is made.
2. Describe the land on which the proposed work is to be done by legal description, street address or similar description that will readily identify and definitely locate the proposed building or work.
3. Indicate the use and occupancy for which the proposed work is intended.
4. Be accompanied by *construction documents* and other information as required in Section 107.
5. State the valuation of the proposed work.
6. Be signed by the applicant, or the applicant's authorized agent.
7. Give such other data and information as required by the *building official*.

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SECTION 107 SUBMITTAL DOCUMENTS

107.1 General. Submittal documents consisting of *construction documents*, *statement of special inspections*, geotechnical report and other data shall be submitted in two or more sets with each *permit* application. The *construction documents* shall be prepared by a *registered design professional* where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*.

Exception: The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a *registered design professional* if it is found that the nature of the work applied for is such that review of *construction documents* is not necessary to obtain compliance with this code.

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

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What is this “Statement of Special Inspections” thing, anyway?



What’s this “Statement of Special Inspections” thing?

IT’S THE BIBLE FOR THE PROJECT. It spells out:



What's this "Statement of Special Inspections" thing?

IT'S THE BIBLE FOR THE PROJECT. It spells out:

- What gets inspected?

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What's this "Statement of Special Inspections" thing?

IT'S THE BIBLE FOR THE PROJECT. It spells out:

- What gets inspected?
- Who inspects it?

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What's this "Statement of Special Inspections" thing?

IT'S THE BIBLE FOR THE PROJECT. It spells out:

- What gets inspected?
- Who inspects it?
- How often it gets inspected?

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Special Inspections were introduced into the BOCA Basic Building Code in the 1988 edition. Connecticut didn't adopt BOCA 1988. We first got Special Inspections in 1994, when we adopted the 1990 BOCA Basic Building Code.

Problem: When Special Inspections were first introduced, there was no professional standard of care for performing Special Inspections. That meant – no professional liability coverage.

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Connecticut's Three Musketeers:

- John Ruddy, P.E.
- Ken Gibble, P.E.
- Dick DiSalvo, P.E.



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Ruddy, Gibble and DiSalvo created the **Statement of Special Inspections** form as a way of creating and standardizing a standard of care for engineers performing Special Inspections.

- Created for the Structural Engineers Coalition (SEC) of Connecticut Engineers in Private Practice (CEPP).
- Subsequently donated to the national engineers' professional society and promulgated nationally by CASE (Council of American Structural Engineers).



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CASE also puts out a very useful guide that helps explain how the Special Inspections process works.

Available on-line.

Guide to
Special Inspections and
Quality Assurance
Third Edition 2004



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Statement of Special Inspections

Project: *Kelly Big Building*
Location: *Hartford, Connecticut*
Owner: *Mega Development Corp*
Design Professional in Responsible Charge: *Fawcett Architects, LLC*

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for consulting these inspections and tests. This Statement of Special Inspections encompasses the following disciplines:

- Structural Mechanical/Electrical/Plumbing
- Architectural Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A Final Report of Special Inspections documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: Random or per attached schedule

Prepared by: _____
Fred Lloyd Stone
Signature

Date *2/1/2016*

Design Professional Seal

Owner's Authorization: _____ Building Official's Acceptance: _____
Signature Date Signature Date

The Project



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NOTICE TO CONTRACTOR – THRESHOLD BUILDING & SPECIAL INSPECTIONS

The Contractor is hereby notified that the construction of this project exceeds the threshold limits defined in CGS Section 29-279(c), and is therefore considered a threshold building.

This project will also be subject to "Special Inspections" in addition to the inspections outlined in Form 816 Article 1.20-1.05.10. These inspections will be performed by the Engineer's representative and are required by building code officials. As such, the contractor must follow the requirements outlined in Form 816 Article 1.20-1.05.10.

Schedule of Inspection and Testing Agencies


Special Inspection Agencies	Firm
1. Special Inspection Coordinator	Monumental Engineering, LLC
2. Special Inspector	Mt. Picky Inspection Services, Inc.
3. Third Party Reviewer	Pretty Big Engineers, LLC
4. Testing Agency	Independent Testing Laboratory (Authorized Representative of Special Inspector)
5. Testing Agency	The Other Independent Testing Laboratory, Inc.
6. Designer	Monumental Engineering, Inc.

Notes:

1. In the following table a comma means "or"
2. In the following table "and G" means that the designer will participate to an extent to be determined.

The Players

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Beware of "TBD"

"TBD" is "To Be Determined." What it really means is "We haven't thought about it yet," or "We're still shopping for the lowest price."

The BO is empowered by the Code to review and approve the qualifications of all proposed special inspectors. If they aren't disclosed during the permit application phase ...

IT AIN'T GONNA HAPPEN

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Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category C and D

Quality Assurance Plan Required (Y/N) Yes

Description of seismic force resisting system and designated seismic systems:

Most of the building is designated for Seismic Category C. A portion of the building has been separated by expansion joints along column lines 17.1 to F to 17.8 to F.8 and is designated as Seismic Category D. The building is a pre-engineered metal framed building with Braced Frames and Concrete Shear Walls.

Within the higher rated portion of the Building, connections and hangers for MEP elements must resist the higher seismic forces.

Quality Assurance for Wind Requirements

Basic Wind Speed (3 second gust) 110 mph

Wind Exposure Category C

Quality Assurance Plan Required (Y/N) Yes

Description of wind force resisting system and designated wind resisting components:

The Building is located adjacent to the Long Island Sound in an area with wind characteristics noted above. Structural elements including Braced Frames and Concrete Shear Walls are designed to resist wind induced forces. Exterior skin and roofing must also be installed to resist wind forces.

Statement of Responsibility

The Contractor and sub-contractor responsible for the construction or fabrication of a system or component included in the above Quality Assurance Plan must submit a Statement of Responsibility. The Contractor's Statement of Responsibility form has been included.

Basic Project Information

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Other Permit Application Information:

“Seismic Design Category” must be indicated on the construction documents.

Caution -

Seismic Design Category is not the same as Site Class – but they use the same alphabetic classifications.

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SITE CLASS. A classification assigned to a site based on the types of soils present and their engineering properties as defined in Section 1613.3.2.

1613.3.2 Site class definitions. Based on the site soil properties, the site shall be classified as *Site Class* A, B, C, D, E or F in accordance with Chapter 20 of ASCE 7. Where the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless the building official or geotechnical data determines Site Class E or F soils are present at the site.

Applies to the site, and is determined by the geotechnical consultant, if there is one, or by the structural engineer-of-record.

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SEISMIC DESIGN CATEGORY. A classification assigned to a structure based on its *risk category* and the severity of the *design earthquake ground motion* at the site.

1613.3.5 Determination of seismic design category. Structures classified as *Risk Category* I, II or III that are located where the mapped spectral response acceleration parameter at 1-second period, S_1 , is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* E. Structures classified as *Risk Category* IV that are located where the mapped spectral response acceleration parameter at 1-second period, S_1 , is greater than or equal to 0.75 shall be assigned to *Seismic Design Category* F. All other structures shall be assigned to a *seismic design category* based on their *risk category* and the design spectral response acceleration parameters, SDS and SD_1 , determined in accordance with Section 1613.3.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe *seismic design category* in accordance with Table 1613.3.5(1) or 1613.5.5(2), irrespective of the fundamental period of vibration of the structure,

Applies to the building, and is determined by the structural engineer-of-record

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TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATIONS

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D


2012 INTERNATIONAL BUILDING CODE*

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1604.5 Risk category. Each building and structure shall be assigned a *risk category* in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the *risk category* shall not be taken as lower than the occupancy category specified therein.

1604.5.1 Multiple occupancies. Where a building or structure is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest risk category corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher *risk category*, both portions shall be assigned to the higher *risk category*.



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TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: <ul style="list-style-type: none"> • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: <ul style="list-style-type: none"> • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000^a. • Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: <ul style="list-style-type: none"> Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the <i>International Fire Code</i>; and Are sufficient to pose a threat to the public if released^b.
IV	Buildings and other structures designated as essential facilities, including but not limited to: <ul style="list-style-type: none"> • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: <ul style="list-style-type: none"> Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the <i>International Fire Code</i>; and Are sufficient to pose a threat to the public if released^b. • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1604.1.2 to use gross floor area calculations shall be permitted to use net floor area to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

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- DEPARTMENT OF ADMINISTRATIVE SERVICES**
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- I Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:
- Agricultural facilities.
 - Certain temporary facilities.
 - Minor storage facilities.
- II Buildings and other structures except those listed in Risk Categories I, III and IV
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- III Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
- Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
 - Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250.
 - Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500.
 - Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.
 - Group I-3 occupancies.
 - Any other occupancy with an occupant load greater than 5,000^a.
 - Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.
 - Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
 - Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and
 - Are sufficient to pose a threat to the public if released ^b.

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- IV Buildings and other structures designated as essential facilities, including but not limited to:
- Group I-2 occupancies having surgery or emergency treatment facilities.
 - Fire, rescue, ambulance and police stations and emergency vehicle garages.
 - Designated earthquake, hurricane or other emergency shelters.
 - Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
 - Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
 - Buildings and other structures containing quantities of highly toxic materials that:
 - Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and
 - Are sufficient to pose a threat to the public if released ^b.

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IV Buildings and other structures designated as essential facilities, including but not limited to:

- Aviation control towers, air traffic control centers and emergency aircraft hangars.
- Buildings and other structures having critical national defense functions.
- Water storage facilities and pump structures required to maintain water pressure for fire suppression.



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TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATIONS

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D



PAY ATTENTION!

- Classification as Seismic Design Category C, D, E or F triggers stricter requirements for many materials and trades.
 - *BO does not make this classification. It is determined by the structural engineer.*

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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*.

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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 1702.

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.

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Section 1702 sends us to Chapter 2:

STRUCTURAL OBSERVATION. The visual observation of the structural system by a *registered design professional* for general conformance to the *approved construction documents*. **Structural observation does not include or waive the responsibility for the inspection required by Section 110, 1705 or other sections of this code.**

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IMPORTANT TERMS:

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IMPORTANT TERMS:

SER: Structural Engineer of Record

- The engineer whose seal and signature are on the construction documents submitted for permit, AND on the Statement of Special Inspections
 - [Must be the same engineer]

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IMPORTANT TERMS:

SER: Structural Engineer of Record

- The engineer whose seal and signature are on the construction documents submitted for permit, AND on the Statement of Special Inspections
 - [Must be the same engineer]

RDPIRC: Registered Design Professional in Responsible Charge

- NOT the SER. The code requires special inspections of more than just structure. The RDPIRC is the engineer responsible for the design of each respective system or subsystem that requires Special Inspection, and who specifies the Special Inspection criteria.
 - The various RDPIRC may all be from one large firm, or they may be from different, smaller firms.

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IMPORTANT TERMS:

(My definitions):

Special Inspector: (a.k.a. Special Inspection Coordinator)

- The person or entity in overall charge of the Special Inspection program.
 - May be the same person or entity as the SER, but does not have to be.

special inspector:

- The person or entity possessing particular skills or expertise, who performs Special Inspections of one or more specific trades subject to Special Inspections.
 - May be the SER, one or more of the RDPIRC, or an independent testing laboratory or agency.

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IMPORTANT TERMS:

(IBC 2012 definition):

Special Inspector:

- A qualified person employed or retained by an *approved* agency and *approved* by the *building official* as having the competence necessary to inspect a particular type of construction requiring *special inspection*.

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IMPORTANT TERMS:

Continuous Special Inspection:

- *The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed. (*CASE Guide to Special Inspections)*
 - *Special inspection by the special inspector who is present when and where the work to be inspected is being performed. (*IBC 2012)*
 - **When continuous inspection is required, 100% of the work must be inspected and it must be inspected as the work is being performed.**
- ➔ Read the Statement of Special Inspections. Many engineers don't understand what "continuous" means, and call for continuous inspection when it isn't necessary or practical. Remember, the Owner has to pay for these inspections.

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IMPORTANT TERMS:

Periodic Special Inspection:

- *The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work. (*CASE Guide to Special Inspections)*
 - *Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed. (*IBC 2012)*
 - When periodic inspection is indicated, inspection of less than 100% of the work may be acceptable for certain items.
 - **The Registered Design Professional, when preparing the Statement of Special Inspections, should indicate the frequency of inspection that is required.**
- ➔ Read the Statement of Special Inspections. Engineers often call for Periodic Inspection without specifying the frequency of the required inspections.

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YOU'RE IN CHARGE!

The Special Inspections program is primarily to assist the Building Official.

- **Review the Statement of Special Inspections during the plan review stage.**
- **If you have questions, ask them.**
- **If you want changes, discuss with the engineer.**

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BUILDING PERMIT APPLICATION SPECIAL INSPECTIONS CHECKLIST

- Special Inspector identified?
 - Engineer-of-Record, or independent inspector?
- Seismic Design Category listed on construction documents?
- Statement of Special Inspections submitted?
 - Frequency identified for periodic inspections?
- Testing laboratories and agents identified?
 - Qualifications reviewed and approved?
- Report interval appropriate to project?
- Compare Statement to Chapter 17 of Building Code
 - Is everything addressed?

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IBC 2012:

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. These inspections are in addition to the inspections identified in Section 110.

- Section 110 tells us what the Building Department inspects
- Chapter 17 tells us what the Special Inspector(s) inspect

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Masonry

Item	Agency (Qualif.)	Scope
1. Material Certification	1,3,4,5 ACI/CCI ICC/BCSF	Review all material certifications provided by Contractor for compliance with ACI 318 and Project Specifications (Periodic)
2. Mixing of Mortar and Grout	2, 4 ICC-SMSF	Inspect proportioning, mixing and retempering of mortar and grout for compliance with Specification 04 22 00 each day. (Periodic)
3. Installation of Masonry	2, 4 ICC-SMSF	Inspect size, layout, bonding and placement of masonry for compliance with Specification 04 22 00 each day. (Periodic)
4. Mortar Joints	2, 4 ICC-SMSF	Inspect construction of mortar joints including tooling and filing of head joints for compliance with Specification 04 22 00 each day. (Periodic)
5. Reinforcement Installation	2, 4 ICC-SMSF AWS-CRT	Inspect placement, positioning and lapping of reinforcing steel for compliance with Specification 04 22 00 for all load-bearing walls and partitions. (Periodic) Inspect all welding of reinforcing steel. (Continuous)
6. Prestressed Masonry	2, 4	
7. Grouting Operations	2, 4 ICC-SMSF	Inspect placement and consolidation of grout. Inspect masonry clear-out for high-lift grouting. (Continuous during installation)
8. Weather Protection	2, 4 ICC-SMSF	Inspect cold weather protection for compliance with ACI 312 and hot weather protection for compliance with ACI 313. Use mortar within 1-1/2 hours after mixing when temperature is above 80°F. Verify that wall cavities are protected against precipitation. (Periodic)

Typical page



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NOTICE TO CONTRACTOR – THRESHOLD BUILDING & SPECIAL INSPECTIONS

The Contractor is hereby notified that the construction of this project exceeds the threshold limits defined in CGS Section 29-276(b), and is therefore considered a threshold building.

This project will also be subject to "Special Inspections" in addition to the inspections outlined in Form 816 Article 1.20-1.05.10. These inspections will be performed by the Engineer's representative and are required by building code officials. As such, the contractor must follow the requirements outlined in Form 816 Article 1.20-1.05.10.

Schedule of Inspection and Testing Agencies

Special Inspection Agencies	Firm
1. Special Inspection Coordinator	Monumental Engineering, LLC
2. Special Inspector	Mt-Peaby Inspection Services, Inc.
3. Third Party Reviewer	Pretty Big Engineers, LLC
4. Testing Agency	Independent Testing Laboratory (Authorized Representative of Special Inspector)
5. Testing Agency	The Other Independent Testing Laboratory, Inc.
6. Designer	Monumental Engineering, Inc.

Notes:

1. In the following table a comma means "or".
2. In the following table "and &" means that the designer will participate to an extent to be determined.

The Players



Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the Agency Number on the Schedule.

- PE/SE Structural Engineer – a licensed SE or PE specializing in the design of building structures
 - PE/GE Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
 - EIT Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination
- American Concrete Institute (ACI) Certification**
- ACI-CFTT Concrete Field Testing Technician – Grade 1
 - ACI-CCI Concrete Construction Inspector
 - ACI-LTT Laboratory Testing Technician – Grade 1&2
 - ACI-STT Strength Testing Technician
- American Welding Society (AWS) Certification**
- AWS-CWI Certified Welding Inspector
 - AWS-CO-CWI Certified Overhead Inspector
- American Society of Non-Destructive Testing (ASNT) Certification**
- ASNT Non-Destructive Testing Technician – Level III & IV
- International Code Council (ICC) Certification**
- ICC-SMCS Structural Masonry Special Inspector
 - ICC-SWIS Structural Steel and Welding Special Inspector
 - ICC-CFIS Concrete Forming Special Inspector
 - ICC-PCSI Precast/Ready Concrete Special Inspector
 - ICC-RCIS Reinforced Concrete Special Inspector
- National Institute for Certification in Engineering Technology (NICET)**
- NICET-CT Concrete Technicians – Levels I, II, III & IV
 - NICET-ET Steel Erection Technicians – Levels I, II, III & IV
 - NICET-ET Geotechnical Engineering Technicians – Levels I, II, III & IV
- Editorial Design Institute (EDI) Certification**
- EDI-EPIC EPIC Third Party Inspector
- Other _____

Inspector Qualifications

Tells us what qualifications are needed for special inspection of specific items in the Statement of Special Inspections



Qualifications of Inspectors and Testing Technicians



The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

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American Concrete Institute (ACI) Certification

- ACI-CFTT Concrete Field Testing Technician – Grade 1
- ACI-CCI Concrete Construction Inspector
- ACI-LTT Laboratory Testing Technician – Grade 1&2
- ACI-STT Strength Testing Technician



REMEMBER:

“TBD” = “Not Gonna Happen”

Ask for qualifications of inspection agencies and inspectors during the permit review period, when you can control the process.



Quality Assurance Plan

Page of

Quality Assurance for Seismic Resistance

Seismic Design Category

Quality Assurance Plan Required (Y/N)

Description of Seismic Risk Category and Seismic Risk Element:

[Empty text box for description]

Quality Assurance for Wind Requirements

Basic Wind Speed (3 second gust)

Wind Exposure Category

Quality Assurance Plan Required (Y/N)

Description of Wind Risk Category and Wind Risk Element:

[Empty text box for description]

Statement of Responsibility

Back to back responsibility for the construction or distribution of a system or component shall be shown on the Statement of Responsibility.

Project Information


This information should already be shown on the construction documents. Check to be sure the information here agrees with the drawings.



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DEPARTMENT OF ADMINISTRATIVE SERVICES
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(Amd) 1704.2.4 Report requirement. Special inspectors shall keep records of inspections. The special inspector shall furnish inspections 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 of inspections documenting completion of all required special inspections and correction of any discrepancies noted in the inspections shall be submitted prior to the issuance of the Certificate of Occupancy. Interim reports shall be submitted periodically at the frequency agreed upon by the permit applicant and the building official prior to the start of work.

Source: 2015 Connecticut Amendment

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What does the Special Inspector Inspect?

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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. When such observation is specifically required by the *building official*.

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(Amd) 1704.5.2 Structural observations for wind requirements.

Structural observations shall be provided for those structures sited where *Vasd* as determined in accordance with Appendix N 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.

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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.

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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 coldformed 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.

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(Amd) 1705.2.2.2. Cold-formed steel trusses. Where a cold-formed steel truss clear span is 30 feet (9,144 mm) or greater, the special inspector shall verify that the permanent individual truss member restraint/bracing is installed in accordance with the approved truss submittal package. 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.



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Code

Statement of S.I.

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BY INSPECTION
1. Inspection of reinforcing steel, including placement location and placement, in accordance with Table 1705.2.2.2.2.		X	ACI 308.3A, 11.7.7	1705.4
2. Inspection of reinforcing steel in accordance with Table 1705.2.2.2.2.		X	ACI 308.3A.1	1705.4
3. Inspection of anchors cast in concrete where allowable loads have been determined or where strength design is used.		X	ACI 308.3A.2	1705.4
4. Inspection of anchors post tensioned in hardened concrete.		X	ACI 308.3A.3	1705.4
5. Verifying use of required bracing.		X	ACI 308.3A.3.1, 3.1.1	1705.4
6. At the time fresh concrete is placed to fabricate operations for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X		ASTM C193, ASTM C138, ASTM C143	1705.10
7. Inspection of concrete and determine placement for proper application techniques.	X		ACI 308.3.1, 3.1.1, 3.1.2, 3.1.3	1705.4
8. Inspection for occurrence of specified curing temperature and moisture.		X	ACI 308.3.1.3.1	1705.4
9. Application of post-tensioning forces.	X		ACI 308.3B, ACI 308.3B.4	1705.4
10. Curing of post-tensioning tendons.		X	ACI 308.3B.4	1705.4
11. Verification of post-tensioning tendons.		X	ACI 308.3B.4	1705.4
12. Verification of pre-compression strength, prior to detaching of tendons in post-tensioned concrete and prior to removal of shores and Center Line bracing and other loads.		X	ACI 308.4.2	1705.4
13. Inspect framework for slope, location and dimensions of the concrete member being tested.		X	ACI 308.4.1.1	1705.4

Item	Agency # (Required)	Scope
1. Mix Design	ACI-CCC, JCC-BCU	Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.
2. Material Certification	ACI-CCC, JCC-BCU	
3. Reinforcement Installation	ACI-CCC, JCC-BCU	Inspect size, cover, spacing, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of oils or other deleterious materials. Inspect bar size and mechanical splices. Verify that bars are adequately tied and supported as shown on drawings.
4. Post-Tensioning Operations	JCC-PCW	Inspect placement, stressing, grouting and protection of post-tensioning tendons. Verify that tendons are correctly positioned, supported, tied and secured. Record tendon diagrams.
5. Welding of Reinforcing	ACI-CCC	Visually inspect all reinforcing steel welds. Verify suitability of reinforcing steel. Inspect preheating of steel when required.
6. Anchor Rods	ACI-CCC	Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.
7. Concrete Placement	ACI-CCC, JCC-BCU	Inspect placement of concrete. Verify that concrete compaction and discharging avoid segregation or contamination. Verify that concrete is properly consolidated.
8. Sampling and Testing of Concrete	ACI-CFTT, ACI-ITP	Test concrete compressive strength (ASTM C109 & C109M, slump (ASTM C143), air content (ASTM C173 or C173M) and temperature (ASTM C1064).
9. Curing and Protection	ACI-CCC, JCC-BCU	Inspect normal, cold-weather protection and hot-weather protection procedures.
10. Other:		



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.

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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.

Unusual construction. See the code if you encounter this.

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(Amd) **1705.5.2. Metal-plate-connected wood trusses.** Where a truss clear span is 30 feet (9,144 mm) or greater, the special inspector shall verify that the permanent individual truss member restraint/bracing is installed in accordance with the approved truss submittal package. 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.

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Remember ...

Seismic Design Category?

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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.

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WHY DO WE CARE ABOUT SEISMIC DESIGN CATEGORY?

Because I'm the Daddy and I say so.

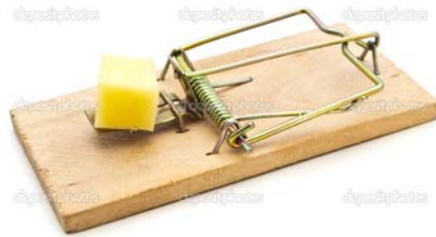
And

Because ... reasons ...

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Seismic Design Category is a trap



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[A] 104.9 Approved materials and equipment.
Materials, equipment and devices *approved* by the *building official* shall be constructed and installed in accordance with such approval.

Source: 2012 IBC

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We have to read the instructions.

(Yes, turn in your man card.)



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DIVISION: 03 00 00—CONCRETE
SECTION: 03 16 00—CONCRETE ANCHORS
DIVISION: 05 00 00—METALS
SECTION: 05 19—POST-INSTALLED CONCRETE ANCHORS

REPORT HOLDER:

HILTI, INC.
7250 DALLAS PARKWAY, SUITE 1000
PLANO, TEXAS 75024

EVALUATION SUBJECT:

HILTI HIT-RE 500 SD ADHESIVE ANCHORS AND POST INSTALLED REINFORCING BAR CONNECTIONS IN CRACKED AND UNCRACKED CONCRETE



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DIVISION 05 05 00 – CONCRETE
Section 05 10 00-Concrete Anchors

DIVISION 05 05 00-METALS
Section 05 05 19-Post-Installed Concrete Anchors

REPORT HOLDER:
HILTI, INC.
7206 DALLAS PARKWAY, SUITE 1000
PLANO, TEXAS 75024
800.878.8000
www.hilti.com
hilti.us/icc-es.com

EVALUATION SUBJECT:
HILTI HIT-RE 500-SD ADHESIVE ANCHORS AND POST-INSTALLED REINFORCING BAR CONNECTIONS IN CRACKED AND UNCRACKED CONCRETE.


1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2010, 2012, 2009 and 2006 International Building Code (IBC)
- 2010, 2012, 2000 and 2006 International Residential Code (IRC)
- 2013 Abu Dhabi International Building Code (ADIBC)

*The ADIBC is based on the 2010 IBC. (2013 IRC) code sections referenced in this report are underlined.

2.0 USES
The Hilti HIT-RE 500-SD Adhesive Anchoring System and Post-Installed Reinforcing Bar System are used to resist static, wind and earthquake (Seismic Design Categories A through F) tension and shear loads in cracked and uncracked normal-weight concrete having a specified compressive strength f'_c of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa) [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1].

*Revised October 2015



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2.0 USES

The Hilti HIT RE-500-SD Adhesive Anchoring System and Post-Installed Reinforcing Bar System are used to resist static, wind and earthquake (Seismic Design Categories A through F) tension and shear loads in cracked and uncracked normal-weight concrete having a specified compressive strength f'_c of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa) [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1].

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4.1.11 Design Strength in Seismic Design Categories C, D, E and F: In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, design anchors must be in accordance with ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable. Modifications to ACI 318.14 17.2.3 shall be applied under Section 1905.1.8 of the 2015 IBC. For the 2012 IBC, Section 1905.9 shall be omitted. Modifications to ACI 318 (-08, -05) D.3.3 must be applied under Section 1908.1.9 of the 2009 IBC or Section 1908.1.16 of the 2006 IBC, as applicable.

The nominal steel shear strength, V_{sr} must be adjusted by $\alpha_{V,seis}$ as given in the tables summarized in Table 1 for the corresponding anchor steel. The nominal bond strength $T_{k,cr}$ must be adjusted by $\alpha_{N,seis}$ as given in the tables summarized in Table 1 for the corresponding anchor steel.



	HIT-RE 500 injectable mortar	HIT-RE 500-50 injectable mortar
Base materials	<ul style="list-style-type: none"> Concrete (uncracked) 	<ul style="list-style-type: none"> Concrete (cracked) Concrete (uncracked)
Base material condition	<ul style="list-style-type: none"> Dry Submerged Water-filled Wet 	<ul style="list-style-type: none"> Dry Submerged Water-filled Wet
Cleaning procedures	<ul style="list-style-type: none"> Compressed-air cleaning Manual chiseling 	<ul style="list-style-type: none"> Compressed-air cleaning
Anchoring elements	<ul style="list-style-type: none"> HAS threaded rods HS-A Interim threaded inserts Rebar 	<ul style="list-style-type: none"> HAS threaded rods HS-A Interim threaded inserts Rebar
Seismic	NO	Yes
Storage and transportation temperature - min	• 41 F	• 41 F
Storage and transportation temperature - max	• 77 F	• 77 F
In-service temperature - range	• -80 • 158 F	• -80 • 158 F
Approvals / Test reports	• DOT approval (contact FHV)	• ICC-ES report (concrete)
Lead information available	Yes	Yes
Advantages	<ul style="list-style-type: none"> Long working time allows greater flexibility in installation Especially suitable for large diameter elements and/or deep embedment depths Suitable for anchoring in diamond-core holes 	<ul style="list-style-type: none"> Suitable for use in cracked and uncracked concrete with all anchoring elements Long working time allows greater flexibility in installation Seismic approval for use in seismic applications Suitable for anchoring in diamond-core holes (ICC-ES)

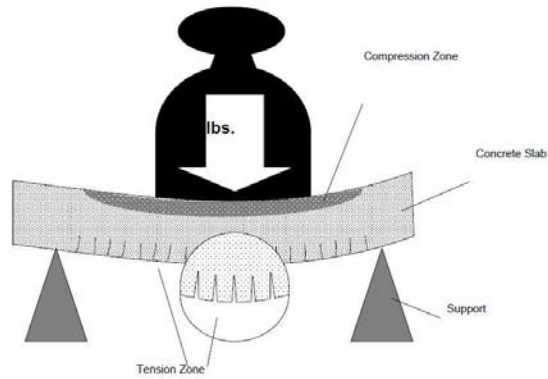


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What is cracked and uncracked concrete?



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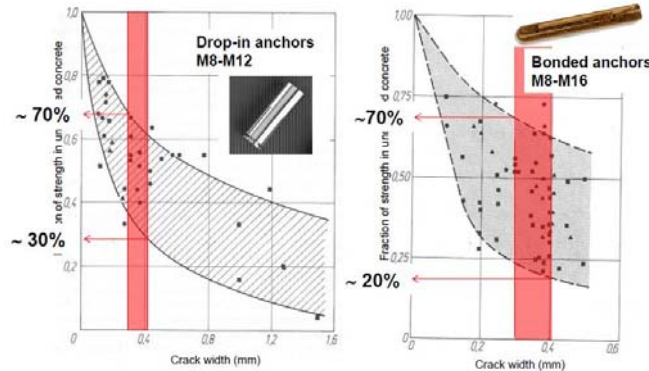
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Elgehausen, et al. 1998

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Anchors Not Suitable For IBC 2006 - Concrete

- **Drop In Anchors - Any Manufacture** 
- **HDI-P - Hilti Anchors for PT Slab** 
- **Powers Spike Anchor** 
- **Powers Drive Anchors** 
- **Tapcon Screw Anchors** 
- **No approved screw anchors yet**
- **No Shot Pins** 

www.hilti.com

ABC Hilti Safety Seminar May 8 2008



If we can't use drop-in anchors, what can we use?

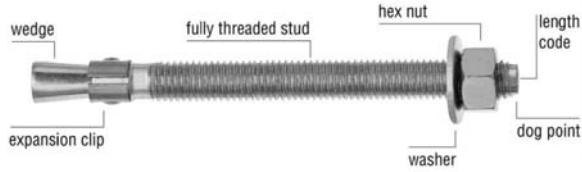


FIGURE 1—ITW RED HEAD TRUBOLT WEDGE ANCHOR

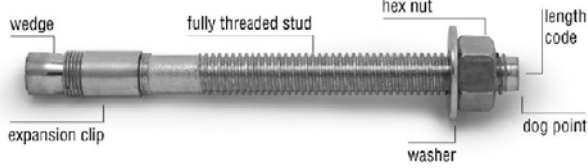


FIGURE 1—ITW RED HEAD TRUBOLT+ WEDGE ANCHOR
(Carbon and Stainless Steel)

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If we can't use drop-in anchors, what can we use?

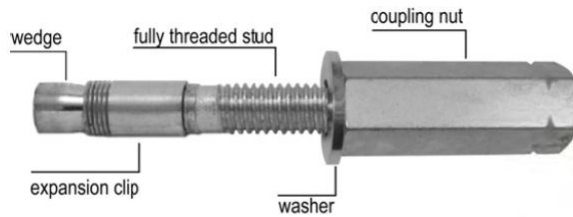


FIGURE 2—OVERHEAD TRUBOLT+ WEDGE ANCHOR

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Testing Laboratories

TRUST, BUT VERIFY



Designation: E 665 - 03 (Reapproved 1998)

Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members¹

This standard is based on the test methods of the American Institute of Architects (AIA) and the American Institute of Steel Construction, Inc. (AISC). It is intended to provide a uniform method for the measurement of the thickness and density of SFRM applied to structural members.

1. Scope
 - 1.1 These test methods cover procedures for determining thickness and density of sprayed fire-resistive material (SFRM) used in structural assemblies. These include approved test and acceptance criteria. The test methods are applicable to both laboratory and field procedures, as indicated in Section 2.
 - 1.2 These test methods require the application of SFRM in accordance with the manufacturer's published instructions. The application materials, and procedure used to apply the SFRM to the substrate shall be the same as used for the construction of either of the test assemblies described in Test Methods E 119 and E 114.
 - 1.3 There is no intent in these test methods to establish a level of performance.
 - 1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
2. Referenced Documents
 - 2.1 ASTM Standards:
 - E 84 Test Method for Surface Burning Characteristics of Building Materials
 - E 119 Test Methods for Fire Tests of Building Construction and Materials
 - E 114 Test Method for Fire Tests of Building Construction
 - 2.2 Terminology—For definitions of terms found in these test methods, refer to Terminology E 111.
 - 2.3 Definitions of Terms: Apply to This Standard:
 - 2.3.1 density—The weight per unit volume of the SFRM.
 - 2.3.2 sprayed fire-resistive material, as materials that are applied onto substrates to provide fire-protective protection of the substrates.
 - 2.3.3 STRAVAL—The distance measured from the substrate to the surface of the SFRM.
3. Terminology
 - 3.1 Definitions—For definitions of terms found in these test methods, refer to Terminology E 111.
 - 3.2 Definitions of Terms: Apply to This Standard:
 - 3.2.1 sprayed fire-resistive material, as materials that are applied onto substrates to provide fire-protective protection of the substrates.
 - 3.2.2 STRAVAL—The distance measured from the substrate to the surface of the SFRM.
4. Summary of Test Methods
 - 4.1 The basic properties of density and thickness are determined using a thickness gage, scales, steel rules, and samples.
 - 4.2 Certain properties, namely thickness and density, of SFRM are tested. It is the intent of these test methods to provide procedures to determine these properties.
5. Significance and Use
 - 5.1 Certain properties, namely thickness and density, of SFRM are tested. It is the intent of these test methods to provide procedures to determine these properties.
6. Apparatus
 - 6.1 Steel Rule, graduated in at least 1 mm (1/16 in.) intervals.
 - 6.2 Thickness Gage, consisting of a wedge of 4 mm and a sliding die perpendicular to the wedge (see Fig. 1). The die shall be of sufficient length for the thickness of the material to be measured. The gage shall be graduated in 1 mm (1/16 in.) intervals. The die shall be perpendicular to the wedge at all times and shall have a V-groove across to grip the gage at one perpendicular corner. The die diameter shall be a minimum of 25 mm (1 in.) and a maximum of 30 mm (1 1/4 in.), in points contact with the surface of the specimen to be measured. The material not readily penetrated by the depth gage, see 6.1.1, and Test 2.
 - 6.3 Scale of sufficient capacity and readability to weigh the test specimens to an accuracy of at least 0.1 g.
 - 6.4 Laboratory Fanbox of undisturbed length and width having a minimum flow of 100 and 148 m/s. The diameter shall be less than 75 mm (3 in.).
 - 6.5 Dish, or other suitable device for heating the specimens.
 - 6.6 Spring Oven, or other device capable of maintaining temperature and humidity conditions during the specimen curing cycle, in accordance with the ASTM manufacturer's requirements (see Section 7.1).
 - 6.7 Commercial Polypropylene Beads, 300 mL—Dispersion C (used with a nominal diameter of 1.6 mm (6/16 in.) diameter) or lead shot (see 6.8).
 - 6.8 Commercial Cylinder, two 350 mL.
 - 6.9 Standard Desiccative Bottle having a top diameter of 150 mm (6 in.) and a bottom diameter of 75 mm (3 in.).
 - 6.10 Bucket, 400 mL, smooth wall type.
 - 6.11 Sieve, minimum 150 mm (6 in.) long rigid straight edge.
 - 6.12 Pan—Two flat pans, minimum 150 mm (6 in.) diameter with minimum 150 mm high rim.



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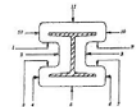


FIG. 28 Test Locations for Measuring Thickness of Fire-Resistive Materials on Beams and Columns



FIG. 29 Test Locations for Measuring Thickness of Fire-Resistive Materials on Joists (Trusses)

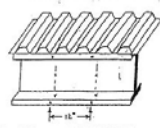


FIG. 3A Beam

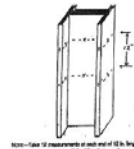


FIG. 3B Column

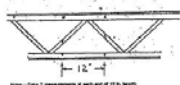


FIG. 3C Joint

8.1.6 Thickness Deficiency—An item (dock, column, beam, or joist) is deficient if:

- 8.1.6.1 An individual measured thickness is more than 6 mm (1/4 in.) less, or more than 25% less, than the required fire resistance design thickness. (See Note 3.)
- 8.1.6.2 The calculated average thickness of the SFRM is less than that required by the design.

NOTE 4—A thickness to density correction formula is contained in certain fire resistance rating criteria or is available from some SFRM manufacturers. Consult the rating criteria and the SFRM manufacturer for specific information before citing for deficiency.

NOTE 5—If an item is deficient, then only that specific item fails. The remaining items in the bay, and like items in other areas of the building, shall not be deemed to have failed solely because the tested item has failed. (See 8.1.7.)

8.1.7 Procedure in Case of Deficiency—If an item is deficient, then it shall be corrected and retested, along with another of that specific item (that is, another column, if a column, the beam, etc.) adjacent to it.

8.2 Density

8.2.1 Conduct one density test at random on each of the following specified elements, per floor or per every 300 m² (3000 sq ft), whichever provides the greater number of tests: the flat portion of the deck, a beam, either the bottom of the beam below floor or the beam web and a column, either the column web or the outside of one of the column flanges.

8.2.1.1 When dividing both the arithmetic average and minimum individual values of the fire resistance design,

Note—Take the measurements at each end of 12 in. length.

length (see Fig. 3C). (See Notes 1 and 2.)

8.1.5.2 Column—For each structural column, by end one 300 mm (12 in.) length and take twelve thickness measurements (see Fig. 28) at each end of the 300 mm length (see Fig. 28). (See Notes 1 and 2.)

8.1.5.4 Beam, Joist (Truss), and Column—As noted separately, the 12 thickness measurements for the beam, the 14 thickness measurements for the joist (truss), and the 24 thickness measurements for the column (A sample data sheet is shown in Fig. 4.) (See Notes 1 and 2.)



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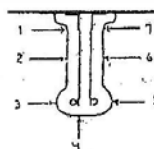


FIG. 28 Test Locations for Measuring Thickness of Fire-Resistive Materials on Beams and Columns

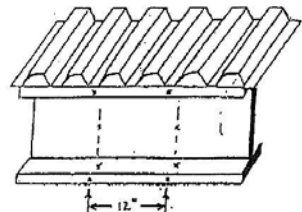
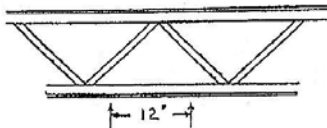


FIG. 3A Beam

length (see Fig. 3C). (See Notes 1 and 2.)

Note—Take 12 measurements at each end of 12 in. length.

FIG. 3B Column



Note—Take 7 measurements at each end of 12 in. length.

FIG. 3C Joint

8.1.6 Thickness Deficiency—An item (dock, column, beam, or joist) is deficient if:

8.1.6.1 An individual measured thickness is more than 6 mm (1/4 in.) less, or more than 25% less, than the required fire resistance design thickness. (See Note 3.)

8.1.6.2 The calculated average thickness of the SFRM is less than that required by the design.

NOTE 4—A thickness to density correction formula is contained in certain fire resistance rating criteria or is available from some SFRM manufacturers. Consult the rating criteria and the SFRM manufacturer for specific information before citing for deficiency.

NOTE 5—If an item is deficient, then only that specific item fails. The remaining items in the bay, and like items in other areas of the building, shall not be deemed to have failed solely because the tested item has failed. (See 8.1.7.)

8.1.7 Procedure in Case of Deficiency—If an item is deficient, then it shall be corrected and retested, along with another of that specific item (that is, another column, if a



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W = constant weight of dried material, kg (lb),
 l = length of the specimen, m (ft),
 w = width of the specimen, m (ft), and
 t = average thickness of the specimen, m (ft).

8.2 **Displacement Method**
 8.2.1 This is an alternative method to 8.1 for determining the in-place density of specimens with irregular surfaces or dimensions or for specimens that are difficult to remove from the substrate.
 8.2.2 The minimum sample size recommended is 131 cm³ (8 in.³).
 8.2.3 The sample shall be cut to a uniform size, removing all uneven edges.
 8.2.4 Cure the specimen in accordance with 7.1.2 or 7.2.
 8.2.5 Determine weight.
 8.2.6 **Volume Determination:**
 8.2.6.1 Place the empty 400 mL beaker in the center of the flat pan and pour the unexpanded polystyrene beads or shot through the funnel until the excess beads (shot) fall over the rim of the beaker.
 8.2.6.2 Hold the screen perpendicular to the rim of the beaker. Begin at the edge opposite the spout and screed off the excess beads (shot). One pass is all that is needed.
 8.2.6.3 Discard the overflow that collects in the pan.
 8.2.6.4 Pour all the beads (shot) remaining in the beaker into the graduated cylinders.
 8.2.6.5 Return the empty beaker into the center of the pan and pour about 100 mL of beads (shot) poured from the graduated cylinder(s) into the beaker. Do not shake the beaker in any way.
 8.2.6.6 Place the sample to be tested in the center of the beaker making sure no edge touches the side of the beaker. Tilt the sample if required.
 8.2.6.7 Pour the remainder of the beads from the graduated cylinders over the sample, leveling the excess beads (shot) over the top of the beaker into the pan. Do not touch any beads (shot) in the graduated cylinders.
 8.2.6.8 Remove the excess beads (shot) at the rim of the beaker (8.2.6.1) and return the beaker from the pan.
 8.2.6.9 Place the beaker, pour the beads (shot) into the pan into the empty graduated cylinder and read the volume displaced by the sample. Do not use or shake the graduated cylinder when reading.
 8.2.7 **Calculation of Density**—Calculate density as follows:

$$\rho = \frac{W}{V} \quad (2)$$

where:
 ρ = density in lb/ft³
 W = constant weight of dried material, g, and
 V = volume of sample dried in cm³ (equal to the volume of beads displaced by the sample).

8.4 **Density Deficiency:**
 8.4.1 An item (deck, column, beam, or joist) is deficient if:
 8.4.1.1 An individual density is less than that allowed in the Fire Resistance design.
 8.4.1.2 The calculated average density of the SFRM is less than that allowed by the respective fire resistance design. (See Notes 4 and 5.)
 8.4.2 Procedure in Case of Deficiency—See 8.1.7 and Note 3.

9. **Report**
 9.1 **Thickness**—Report the average, maximum, and minimum thickness of the test specimens, expressed in millimetres (inches).
 9.2 **Density**—Report the average, maximum, and minimum density values of the test specimens, expressed in kilograms per cubic metre (pounds per cubic foot).
 9.3 Also report the following information, as applicable:
 9.3.1 Date of test and report.
 9.3.2 Identification of the specimen (product name, manufacturer, dimensions, and other pertinent information).
 9.3.3 Description of specimen.
 9.3.3.1 Project and design specification.
 9.3.3.2 Size of test specimen.
 9.3.3.3 Detailed drawings of the specimen that provide a description of the physical characteristics, including dimensioned section profiles and any other pertinent construction details.



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W = constant weight of dried material, kg (lb),
 l = length of the specimen, m (ft),
 w = width of the specimen, m (ft), and
 t = average thickness of the specimen, m (ft).

8.3 **Displacement Method:**
 8.3.1 This is an alternative method to 8.2 for determining the in-place density of specimens with irregular surfaces or dimensions or for specimens that are difficult to remove from the substrate.
 8.3.2 The minimum sample size recommended is 131 cm³ (8 in.³).
 8.3.3 The sample shall be cut to a uniform size, removing all uneven edges.
 8.3.4 Cure the specimen in accordance with 7.1.2 or 7.2.
 8.3.5 Determine weight.
 8.3.6 **Volume Determination:**
 8.3.6.1 Place the empty 400 mL beaker in the center of the flat pan and pour the unexpanded polystyrene beads or shot through the funnel until the excess beads (shot) fall over the rim of the beaker.
 8.3.6.2 Hold the screen perpendicular to the rim of the beaker. Begin at the edge opposite the spout and screed off the excess beads (shot). One pass is all that is needed.
 8.3.6.3 Discard the overflow that collects in the pan.
 8.3.6.4 Pour all the beads (shot) remaining in the beaker into the graduated cylinders.
 8.3.6.5 Return the empty beaker into the center of the pan and pour about 100 mL of beads (shot) poured from the graduated cylinder(s) into the beaker. Do not shake the beaker in any way.

V = volume of sample dried in cm³ (equal to the volume of beads displaced by the sample).

8.4 **Density Deficiency:**
 8.4.1 An item (deck, column, beam, or joist) is deficient if:
 8.4.1.1 An individual density is less than that allowed in the Fire Resistance design.
 8.4.1.2 The calculated average density of the SFRM is less than that allowed by the respective fire resistance design. (See Notes 4 and 5.)
 8.4.2 Procedure in Case of Deficiency—See 8.1.7 and Note 3.

9. **Report**
 9.1 **Thickness**—Report the average, maximum, and minimum thickness of the test specimens, expressed in millimetres (inches).
 9.2 **Density**—Report the average, maximum, and minimum density values of the test specimens, expressed in kilograms per cubic metre (pounds per cubic foot).
 9.3 Also report the following information, as applicable:
 9.3.1 Date of test and report.
 9.3.2 Identification of the specimen (product name, manufacturer, dimensions, and other pertinent information).
 9.3.3 Description of specimen.
 9.3.3.1 Project and design specification.
 9.3.3.2 Size of test specimen.
 9.3.3.3 Detailed drawings of the specimen that provide a description of the physical characteristics, including dimensioned section profiles and any other pertinent construction details.



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Fireproofing Inspection Report

Client: Urban Engineers Project No.: 0669
Project: New Haven Railway Report No.: 001
Inspector: Brian Benson Date: 04/12/12
Subject: ASTM E-605, E-736

The writer performed a fireproofing thickness inspection on the mezzanine, floor framing in the area of C-D.6/20-23. The structural members were sprayed with Carbolite 7GP. Eight (8) beams were tested. Areas tested met or exceeded the minimum thickness requirements.

Specification from where: Approved Submittal Brand: Carbolite 7 GP
Thicknesses - Beams: Varies Columns: Varies Decking: N/A
Density: 135 pcf
Cohesive/Adhesive Force: 150 pcf

Location Beams, Columns, or Decking:	Avg. Thickness (1/16 inch)	Density (pcf)	Force (lbs)	Bond Break (psf)	Bond Break Type
1) Beam 20/C 8-C	9.7	--	--	--	--
2) Beam 20.75/C-C.8	8.9	--	--	--	--
3) Beam 21.25/C-Start	8.5	--	--	--	--
4) Beam C/22-23	5.9	--	--	--	--
5) Beam 22.5/C-C.8	7.5	--	--	--	--
6) Beam 21.75/C-Start	7.0	--	--	--	--
7) Beam 21.25/C 8-D.6	9.8	--	--	--	--
8) Beam 20/C 8-D.6	9.8	--	--	--	--



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9. Report

9.1 Thickness—Report the average, maximum, and minimum thickness of the test specimens, expressed in millimetres (inches).

9.2 Density—Report the average, maximum, and minimum density values of the test specimens, expressed in kilograms per cubic metre (pounds per cubic foot).

9.3 Also report the following information, as applicable:

9.3.1 Date of test and report.

9.3.2 Identification of the specimen (product name, manufacturer, dimensions, and other pertinent information).

9.3.3 Description of specimen.

9.3.3.1 Project and design specification.

9.3.3.2 Size of test specimen.

9.3.3.3 Detailed drawings of the specimen that provide a description of the physical characteristics, including dimensioned section profiles and any other pertinent construction details.



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Spray Applied Fire Resistive Materials Test Results

Date	Report No.	Location of Beam, Column or Ceiling	Floor/Story Level	Member Size	Ryng (Inch)	Identify and		Bond Strength (psi)		Fire-resistance (minutes)				Comments	
						Tested	Pass/Fail	Tested	Pass/Fail	Design	Avg. Tester	Pass/Fail	Min. Tester		Pass/Fail
04/13/12	001	Beam 20-25C-E	Mezzanine	W18x20	1					0.48	0.61	Pass	0.44	Pass	
04/13/12	001	Beam 20-25C-C	Mezzanine	W18x20	1					0.48	0.68	Pass	0.44	Pass	
04/13/12	001	Beam 21-25C-20W	Mezzanine	W12x10	1					0.48	0.53	Fail	0.39	Fail	
04/13/12	001	Beam 20-25C-E	Mezzanine	W18x20	1					0.39	0.37	Fail	0.13	Fail	
04/13/12	001	Beam 20-25C-C	Mezzanine	W18x20	1					0.48	0.47	Fail	0.13	Fail	
04/13/12	001	Beam 21-25C-10W	Mezzanine	W12x10	1					0.48	0.44	Fail	0.13	Fail	
04/13/12	001	Beam 21-25C-E-0-6	Mezzanine	W18x20	1					0.48	0.61	Pass	0.39	Pass	
04/13/12	001	Beam 20-25C-E-0-6	Mezzanine	W18x20	1					0.48	0.61	Pass	0.38	Pass	
04/13/12	002	Beam 22-45C-E	Second	W18x20	1					0.48	0.41	Fail	0.19	Fail	
04/13/12	002	Beam 20-25C-E	Second	W18x20	1					0.48	0.38	Fail	0.19	Fail	
04/13/12	002	Beam 20-25C-E-0-6	Second	W18x20	1					0.48	0.44	Fail	0.20	Fail	
04/13/12	002	Beam 21-25C-E-0-6	Second	W18x20	1					0.48	0.46	Fail	0.24	Fail	
04/13/12	002	Column C-20	Second	W14x53	2					1.32	1.01	Fail	0.44	Pass	
04/13/12	002	Column C-20	Second	W14x53	2					1.38	1.08	Pass	0.84	Pass	
04/13/12	002	Column C-20	Third	W14x53	2					1.32	1.01	Fail	0.19	Fail	
04/13/12	002	Column F-2019-7	Third	W14x53	2					1.38	1.05	Fail	0.81	Fail	
04/13/12	002	Column F-2019-7	Third	W14x53	2					1.50	0.93	Fail	0.59	Fail	
04/18/12	004	Column C-20	Second	2	20-8	Pass	261	Pass							
04/18/12	005	Beam 20-25C-C-8	Mezzanine	3	22-2	Pass	330	Pass							
04/18/12	005	Beam 20-25C-E-0-6	Mezzanine	1	24-8	Pass	365	Pass							
04/18/12	003	Beam 22-75C-E	Third	W18x20	1					0.48	0.59	Pass	0.38	Pass	
04/18/12	003	Beam 21-25C-C	Third	W12x10	1					0.48	0.43	Fail	0.09	Fail	
04/18/12	003	Beam 20-25C-E	Third	W18x20	1					0.48	0.54	Pass	0.38	Pass	
04/18/12	003	Beam 19-25C-E	Third	W18x20	1					0.48	0.47	Pass	0.26	Fail	
04/18/12	003	Beam 19-25C-E	Third	W18x20	1					0.47	0.54	Pass	0.38	Pass	
04/18/12	003	Beam 17-25C-D	Third	W18x35	1					0.42	0.50	Pass	0.30	Pass	
04/18/12	003	Beam 0-7-11	Third	W24x55	1					0.37	0.52	Pass	0.31	Pass	
04/18/12	003	Beam 11-25C-E	Third	W18x20	1					0.48	0.68	Pass	0.38	Pass	
04/18/12	003	Beam 18-25C-E	Third	W18x20	1					0.48	0.58	Pass	0.38	Pass	
04/18/12	004	Beam 18-25C-E-0-6	Third	W18x20	1					0.48	0.66	Pass	0.38	Pass	
04/18/12	004	Beam 20-25C-E-0-6	Third	W18x20	1					0.48	0.55	Pass	0.38	Pass	
04/18/12	004	Beam 21-25C-E-0-6	Third	W18x20	1					0.48	0.54	Pass	0.38	Pass	
04/18/12	004	Beam 22-25C-E-0-6	Third	W18x20	1					0.48	0.54	Pass	0.13	Fail	
04/18/12	004	Beam 21-25C-E	Third	W18x20	1					0.37	0.30	Fail	0.13	Fail	
04/18/12	004	Beam 20-25C-E-2	Third	W24x55	1					0.37	0.45	Pass	0.13	Fail	
04/18/12	004	Beam 19-25C-E	Third	W24x55	1					0.37	0.48	Pass	0.31	Pass	
04/18/12	004	Beam 18-25C-E-2	Third	W18x35	1					0.42	0.41	Fail	0.13	Fail	
04/18/12	004	Beam 18-25C-E	Third	W18x35	1					0.42	0.45	Pass	0.09	Fail	
04/18/12	004	Beam 17-25C-E	Third	W18x35	1					0.42	0.42	Pass	0.13	Fail	
04/18/12	004	Beam 18-25C-E-Corridor	Third	W18x35	1					0.48	0.39	Fail	0.00	Fail	



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Designation: E 605 - 93 (Reapproved 1998)

Standard Test Methods for
Thickness and Density of Sprayed Fire-Resistive Material
(SFRM) Applied to Structural Members¹

This standard is based on the first designation E 605. Its number (reapproved) following the designation indicates the year of original adoption, or the year of last revision, or the year of last approval, as shown in parentheses before the year of last approval. A separate edition indicates an edition whose date is not shown or is not applicable.

- Scope
 - These test methods cover procedures for determining thickness and density of sprayed fire-resistive material (SFRM) used in structural assemblies. These include sprayed fire and alternative types. The test methods are applicable to both laboratory and field procedures, as indicated in Section 7.
 - These test methods require the application of SFRM in accordance with the manufacturer's published instructions. The application materials and procedure used to apply the SFRM for laboratory tests shall be the same as is used for the construction of either of the test assemblies described in Test Methods D 119 and D 114.
 - There is no intent in these test methods to establish levels of performance.
 - This standard does not purport to address all of the safety concerns if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
- Referenced Documents
 - ASTM Standards:
 - D 114 Test Method for Surface Burning Characteristics of Building Materials²
 - D 119 Test Methods for Fire Tests of Building Construction and Materials²
 - E 631 Terminology of Building Construction³
 - Terminology
 - Definitions—For definitions of terms found in these test methods, refer to Terminology E 631.
 - Definitions of Terms Specific to This Standard
 - Density, ρ —the weight⁴ per unit volume of the SFRM.
 - Applied fire-resistive material, a —material that are applied onto substrate to provide fire-resistive protection of the substrate.
 - Thickness, t —the distance measured from the substrate to the outer surface of the SFRM.
- Significance and Use
 - Correct properties, namely thickness and density, of SFRM are tests. It is the intent of these test methods to provide procedures to determine these properties.
 - Appearance
 - Steel Rods, galvanized to at least 1 mil (25.4 μ m) thickness.
 - Thickness Gage, consisting of a needle or pin and a sliding disk, perpendicular to the needle (see Fig. 1). The pin shall be of sufficient length for the thickness of the material to be measured. This pin shall be graduated in 1 mm (1/16 in.) intervals. This disk shall be perpendicular to the needle at all times and shall have a flange device to grip the pin unless purposely moved. The disk diameter shall be a minimum of 75 mm (3 in.) and a maximum of 85 mm (3 1/4 in.), to permit contact with the surface of the specimen to be measured. Fire materials not readily penetrated by the depth gage, see 8.1.2.1 and Note 2.
 - Quality of sufficient capacity and sensitivity to weigh the test specimens to an accuracy of at least 0.1 g.
 - Accelerometer, Template of predetermined length and width having a minimum area of 110 mm² (4 1/8 in.²). The dimension shall be less than 76 mm (3 in.).
 - Unexpanded Polystyrene Beads, 500 μ m—Designation C Bead with a nominal diameter of 1.0 mm (3/16 in.) (nominal) or real size—size #8 (alternates).
 - Graduated Cylinders, two 150 cm³.
 - Funnel—Polypropylene funnel having a top diameter of 150 mm (6 in.) and a bottom diameter of 75 mm (3 in.).
 - Beaker, 400 mL, smooth wall type.
 - Sieve, minimum 150 mm (6 in.) 304 right straight edge.
 - Pen—Two flat pens minimum 150 mm (6 in.) diameter with minimum 150 mm (6 in.) length.

These ASTM standards are expensive.
Possible sources:

- The testing lab
- The product manufacturer



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Testing Laboratories

TRUST, BUT VERIFY

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KEEP TRACK OF UNRESOLVED ISSUES

- Special Inspector?
- Building Department?
- _____ ?

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BIG NAME CORPORATION, INC.

SUMMARY of SPECIAL INSPECTION ISSUES

Number	Issue	Date	Notification	Description	Status	Anticipated Action Date	Remarks	Bill To Court
E2	Incomplete HVAC hanger support details			This is an expansion of open item number 54. Submittals received and revised to date do not provide sufficient information regarding both size and spacing of hangers to allow Urban's inspector to determine whether or not support of HVAC ductwork and hydronic piping is adequate to resist seismic design forces. Submittals have included individual components but have not included calculations to document that the installed conditions will sustain seismic loads as required by the State Building Code and its reference standards.	Delegated design engineer to issue final sign-off	Unknown	Delegated design engineer has indicated that layout drawings supersede original design calculations.	Arch.
E3	Incomplete Plumbing hanger support details			This is an expansion of open item number 54. Submittals received and revised to date do not provide sufficient information regarding both size and spacing of hangers to allow Urban's inspector to determine whether or not support of plumbing piping is adequate to resist seismic design forces. Submittals have included individual components but have not included calculations to document that the installed conditions will sustain seismic loads as required by the State Building Code and its reference standards.	Delegated design engineer to issue final sign-off	Unknown	Delegated design engineer has indicated that layout drawings supersede original design calculations.	Eng'r
E4	Incomplete Electrical hanger support details			This is an expansion of open item number 54. Submittals received and revised to date do not provide sufficient information regarding both size and spacing of hangers to allow Urban's inspector to determine whether or not support of electrical conduit, raceways and similar equipment is adequate to resist seismic design forces. Submittals have included individual components but have not included calculations to document that the installed conditions will sustain seismic loads as required by the State Building Code and its reference standards.	Delegated design engineer to issue final sign-off	Unknown	Delegated design engineer has indicated that layout drawings supersede original design calculations.	Owner

9/22/2015

Unresolved Issues Summary Page 1 of 2



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Project Close-Out: Required Documents

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*.



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Final Report of Special Inspections

Project:
Location:
Owner:
Owner's Address:
Architect of Record:
Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the Statement of Special Inspections submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector:

(Type or print name)

Signature Date



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Final Report of Special Inspections

Agent's Final Report

Project:
Agent:
Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the Statement of Special Inspections submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

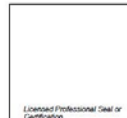
(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date





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* 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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1704.5 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 1702.

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.

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(Add) **111.1.4 Statement of professional opinion.** Pursuant to section 29-276c of the Connecticut General Statutes, no certificate of occupancy shall be issued for a proposed structure or addition to buildings classified as (1) assembly, educational, institutional, high hazard, transient residential, which includes hotels, motels, rooming or boarding houses, dormitories or similar buildings, other than residential buildings designed to be occupied by one or more families, without limitation as to size or number of stories; (2) business, factory and industrial, mercantile, moderate and low hazard storage, having three stories or more or exceeding 30,000 square feet total gross area; and (3) nontransient residential dwellings having more than 16 units or 24,000 square feet total gross area per building, until the building official has been provided with a **statement signed by the architect or professional engineer and the general contractor stating that the completed structure or addition is in substantial compliance with the approved plans on file.**

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Questions

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