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# Special Inspections

by

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Course Outline:

Types of Inspections  
IBC Chapter 17  
What Requires a Special Inspection?  
Statement of Special Inspections  
Role of Building Official  
Approved Agencies  
Special Inspectors  
Special Inspections and Tests  
Seismic Special Inspections  
Structural Observations  
Reporting  
Helpful References  
Examination





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Engineer's Review

Also, the registered design professional in responsible charge (also called the engineer of record) must review the completed construction to confirm acceptance. Signed record drawings are often required for the certificate of occupancy, permit closures, and other close-out procedures. Often a statement of acceptance from the engineer of record) is required for the building official to close out the permit. This is often called an Engineering Affidavit or Certificate of Final Acceptance (as shown below). These final acceptance procedures may or may not require a final report of special inspections depending on the needs of the project and building official.

<b>CERTIFICATE OF FINAL ACCEPTANCE</b>		
Project Name: _____	A&E #: _____	
Location: _____	Date: _____	
<b>To: MONTANA DEPARTMENT OF ADMINISTRATION ARCHITECTURE AND ENGINEERING DIVISION 1520 E. SIXTH AVENUE, P.O. BOX 200103 HELENA MT 59620-0103</b>		
Architect/Engineer: _____ _____		
Contractor: _____ _____	Contract Date: _____	Contract Amount: _____
<small>The Work performed under this Contract has been reviewed and found to be complete and has reached Final Acceptance. The Date of Final Acceptance of the Work is defined as the Date Certified by the Architect/Engineer upon which the Work is fully complete in all aspects, <b>and</b> which the Owner accepts the Contractor's work as complete. The Date of Final Acceptance of the Project, or portion thereof designated above, is also the basis for commencement of the DURATION of applicable warranties required by the Contract Documents. The Warranty Period is defined in the Contract Documents as commencing with Substantial Completion(s) and continuing for one (1) calendar year from the Date of Final Acceptance. This date shall correspond to the date of the Architect/Engineer's approval on the final pay application unless otherwise agreed upon in writing. In the event of a disparity between the date of the Architect/Engineer's approval and this form, if no other written agreement exists as to the date of final acceptance, this form shall constitute such agreement and it shall govern as the date of Final Acceptance.</small>		
Date of Substantial Completion:	Date of Final Acceptance:	Date of Warranty Expiration:

Representative Observations

Many owners elect to have an onsite construction representative to observe construction activities, document daily work progress, review pay applications, and coordinate work by others. These ongoing observations are not formal inspections.



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### Special Inspections

Special inspections are required for critical structural, fire, and life-safety installations. They are to be performed by a qualified and approved “special inspector”, as defined in IBC Chapter 17, and as amended by each state.

Special inspection work typically involves the following activities:

- Identifying components requiring special inspection and structural observations
- Create a statement of special inspections
- Secure one or more agencies with qualified inspectors and tests
- Submit to the building department and gaining approval of the building official
- Inspectors review project documents including drawings, specifications, permits, and approved shop drawing submittals
- Perform periodic and continuous special inspections
- Perform structural observations as required
- Perform special testing as required and review results
- Issue special inspection reports
- Issue a final statement

Special inspections do not take the place of building inspections or an engineer’s review. Special inspections are generally in addition to those standard requirements.

### Structural Observations

Certain structural installations require frequent observations from a registered professional engineer or architect, ideally the engineer responsible for the structural design. These observations are in addition to (not in place of) required building inspections and other special inspections. Structural observation requirements are specified in IBC 1704.6 and are typically treated as a type of special inspection.



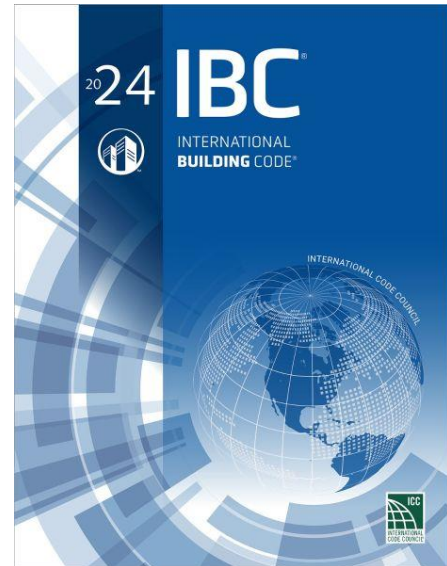
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## **IBC Chapter 17**

The International Building Code (IBC) by the International Code Council (ICC) is the governing document for special inspection requirements. The IBC is adopted in all 50 states, Canada, and many other countries. Many states have amendments with additional special inspection requirements.

When the IBC was formed in 2000, it was a merging of the following codes which are now discontinued:

- Uniform Building Code (UBC)
- BOCA National Building Code (BOCA/NBC)
- Standard Building Code (SBC)



The IBC is updated every three years. The IBC requirements for special inspections are in Chapter 17 entitled “Special Inspections and Tests”. Table 1 lists the Chapter 17 contents with section and subsection names.

These are the three main sections of Chapter 17:

- 1703 – Approvals
  - Requirements for an “approved agency” to be identified and approved to perform special inspection work
- 1704 – Special Inspections and Tests, Contractor Responsibility and Structural Observation
  - Lists exceptions that don’t require special inspections
  - Inspector qualifications
  - Statement of Special Inspections requirements
  - Contractor responsibilities
  - Submittals to building official
  - Structural observation requirements
- 1705 – Required Special Inspections and Tests
  - Details the types of construction requiring special inspections including steel, concrete, masonry, wood, foundations, and fire protection items.



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Table 1: Contents of IBC 2021 Chapter 17 “Special Inspections and Tests”			
Section	Section Name	Subsect.	Sub-Section Name
1701	General	1701.1	Scope.
1702	New Materials	1702.1	Scope.
1703	Approvals	1703.1	Approved agency.
		1703.2	Written approval.
		1703.3	Record of approval.
		1703.4	Performance.
		1703.5	Labeling.
		1703.6	Evaluation and follow-up inspection services.
1704	Special Inspections and Tests, Contractor Responsibility and Structural Observation	1704.1	General.
		1704.2	Special inspections and tests.
		1704.3	Statement of special inspections.
		1704.4	Contractor responsibility.
		1704.5	Submittals to the building official.
		1704.6	Structural observations.
1705	Required Special Inspections and Tests	1705.1	General.
		1705.2	Steel construction.
		1705.3	Concrete construction.
		1705.4	Masonry construction.
		1705.5	Wood construction.
		1705.6	Soils.
		1705.7	Driven deep foundations.
		1705.8	Cast-in-place deep foundations.
		1705.9	Helical pile foundations.
		1705.10	Structural integrity of deep foundation elements.
		1705.11	Fabricated items.
		1705.12	Special inspections for wind resistance.
		1705.13	Special inspections for seismic resistance.
		1705.14	Testing for seismic resistance.
		1705.15	Sprayed fire-resistant materials.
		1705.16	Mastic and intumescent fire-resistant coatings.
		1705.17	Exterior insulation and finish systems (EIFS).
		1705.18	Fire-resistant penetrations and joints.
		1705.19	Testing for smoke control.
		1705.20	Sealing of mass timber.
1706	Design Strengths of Materials	1706.1	Conformance to standards.
		1706.2	New materials.
1707	Alternative Test Procedure	1707.1	General.
1708	In-Situ Load Tests	1708.1	General.
		1708.2	In-situ load tests.
1709	Preconstruction Load Tests	1709.1	General.
		1709.2	Load test procedures specified.
		1709.3	Load test procedures not specified.
		1709.4	Wall and partition assemblies.
		1709.5	Exterior window and door assemblies.
		1709.6	Skylights and sloped glazing.
		1709.7	Test specimens.





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Referenced Standards

Chapter 17 lists several “referenced standards” rather than describing detailed material and test requirements. The applicable portions of these referenced standards are enforceable as part of the IBC. The referenced standards are as follows:

- AAMA/WDMA/CSA 101/IS2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights
- AAMA 2502 - Comparative Analysis Procedure for Window and Door Products
- ACI 318 - Building Code Requirements for Structural Concrete
- ACI 550 - Code Requirements for the Design of Precast Concrete Diaphragms for Earthquake Motions
- AISC 360 - Specification for Structural Steel Buildings
- AISC 341 - Seismic Provisions for Structural Steel Buildings
- ANSI/MH 16.1 - Industrial Steel Storage Racks
- ANSI/DASMA 108 - Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors
- ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures
- ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort
- ASTM D4945 - High-Strain Dynamic Testing of Deep Foundations
- ASTM D5882 - Low Strain Impact Integrity Testing of Deep Foundations
- ASTM D6760 - Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing
- ASTM D7949 - Thermal Integrity Profiling of Concrete Deep Foundations
- ASTM E330 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- ASTM E605 - Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
- ASTM E736 - Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
- ASTM E1886 - Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- ASTM E1996 - Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
- ASTM E2174 - On-Site Inspection of Installed Firestop Systems





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- ASTM E2393 - On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- ASTM E2570 - Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage
- AWC 12-B – Testing and Inspection of Thin-Film Intumescent Fire-Resistive Materials
- AWS D1.4 – Structural Welding Code – Reinforcing Steel
- SJI – Steel Joint Institute Standard Specifications
- TMS 402 - Building Code Requirements for Masonry Structures
- TMS 602 - Specification for Masonry Structures

A more complete list of referenced standards in all Chapters of the IBC is listed in IBC Chapter 35 entitled “Referenced Standards”. IBC Chapter 17 also makes reference to other IBC Chapters which have requirements that apply to special inspection work.



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**What Requires a Special Inspection?**

IBC 1705 lists the following specific types of construction requiring special inspections:

- Steel construction:
  - Structural steel, structural welds, and high-strength bolts, per 1705.2.1
  - Cold-formed steel deck, per 1705.2.2
  - Open web steel joints and joist girders, per 1705.2.3
  - Cold-formed steel trusses 60 ft span and greater, per 1705.2.4
- Concrete construction, per 1705.3:
  - Exceptions include footings of most buildings three stories or less, and nonstructural slabs on grade, patios, driveways, and sidewalks.
- Masonry construction, per 1705.4:
  - Exceptions include empirically designed masonry, glass unit, and masonry veneer designed per IBC 2109, 2110 or Chapter 14 in risk category I, II or III. Also, foundation walls, fireplaces, heaters, chimneys designed per IBC.
- Wood:
  - High-load diaphragms, per 1705.5.1
  - Metal-plate-connected wood trusses 60 ft span and greater, per 1705.5.2
  - Mass timber elements in Types IV-A, IV-B, and IV-C, per 1705.5.3
- Soils, verify per geotech report and construction documents, per 1705.6:
  - Soil below shallow foundations
  - Excavations to proper depth and material
  - Classify compacted fill, fill placement, densities, and lift thickness
  - Subgrade prior to placing compacted fill
- Foundations
  - Driven deep piles, per 1705.7
  - Cast-in-place piles (drilled piers), per 1705.8
  - Helical piles, per 1705.9
  - Other deep foundation elements, per 1705.10
- Wind resistant elements, per 1705.12.1 to 12.3
- Seismic resistant elements, per 1705.13.1 to 13.9, and 14.1 to 14.4
- Sprayed fire-resistant materials, per 1705.15.1 to 15.6
- Mastic and intumescent fire-resistant coatings, per 1705.16
- Exterior insulation and finish systems (EIFS), per 1705.17
- Fire-resistant penetrations and joints, per 1705.18
- Smoke control systems, per 1705.19
- Prefabricated structural assemblies, per 1704.2.5



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Special cases need special inspections as determined by the building official per 1705.1.1, including:

- Alternatives to IBC specified construction materials and systems
- Unusual design applications with IBC specified materials
- Manufacturer's installation instructions vary from IBC standards

### Risk Category Impact

The Risk Category of a building or structure has an impact on the need for some special inspections in these areas:

- Structural observations are required for any structure classified as Risk Category III or IV, per IBC 1704.6.1.
- Glass unit masonry or masonry veneer designed per IBC 2109, 2110, or Chapter 14, do NOT require special inspections when classified as Risk Category I, II or III, per IBC 1705.4.
- Glass unit masonry or masonry veneer always require special inspections and tests when part of a structure classified as Risk Category IV, per IBC 1705.4.1.
- Fire-resistant penetrations and joints in high-rise buildings (height over 75 feet above base) require special inspections for buildings assigned to Risk Category III, IV, or fire areas containing Group R occupancies with an occupant load greater than 250, per IBC 1705.18.

Risk categories I, II, III, and IV are defined in IBC 1604.5.

### Exceptions

Per IBC 1704.2, special inspections and tests are NOT required for the following applications:

- The building official can waive special inspections for construction of a minor nature or due to conditions of the local jurisdiction.
- Group U occupancy (utility and miscellaneous) structures that are accessory to a residential occupancy, such as a farmhouse. Examples may include agricultural buildings, barns, stables, silos, livestock shelters, greenhouses, sheds, carports, private garages, fences, and retaining walls.
- Conventional light-frame construction (wood or cold-formed steel), such as most residential houses.

Other than these exceptions, practically all buildings require special inspections.



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### **Statement of Special Inspections**

Per IBC 1704.3.1, whenever special inspections or tests are required, the registered design professional in responsible charge shall prepare a “statement of special inspections”. As an exception, another qualified person approved by the building official may prepare the statement of special inspections.

The statement is to be submitted by the permit applicant (owner or contractor) to the building official. Often the statement is included in the project specifications or on a plan drawing, since those documents must be submitted to the building department prior to issuance of the construction/building permit.

### **Statement Contents**

The main purpose of the statement is to list all the special inspections and tests required for the project. IBC 1704.3.1 states a statement of special inspections must identify the following:

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

Often the jurisdiction will have a special inspections form with a schedule of inspections which must be filled out, signed, and submitted. See Figure 2 for an example. The California Division of the State Architect website has an online tool that helps identify required special inspections and tests (see web address in Helpful References).

### **Seismic Inspections**

Per IBC 1704.3.2, whenever special inspections or tests for seismic resistance are required, the statement of special inspections shall identify the SFRS and/or designated seismic systems (as defined in previous section) which are subject to the special inspections or tests.



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Wind Inspections

Per IBC 1704.3.3, whenever special inspections for wind resistance are required, the statement of special inspections shall identify the main windforce-resisting systems and wind-resisting components that are subject to special inspections.

Exception

A statement of special inspections is NOT required for conventional light-frame construction (wood or cold-formed steel), such as most residential houses.

MATERIAL/ACTIVITY	TYPE OF INSPECTION	Y/N
Structural steel – materials	Material identification markings and review of Certificate of Compliance	
Structural steel details – installation	Inspection of member locations, structural details for bracing, connections, stiffening	
Weld filler materials and welder certification	Review of identification markings, certificate of compliance, and welder certifications	
Welds	Inspection and testing of welds	
Cold-formed steel trusses spanning 60’ or greater	Inspection of temporary and permanent restraints/bracing	
<b>WOOD</b>		
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures**	
Metal plate connected wood/metal trusses spanning 60’ or more	Approved bracing with submittal	
High-Load Diaphragms- Installation	Review submittal and as-built assemblies; Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing.	
<b>SPRAYED CEMENTITIOUS AND MINERAL FIBER FIRE RESISTIVE MATERIAL</b>		
Structural member surface conditions	Field Review of surface conditions prior to application	
Application/thickness	Field review of application operations and thickness	
Mastic & Intumescent Fire- Resistant Coating	Field review of application operations and thickness	

Figure 2: Example schedule of inspections from a County special inspection form.  
Source: public domain



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### **Role of Building Official**

Building officials are employed by the local jurisdiction responsible for code enforcement, such as the City or County Building Department. A building official oversees the staff and processes related to plan review, permit issuance, building inspections, issues certificates, and other tasks related to enforcing the building code.

Concerning special inspections, the building official has the following minimum responsibilities per IBC Chapter 17:

- Confirm approved agency meets requirements of IBC 1703.1 through 1703.1.3
- Confirm proposed special inspectors are acceptable, per IBC 1704.2.1
- Keep records of approved documents, per IBC 1703.3
- Approval of fabricators where work is done on premises, per IBC 1704.2.5.1
- Make final decision on “special cases” that require special inspections, per IBC 1705.1.1
- Make final decision on acceptable “alternative test procedures” for new material and assemblies, per IBC 1707.1
- Receive and review the following documents (see Reporting section):
  1. Statement of special inspections
  2. Structural observation plan statement
  3. Special inspector qualifications
  4. Statement of responsibility (from Contractor)
  5. Special inspection reports
  6. Special inspection test results
  7. Certificates of compliance
  8. Special reports
  9. Final special inspection report



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### Approved Agencies

Special inspectors must be employed by an inspection agency. The agency becomes an “approved agency” on a project-by-project basis. To qualify, the agency must meet the following minimum requirements, per IBC 1703.1:

- Objective and competent
- Independent from the contractor responsible for the construction work
- Possess adequate and calibrated equipment to perform tests
- Employ experienced personnel (inspectors) educated in conducting, supervising, and evaluating tests and special inspections

Registered design professionals in responsible charge are permitted to act as the approved agency and staff working under their direct supervision are allowed to act as special inspectors, provided they qualify to perform inspections, per IBC 1704.2.1.

### Employing an Agency

Per IBC 1703.1 and 1704.2, the owner or an owner authorized agent (engineering firm, consultant, etc.) shall employ approved agencies to provide any required special inspections and tests. The construction contractor shall not employ the approved agencies. If the owner is self-performing construction and thus acting as the contractor, then the owner/contractor can employ the approved agencies.

### Agency Approval

An agency becomes an “approved agency” once the building official approves them for the project. Sometimes building officials will have a list of pre-qualified agencies. However, the owner or their agent must still indicate which agencies are being proposed for the project and gain building official approval.







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### Multiple Agencies

Often there are multiple approved agencies in order to cover the combination of inspection and testing work on a project. Here are possible arrangements:

- A single approved agency will have multiple special inspectors on staff, each with different qualifications, and special testing capabilities. In this case, a single approved agency would provide all the special inspections and tests for a project.
- One approved agency provides inspection services while a second approved agency provides testing services.
- A self-employed engineer acts as both the approved agency and the special inspector.
- The structural engineer of record acts as the approved agency and other staff under their supervision provide inspection services. A second approved agency provides for testing services.

### Agency Accreditation

Although not required by IBC, some jurisdictions require approved agencies be accredited to one of the following standards:

- ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
- ISO 17020 - Conformity Assessment – Requirements for The Operation of Various Types of Bodies Performing Inspection
- ISO 17025 - General Requirements for the Competence of Testing and Calibration Laboratories

There are recognized accreditation organizations, like ANAB (ANSI National Accreditation Board) that can perform an assessment on the inspection agency and provide an accreditation. The assessment evaluates inspection agency compliance with the requirements of IBC Chapter 17, ASTM E329, and ISO 17020. ANAB accreditation provides objective, independent evidence of compliance for the owner to select the agency and for the building official to approve the agency.



Some municipalities have their own special inspection program with specific procedures and requirements. Inspections agencies must register with the program in order to qualify as an approved agency for a project within the municipal jurisdiction. Examples include New York City, Philadelphia, and the State of Washington.



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### **Special Inspectors**

Special inspectors perform the onsite inspection work. Each inspector must be employed by an “approved agency” for the project. Proposed special inspectors and their qualifications are to be provided to the building official prior to beginning construction, per IBC 1704.2.1.

### **Multiple Inspectors**

The following are some reasons there may be multiple special inspectors for a project:

- To provide coverage over the span of the construction project.
- The project includes different construction types and there is no single inspector that is qualified in all the areas.
- There are multiple construction crews doing work requiring special inspections, so two inspectors are needed on some days.
- The original special inspector is no longer available.

### **Inspector Qualifications**

IBC 1704.2 lists the following qualifications for special inspectors that should be presented to the building official to show competence:

- Relevant experience
- Relevant training

The experience or training must be:

- Documented,
- Of similar complexity to the project, and
- Same type of construction or material qualities.

### **Certifications**

The IBC does not require special inspectors to be certified, however some local jurisdictions do require it. Either way, obtaining certification can help meet the IBC qualification requirements, especially if the certification is for the same type of construction to be inspected (steel, wood, soils, etc.).



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The following is a list of recognized certifications available

- ACI – American Concrete Institute
- ASNT – American Society for Nondestructive Testing
- AWS – American Welding Society
- BIA – Brick Industry Association
- DSA – Division of State Architect, State of California
- ICC – International Code Council
- IFC – International Firestop Council
- NCMA – National Concrete Masonry Association
- NICET – National Institute for Certification in Engineering Technologies
- PCI – Precast/Prestressed Concrete Institute
- PTI – Post-Tensioning Institute

**ICC** Special Inspector Certifications are the most recognized in the industry, with the following categories available:

- 47 Reinforced Concrete
- 84 Structural Masonry
- 86 Spray-applied Fireproofing
- 92 Prestressed Concrete
- 93 Tall Mass Timber Buildings
- EC Soils
- S1 Structural Steel and Bolting (see certificate on right)
- S2 Structural Welding
- MSI Master of Special Inspection



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## **Special Inspections and Test**

### IBC Requirements

Inspection tasks are based on the following:

- Requirements described in IBC 1705 to 1709,
- Requirements in applicable sections of standards referenced in IBC 1705 to 1709, and
- Relevant requirements listed in the contract documents (drawings and specifications).

The registered design professional determines the applicable special inspections and tests, then lists them in the “statement of special inspections” for approval by the building official.

Table 2 lists common inspections and tests required in IBC Chapter 17 according to construction type.

### Visual Inspections

Special inspections typically involve reviewing the materials, fabrication, formwork, and installation of critical components to confirm compliance with construction documents.

### Checklists

It is common to utilize inspection checklists to help ensure important quality reviews are performed. Completed checklists can be attached to special inspection reports. See Table 3 for an example checklist.



Source: Author



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Table 2: Common Special Inspections and Tests			
Section	Construction Type	Visual Inspections	Tests
1705.2	Steel	Integrity of framing welds Joints and connections High-strength bolts, nuts, washers Locations of bracing and stiffeners Cold-formed steel trusses spanning 60' or greater	Weld smoothness test Weld dye-penetration test High-strength bolt torque test and material Steel material check (magnet, spark, hardness)
1705.3	Concrete	Formwork Reinforcing steel Prestress tendons and grouting Anchor bolts Concrete placement and vibration Confirm concrete design mix Curing methods	Plumb and level check of forms Anchor bolt testing Strength test (concrete cores, break test) Slump test Air content test Temperature test
1705.4	Masonry	Mortar joint materials and placement Grout placement and space Reinforcement size, spacing, welding Prestressing techniques and force Anchor bolts	Masonry prism test Anchor bolt testing
1705.5	Wood	High-load diaphragms Framing members at panel edges Sheathing thickness and material Nail and staple diameter, length, and spacing Wood trusses spanning 60' or greater	Bend, compression or tension test Ultrasound test Visible light distortion Bolt torque test
1705.6	Earthwork (Soils)	Soil smell, color, texture, and aggregate type Fill quality visual inspection Inspect subgrade prior to concrete placement	Soil classification test Bearing capacity test, standard penetration test In-place density/compaction test Test subgrade prior to concrete placement



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1705.7	Driven deep foundations	Materials Size, Diameter, Length, Depth Placement technique Plumbness Embeddedness	Material test Load test Steel pile testing per 1705.2 Concrete pile testing per 1705.3 Specialty pile testing per design professional
1705.8	Cast-in-place deep foundations		
1705.9	Helical pile foundations		
1705.10	Structural integrity of deep foundation elements		
1705.11	Prefabricated items	In-plant inspection of fabrication Quality control procedures review	In-plant tests per applicable sections
1705.15	Sprayed fire-resistant materials	Surface preparation Extent of coverage	Thickness Density
1705.16	Mastic and intumescent fire-resistant coatings	Material check Number of coats	Coating thickness
1705.17	Exterior insulation and finish systems (EIFS)	Material check Installation technique	Thickness
1705.18	Fire-resistant penetrations and joints	Check firestops	Time-temperature fire test Hose steam test Leakage test
1705.19	Smoke control system	Performance review Controls and interaction with other systems	Leakage test Pressure difference test Flow measurement and direction test
1705.20	Sealing of mass timber	Material check Application technique and coverage	Material test
1705.1	Special cases	Validate unusual designs and alternate methods and materials Confirm manufacturer's installation instructions	Testing as determined by design professional



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Table 3: Example Reinforced Concrete Inspection Checklist

Before Reinforcing is Placed

- Confirm subgrade has passed specified number of soil density tests with minimum 95% modified proctor, prior to any reinforcing steel placement.
- Confirm elevations of subgrade and top of forms.
- Check that chamfer strips are placed along exposed vertical and horizontal edges.
- Visually check for plumbness of forms.

After Reinforcing is Placed

- Check reinforcing bar sizes by reviewing shipping tags or stampings on each bar every few feet, with bar size in 1/8" increments (i.e. 8 = 8/8<sup>ths</sup> inch = 1").
- Check for reinforcing clearance down to subgrade (usually 3" dobie's or 3" square blocks with embedded tie wires tied to rebar).
- Check reinforcement clearance to finished grade and forms (usually 2").
- Check bar spacing (min. 2") and sufficient ties (usually every fourth bar intersection) and "spreader" bars between mats to prevent bar movement during concrete placement.

Immediately Prior to Concrete Placement

- Check that all debris and loose soil has been removed.
- Check soil has been moisturized with no puddles.

During Concrete Placement

- Testing lab to cast compressive concrete strength test molds and check slump.
- Check batch ticket has mix number that matches approved mix number.
- Check that the minutes passed from time on batch ticket does not exceed 90 minutes.
- Check that concrete is thoroughly vibrated.
- Correct finish: "broom" for exterior surfaces and steel (hard) trowel finish for interior floors.

After Concrete Placement

- 7 days minimum curing with either membrane cure (2 coats) or water cure (continuous wetness).





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Testing

Special tests typically involve using instruments or laboratory methods (beyond visual or dimensional checks) to confirm compliance with construction documents. Testing can also be done in the absence of sufficient data or documentation to provide evidence of conformance to required quality standards and design criteria. Most testing is done onsite, however for prefabricated assemblies, testing may be done in the factory. For standard parts like nuts and bolts, test results from the past may be acceptable assuming the production procedures are the same.

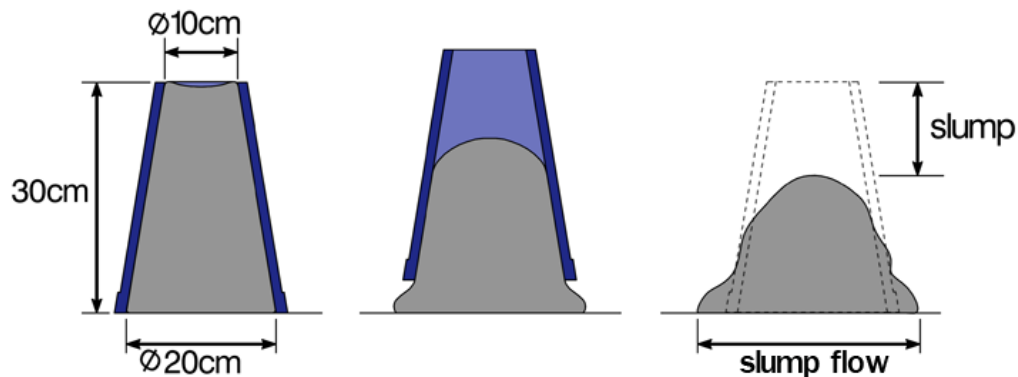


Figure 3: Concrete slump test is a measure of how much the concrete sinks (slump) after the cone (blue) is removed. Each concrete mix has a specified slump range which can be tested before placement to confirm the concrete is not too wet (high slump) or too stiff (low slump).

Source: public domain

Exceptions

Per IBC 1704.2, special inspections and tests are NOT required for the following applications:

- The building official can waive special inspections for construction of a minor nature or due to conditions of the local jurisdiction.
- Group U occupancy (utility and miscellaneous) structures that are accessory to a residential occupancy (such as a farmhouse). Examples may include agricultural buildings, barns, stables, silos, livestock shelters, greenhouses, sheds, carports, private garages, fences, and retaining walls.
- Conventional light-frame construction (wood or cold-formed steel), such as most residential houses.



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### **Seismic Special Inspections**

Per IBC 1705.13, there are additional special inspections required for buildings and structures that require seismic force-resisting systems (SFRS), designated seismic system components, and other components as summarized in Table 4. Components assigned to Seismic Design Category A (SDC A) do not require special inspections. Components assigned to SDC D, E, and F always require special inspections, unless meeting the exceptions of IBC 1704.2.

*SFRS* components include struts, collectors, chords, beams, columns, and foundations.

*Designated seismic systems* are nonstructural components (architectural, mechanical, plumbing, electrical, etc.) that require seismic design per ASCE 7, Chapter 13 and have an important factor  $I_p > 1$  (for example,  $I_p = 1.5$ ) per ASCE 7, 13.1.3. Examples include anchorage, tanks, electrical enclosures, weather or sound enclosures, pipe supports, raceway supports, and sway braces.

The following are exceptions that do NOT require seismic special inspections:

- Light frame construction with  $SDS \leq 0.5$  and height  $\leq 35$  feet
- Reinforced concrete and reinforced masonry SFRS's with  $SDS \leq 0.5$  and height  $\leq 25$  feet
- Detached one- or two-family dwellings with one or two stories above grade, provided the structure does not have any of the following vertical or horizontal irregularities:
  - Torsional irregularity
  - Extreme torsional irregularity
  - Nonparallel systems irregularity
  - Stiffness-soft story irregularity
  - Stiffness-extreme soft story irregularity
  - Discontinuity in lateral strength-weak story irregularity



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**Table 4: Required Periodic Seismic Special Inspections for each SDC**

Section 1705.13.x	Component	Seismic Design Category (SDC)					
		A	B	C	D	E	F
1	Structural steel, SFRS, steel elements		X	X	X	X	X
2	Structural wood, SFRS (except when sheathing fastener spacing is > 4")			X	X	X	X
3	Cold-formed steel, light-frame construction			X	X	X	X
4	Designated seismic systems			X	X	X	X
5	Architectural components, cladding fasteners, non-bearing walls, veneer				X	X	X
6	Plumbing, mechanical, and electrical components			X	X	X	X
7	Steel storage racks, cantilever storage racks 8 feet and greater in height				X	X	X
8	Seismic isolation systems and base isolated structures		X	X	X	X	X
9	Cold-formed steel special bolted moment frames (SBMF)				X	X	X



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**Seismic Testing Requirements**

Per IBC 1705.14, there are additional special tests required for buildings and structures that require seismic force-resisting systems (SFRS), designated seismic system components, other non-structural components subject to seismic design requirements, and seismic isolation structures, as summarized in Table 5. Components assigned to SDC A do not require special tests. Components assigned to SDC C, D, E, and F always require special tests, unless meeting the exceptions of IBC 1704.2.

Table 5: Required Seismic Special Tests for each SDC							
Section 1705.14.x	Component	Seismic Design Category (SDC)					
		A	B	C	D	E	F
1	Structural steel, SFRS, steel elements, non-destructive <sup>1</sup>		X	X	X	X	X
2	Other non-structural components subject to seismic design <sup>2</sup>		X	X	X	X	X
3	Designated seismic systems <sup>2</sup>			X	X	X	X
4	Seismic isolation systems and base isolated structures		X	X	X	X	X

Notes: 1) See exceptions based on respond modification coefficient, R, AISC 360, AISC 341, and ASCE 7 Table 15.4-1.  
2) Certificates of compliance shall be submitted to the building official.



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### **Structural Observations**

Construction of certain critical structures require frequent observations from a “structural observer”, who needs to be a licensed engineer (or architect) and ideally is the registered professional engineer responsible for the structural design. Structural observation requirements are specified in IBC 1704.6.

The structural observer must complete these steps:

1. Submit a written statement to the building official with the proposed frequency and extent of the structural observations. This can be part of the statement of special inspections or the special inspection plan.
2. During installation, visually witness a representative portion of the structural systems to confirm general conformance to the construction documents (plans and specifications).
3. After installation, visually confirm general conformance to the construction documents.
4. Submit a written statement that site visits have been completed, if the installation appears to generally conform to construction documents, and any deficiencies that have not be resolved to the best of the observer’s knowledge. This is typically included the special inspections final report.

Structural observations are needed when one or more of these conditions apply:

- Structure classified as Risk Category III or IV,
- Structure height over 75 feet above base (i.e. high-rise building),
- Structure is Seismic Design Category E (SDC E) and over two stories above grade,
- Recommended by the registered design professional for structural design, or
- Recommended by the building official.



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## **Reporting**

### **Submittals to the Building Official**

Per IBC 1704.2.4 and 1704.2.5, the following documents shall be submitted to the building official:

1. Statement of Special Inspections, per IBC 1704.3
2. Structural Observation Plan Statement, per IBC 1704.6
3. Special Inspector Qualifications, per IBC 1704.2.1
4. Statement of Responsibility (from Contractor) for wind or seismic resisting systems or components, per IBC 1704.4
5. Special Inspection Reports, per IBC 1704.2.4
6. Special Inspection Test Results, per IBC 1704.2.4
7. Certificates of Compliance for the following:
  - I. Fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of an approved fabricator, per IBC 1704.2.5.1.
  - II. Seismic qualification of nonstructural components, supports and attachments, per IBC 1705.14.2.
  - III. Designated seismic systems, per IBC 1705.14.3.
  - IV. Open web steel joists and joist girders, per IBC 2207.5.
8. Special Reports for the following, per IBC 1704.5:
  - I. Preconstruction tests for shotcrete in accordance with ACI 318.
  - II. Material properties verifying compliance with the requirements of AWS D1.4 for weldability as specified in IBC 26.6.4 of ACI 318 for reinforcing bars in concrete complying with a standard other than ASTM A706 that are to be welded.
  - III. Mill tests in accordance with IBC 20.2.2.5 of ACI 318 for reinforcing bars complying with ASTM A615 and used to resist earthquake-induced flexural or axial forces in the special moment frames, special structural walls or coupling beams connecting special structural walls of seismic force-resisting systems in structures assigned to Seismic Design Category B, C, D, E or F.
  - IV. Structural components or prefabricated assemblies not visible after fabrication. Report shall include assembly description, component details, material list, basis for evaluation, and test results, per IBC 1703.6
9. Final Special Inspection Report, per IBC 1704.2.4

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### Daily Reports

Typically, during construction, an owner's onsite representative will provide daily reports with observation such as weather, number of construction staff working, work hours, work performed, stored material onsite, shipments received, photographs, tests performed, and inspections performed. Field notes and daily reports typically do not qualify as "special inspection reports", although they can be referenced or attached to special inspection reports.



Figure 4: Special inspector writing field notes for concrete pier installations.

Source: commons.wikimedia.org/wiki/File:Eng.Christian\_Odhambo\_Akuku\_inspecting\_the\_finished\_piers.jpg,  
Christian odhambo akuku, CC-BY-SA-4.0

### Special Inspection Reports

Per IBC 1704.2.4, approved agencies are to maintain and submit special inspection and test reports to the building official and to the registered design professional in responsible charge. Reports must indicate if the construction work inspected or tested was or was not deemed to be in conformance with the construction documents. A special inspection report can be brief (one or two paragraphs) and it often covers multiple days (unlike a daily report). Ideally, each report is to cover a single area of work that has been inspected by a single qualified inspector. That inspector is to sign or otherwise approve the report.





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### Test Results

Test results are to be included in the special inspection reports, whether summarized in the report text or as an attachment. Test records should be maintained.

### Discrepancies

Any discrepancies found by special inspectors are to be brought to the immediate attention of the contractor. If the contractor does not address them in a reasonable period, the discrepancies shall be reported to the building official and registered design professional in responsible charge. Special inspection reports shall indicate discrepancies and disposition as of the date of the report.

### Records

In the past, a three-ring binder or folder of all special inspection reports and attached test reports would be kept onsite in the inspector's job trailer. Building inspectors could view these documents when onsite for inspections. However, it is now common for the reports to be saved in a folder and sent digitally to the building department, either through an online permit portal, a file-sharing site, a construction management site, or by email.

### Final Report

Per IBC 1704.2.4, a final report for special inspections is to be submitted including the following:

- Document all special inspections and tests performed (list and/or attach reports)
- Corrections completed for any discrepancies noted in the reports
- Submit prior to startup to building official

Typically, the final report is a letter from the special inspector stating that special inspections and tests have been completed and any discrepancies corrected. Attached to the letter are the special inspection reports.



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**Helpful References**

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