**Learning Objectives**

1. Understand how to establish a solid special inspection program
2. Know the importance of a project-specific Statement of Special Inspections
3. Learn how to approve special inspectors & agencies
4. Know when structural observations should be performed

**Seminar Format**

1. Introduction
2. Qualifications
3. Exemptions
4. Approved Fabricators
5. Inspections & Tests
6. Statement of Special Inspections
7. Structural Observations
8. Special Inspection Program

**PART 1**

**Introduction**
Introduction

• What are special inspections?
• What items require special inspections?
• Who can provide special inspections?
• Has your jurisdiction developed a Special Inspection Program?

Introduction

• ICC’s Special Inspection Manual:
  “The most common contributing factor to significant structural damage and building failure in extreme natural events such as hurricanes, tornados and earthquakes is construction that fails to comply with codes, standards and design documents.”

Introduction

Why should AHJ be concerned?
• “Of all the team members involved in the construction process, the building official is the only one with the legal authority to enforce the special inspection provisions of the code.” – ICC’s “Model Program for Special Inspections”
• “Those building departments that have a well-designed program in place have not only saved lives, but have also spared their government and community unnecessary damage and financial losses.” – ICC’s “Special Inspection Manual, 2018 Edition”

Introduction

Why should design professional be concerned?
• “…you can help protect yourself from liability, provide a better product to the building owner, and provide an increased level of life safety.” - The Design Professional’s Role in Special Inspections, June 2016, Structure Magazine
• “There is probably no single act that an engineer can do that is as effective at reducing his or her liability exposure as performing inspections during construction.” - The Practice of Special Inspections, 2/19/14, Civil + Structural Engineer Magazine
Introduction

- Inspections for structural components included in the first edition of the UBC (1927)
- The term “Special Inspections” first appeared in the 1961 edition of the UBC.
- BOCA first introduced special inspection requirements in 1988.
- The 2000 IBC merged the UBC, SBC and BOCA special inspection provisions into Chapter 17.

Introduction

- Initially special inspections were limited to structural components.
- The 1996 BOCA code began requiring special inspections of non-structural items.
- The list of non-structural items keeps growing with every code cycle.

Introduction

- Often confused with Quality Assurance (QA)
- What is Quality Assurance?
- Is it the same as Quality Control?
- 2006 IBC changed terminology from Quality Assurance Plan to Statement of Special Inspections (SSI)
- We often still see Quality Assurance as the term used on plans

Introduction

- Where are special inspection requirements typically provided?
- Do they have to be on the plans?

Introduction

• IBC § 202:
  • Special Inspection: "Inspection of construction requiring the expertise of an approved special inspector in order to ensure compliance with this code and the approved construction documents."

Merriam-Webster’s Collegiate Dictionary, 11th Edition

PART 2
Qualifications

Introduction

• IBC § 202:
  • Special Inspector: “A qualified person… approved by the building official as having the competence necessary to inspect a particular type of construction requiring special inspection.”

Qualifications

• Approved Agency (IBC 1703.1)
  • “…shall provide all information as necessary for the building official to…” approve the agency

• 3 Key Steps:
  • Independence (IBC 1703.1.1) → Objective, competent and independent from the Contractor
  • Equipment (IBC 1703.1.2) → Adequate equipment to perform the required tests
  • Personnel (IBC 1703.1.3) → “… shall employ experienced personnel educated in conducting, supervising and evaluating tests and special inspections.”
Qualifications

• **Approved Agency** *(IBC 1703.1)*

• What documentation do you require?

• WABO Criteria *(6 pages)*:
  • Lab & inspection
  • Types of work
  • Qualification documentation
  • Equipment & facility info
  • Field testing procedures
  • QA Manual

https://www.wabo.org/

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Qualifications

• **Special Inspector Qualifications** *(IBC 1704.2.1)*

• Three Key Parts…
  
  • **Part 1**: “Prior to the start of the construction, the approved agencies shall provide written documentation to the building official demonstrating the competence and relevant experience or training of the special inspectors who will perform the special inspections and tests during construction.”

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Qualifications

• **Special Inspector Qualifications** *(IBC 1704.2.1)*

• What documentation do you require?

• Example #1 – Clark County
  
  • 40-page criteria document
Qualifications

• **Special Inspector Qualifications (IBC 1704.2.1)**

• What documentation do you require?
  - **Example #2** – IAS

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Qualifications

• **Special Inspector Qualifications (IBC 1704.2.1)**

• What documentation do you require?
  - **Example #3** – SSI Agreement

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Qualifications

• **Special Inspector Qualifications (IBC 1704.2.1)**

• Three Key Parts…
  - **Part 2:** “Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of special inspection or testing activities for projects of similar complexity and material qualities.”

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Qualifications

• **Special Inspector Qualifications (IBC 1704.2.1)**

• What would you require?

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https://dfcm.utah.gov/building-official/#inspectanchor
Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

Accreditation:
- AIA - American Institute of Architects
- ASHTO - American Association of State Highway and Transportation Officials
- ACI - American Concrete Institute
- ASNT - American Society of Nondestructive Testing
- AWS - Association of Welding and Cutting Industry
- AWSA - American Welding Society
- CMME - Construction Materials Engineering Council
- ISAS - International Association of Solar Engineering
- ICS - International Code Council
- NEBB - National Environmental Building Board
- NCSL - National Society for Certification in Nondestructive Testing
- NIBQ - National Institute of Business Quality
- PFI - Proprietary Foundation Institute
- WJQNC - Western Alliance for Quality Nondestructive Construction

B. Steel Construction (IBC 1704.5)

B.1. Steel Fabrication & High Strength Bolts

The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Structural Steel and Bolting Special Inspector (S1).
2. Current AWS Certification as a Certified Welding Inspector (CWI).
3. Current AWS Certification as a Certified Associate Welding Inspector (CAWI).

B.2. Welding

The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. High school graduate, or equivalent, and two years of relevant work experience.
2. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Structural Welding Special Inspector (S2).
2. Current AWS Certification as a Certified Welding Inspector (CWI).
3. Current AWS Certification as a Certified Associate Welding Inspector (CAWI)

B.3. Nondestructive Testing (NDT)

The Special Inspector shall comply with at least one of the Certification Requirements noted below:

Minimum Certification Requirements:
1. Current ASNT Certification as a NDT Level II
2. Current AWS Certification as a Certified Radiographic Interpreter.
Qualifications
• Special Inspector Qualifications (IBC 1704.2.1)

B.4. Structural Steel
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Structural Steel and Bolted Special Inspector (S1).
2. Current ICC Certification as a Commercial Building Inspector (B2).
3. Current ICC Certification as a Residential Building Inspector (B1).

Qualifications
• Special Inspector Qualifications (IBC 1704.2.1)

C. Concrete Construction (IBC 1704.2.1)

C.1. Cast-in-Place & Precast
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Reinforced Concrete Special Inspector (47).
2. Current ACI Certification as a Concrete Construction Special Inspector.
3. Current ACI Certification as a Concrete Field testing Technician, Grade I.
4. Current WAOTC Certification as a Concrete Testing Technician (CCT).
5. Current NCCER Certification in Concrete Testing & Inspection, Level II.

Qualifications
• Special Inspector Qualifications (IBC 1704.2.1)

C.2. Prestressed
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Prestressed Concrete Special Inspector (92).
2. Current EIT Certification as a Level 2 Unbonded PT Inspector.
3. Current ACI Certification as a Concrete Construction Special Inspector.
Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

D. Masonry Construction (IBC 1705.4)
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Structural Masonry Special Inspector (84).
2. Current ACI Certification as a Masonry Field Testing Technician.

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

E. Wood Construction (IBC 1705.5)
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Commercial Building Inspector (82).
2. Current ICC Certification as a Residential Building Inspector (83).

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

F. Soils & Deep Foundation Elements (IBC 1705.6 – IBC 1705.9)
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. Utah Registered Professional Engineer and a minimum of three months of relevant work State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current ICC Certification as a Soils Special Inspector (84).
2. Current NCEET Certification as Geotechnical Construction Level II.
3. Current NCEET Certification as Soils Level II.

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

G. Fire-Resistant Materials (IBC 1705.14, 1705.15 & 1705.17)
The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

H. Exterior Insulation & Finish Systems (IBC 1703.16)

The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
2. Current ICC Certification as a Residential Building Inspector (B1).

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

J. Miscellaneous (IBC 1705.1.1, 1705.12 & 1705.13)

DWCII will approve special inspectors on a case-by-case basis for special cases that are not covered by the IBC and which require special inspections. An example of such a scenario could include foundation excavation during systems.

1. Designated Systems, Architectural Components, MEP Components, & Parking

The Special Inspector shall comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
2. Current ICC Certification as a Residential Building Inspector (B1).

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

L. Smoke Control Systems (IBC 1705.18)

The Special Inspector shall have expertise in Fire Protection Engineering, Mechanical Engineering and must be certified as Air Balancers. They shall also comply with at least one of the Education and Experience Requirements and at least one of the Certification Requirements noted below:

Minimum Education and Experience Requirements:
1. State of Utah Registered Professional Engineer, or Registered Structural Engineer, and six months of relevant work experience.
2. Two years of college or technical training and one year of relevant work experience.
3. High school graduate, or equivalent, and two years of relevant work experience.
4. A minimum of three years of relevant work experience.

Minimum Certification Requirements:
1. Current AABC Certification as a Test and Balance Engineer (TBE) or Test and Balance Technician (TBT).

Qualifications

• Special Inspector Qualifications (IBC 1704.2.1)

K. Testing Laboratory Qualifications

Each designated Testing Lab shall be accredited by at least one of the following accreditation authorities:

1. IAS accreditation with the scope of accreditation covering the disciplines for which the Testing Lab is designated.
2. AASHTO Accreditation Program per either AASHTO R18 or International Organization of Standards/International Electrotechnical Commission (ISO/IEC) 17025.
3. Current accreditation through A2LA.
4. Current accreditation through NVLAP.
5. Current accreditation through CEMEC.
6. Other Accreditation Authority Program. The Testing lab shall be accredited by a third-party and shall meet the requirements of Section 1703.1 of the IBC.
Qualifications

• **Special Inspector Qualifications (IBC 1704.2.1)**

  1. **Laboratory Technician Qualifications**
     
     Each Laboratory Technician shall have certification in the appropriate category and one year minimum experience.

     **General Notes**
     
     1. An inspector who does not meet the qualifications noted above may be allowed to perform as a "Special Inspector" at the discretion of the Special Inspection Agency provided one or more of the following conditions have been met:
        a. The individual is working under the direct and continuous supervision of a Special Inspector fully qualified for the type of work involved.
        b. The individual is working under the direct and periodic supervision of a Special Inspector, and the scope is minor and routine within the capabilities of the individual.
     2. DFCM will consider equivalent certifications from a Nationally Recognized Organization obtained by written examination when sufficient documentation is provided.
     3. DFCM will consider equivalent criteria for the qualifications of any designated entity. The Registered Design Professional shall provide sufficient documentation to substantiate the equivalency request.

• **Special Inspector Qualifications (IBC 1704.2.1)**

  • Three Key Parts...

  • **Part 3:** "The registered design professional in responsible charge and engineers of record involved in the design of the project are permitted to act as the approved agency and their personnel are permitted to act as special inspectors for the work designed by them, provided they qualify as special inspectors."

• **Special Inspector Qualifications (IBC 1704.2.1)**

  • "The (Engineer of Record) should serve as the Special Inspector whenever possible and practical." – CASE, Guide to Special Inspection & Quality Assurance.

  • Does the code require the actual EOR?

Collapses & Disasters

• **Collapse of Hyatt Regency walkway in Kansas City (1981)**

  • 2 walkways collapsed onto a dance held at the hotel lobby below.
  • 114 were killed and 216 injured
  • Largest non-deliberate structural failure in U.S. history
  • Collapse was due to changes to design in walkways steel tie rods
Qualifications

• **Special Inspector Qualifications** *(IBC 1704.2.1)*
  - U.S. House of Representatives Subcommittee recommended that …
  - “Professional organizations, such as (BOCA and ICBO), should make every effort to ensure that provisions are written into building codes and adopted in public forum which make the on-site presence of the structural engineer mandatory during the construction of structural components on public facilities.”

Qualifications Quiz

1. To be an approved agency which of the following is not required?
   A. Qualified personnel
   B. Years of experience
   C. Appropriate equipment
   D. Independence from contractor

2. Is a CWI certification appropriate for a concrete special inspector?

3. Is an ICC Fire Inspector II certification acceptable to perform special inspections of spray-applied fire proofing?

4. Can the EOR perform ultrasonic testing of demand critical welds?

Exemptions

• There are several instances when special inspections are not required.

  • **General** *(IBC 1704.2)*
    - Work is deemed *minor in nature*.
    - *Group U* occupancies that are accessory to residential.
    - “*Conventional*” cold-formed or wood light-framed construction.
**Exemptions**

- **Approved Fabricators (IBC 1704.2.5)**
  - [Image of Approved Fabricators logos]

- **Concrete Construction (IBC 1705.3)**
  - **Isolated** spread footings for buildings 3-stories or less.
  - **Continuous** footings for buildings 3-stories or less where...
    - Supporting **light-framed** walls, or...
    - Design considers a compressive strength of 2,500 psi.
  - **Nonstructural** concrete slabs and other flatwork.
  - **Foundation walls** per IBC Table 1807.1.6.2.

- **Wood & Metal Stud Construction**
  - Trusses spanning < 60-feet (IBC 1705.5.2 & 1705.2.4)
  - Non-high-load wood diaphragms (IBC 1705.5.1)
  - Diaphragm or wall nailing ≤ 4"o.c. (IBC 1705.11.1, 1705.11.2, 1705.12.2, 1705.12.3)

- **Masonry Construction (IBC 1705.4)**
  - Empirically designed masonry.
  - Masonry foundations per IBC prescriptive tables.
  - Fireplaces/chimneys constructed per IBC 2111-2113.

- **Exemptions**
  - [Image of a construction site]

- **Exemptions**
  - [Image of a construction site]

- **Exemptions**
  - [Image of a construction site]

- **Exemptions**
  - [Image of a construction site]

---

Exemptions

- **Soils** *(IBC 1705.6)*
  - If < 12-inch depth of structural fill *(IBC 1803.5.8)*
  - This still requires special inspection for in-place dry density of ≥ 90%.

Exemptions

- **High Wind** *(IBC 1705.11)*
  - Exposure 'B' \( V_{asd} < 120 \text{mph} \) \( (V_{ult} \geq 155 \text{mph}) \)
  - Exposure 'C' or 'D' \( V_{asd} < 110 \text{mph} \) \( (V_{ult} \geq 140 \text{mph}) \)
  - This mainly applies to special wind regions or coastal regions.

Exemptions

- **High Seismic** *(IBC 1705.12)*
  - Light-frame construction & \( S_{DS} \leq 0.5g \) & height ≤ 35-ft
  - Concrete or Masonry & \( S_{DS} \leq 0.5g \) & height ≤ 25-ft
  - Detached 1- or 2-family residence no more than 2-stories & having limited structural irregularities.

Exemptions Quiz

1. When is structural fill exempt from special inspections or tests?
2. When are continuous footings exempt from special inspections or tests?
3. If wind exposure ‘C’, when are high wind special inspections required?
4. Are seismic special inspections required for one-story wood structures in SDC ‘D’?
PART 4

Approved Fabricators

Approved Fabricators

• IBC § 202:
  • Fabricated Item: “Structural, load-bearing or lateral load-resisting members or assemblies consisting of materials assembled prior to installation in a building or structure…”
  • “…Materials produced in accordance with standards referenced by this code, such as rolled structural steel shapes, steel reinforcing bars, masonry units and wood structural panels, or in accordance with a referenced standard that provides requirements for quality control done under the supervision of a third-party quality control agency, are not “fabricated items.”

Approved Fabricators

• Examples of pre-fabricated items:
  • Metal buildings
  • Precast concrete
  • Manufactured trusses
  • What else?

Approved Fabricators

• Modular construction is booming!
Approved Fabricator

• **IBC 1704.2.5:**
  “Where fabrication of structural, load-bearing or lateral load-resisting members or assemblies is being conducted on the premises of a fabricator’s shop, special inspections shall be performed during fabrication.”

Approved Fabricator

• **IBC 1704.2.5.1:**
  “Special inspections during fabrication are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection.”

Approved Fabricators

• **Approved Fabricators** (IBC 1704.2.5 & 1705.10)
  • Off-site fabrications of “…structural load carrying members or assemblies”.
  • What is the benefit of becoming an “approved” fabricator?
  • If “approved”, a **certificate of compliance** must be provided to the building official (see IBC 1704.2.5.1). **
  • How does one become an approved fabricator?

Approved Fabricators

• **Fabricator Approval** is based upon the review of…
  • Fabricator’s written procedural and quality control manuals
  • Periodic **auditing** of fabrication practices by approved 3rd party, or by building official
  • Typically provide QC personnel qualifications
  • Typically provide national accreditation
    • International Accreditation Service (IAS)
    • National Precast Concrete Association (NPCA)
    • Precast/Prestressed Concrete Institute (PCI)
    • Post-Tensioning Institute (PTI)
Approved Fabricators

- IBC § 202:
- Certificate of Compliance: “A certificate stating that materials and products meet specified standards or that work was done in compliance with approved construction documents.”

Approved Fabricators

Certificate of Compliance
- Provided at completion of fabrication
- Must be provided to the B.O.
- Must state “…that the work was performed in accordance with the approved construction documents.”
- Similar to a “final” special inspection report

Approved Fabricator

Certificate of Compliance
- Many jurisdictions provide their own...

Approved Fabricators

- What if brought to the site after the fact? (IBC 1703.6):
  - “Where structural components or other items regulated by this code are not visible for inspection after completion of a pre-fabricated assembly, the owner or the owner’s authorized agent shall submit a report of each prefabricated assembly.”
  - “The report shall indicate the complete details of the assembly, including a description of the assembly and its components, the basis upon which the assembly is being evaluated, test results and similar information and other data as necessary for the building official to determine conformance to this code. Such a report shall be approved by the building official.”
Approved Fabricator Quiz

1. To become an approved fabricator, which of the following is not required?
   A. Written fabrication procedures
   B. Audit report
   C. Quality control manuals
   D. Quality control personnel qualifications

2. Is a certificate of compliance required prior to erection of fabricated elements?

3. What is the difference between a fabricator and an approved fabricator?

Inspections & Tests

- **General Items**
  - Special inspections are mandatory
  - IBC requirements are “minimum”
  - New materials → subjected to tests (IBC 1702.1)
  - Approval → in writing after satisfactory completion of tests (IBC 1703.2)
  - Recorded by B.O. and available for public review (IBC 1703.3)
  - Shall remain accessible and exposed for special inspection and testing purposes (IBC 1704.2.2)

- **Steel Construction** (IBC 1705.2)
  - Structural Steel → per AISC 360
  - Includes requirements for...
    - Prior to welding
    - During welding
    - After welding
    - Nondestructive testing
    - Prior to bolting
    - During bolting
    - After bolting

---

**TABLE 1705.2-1**
Inspection Tasks Prior to Welding

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Shop</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection of welds</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dimensions, tolerances, and material</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Radiographic testing</td>
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<td>X</td>
</tr>
<tr>
<td>Nondestructive testing</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Test for alignment of parts</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Test for fit-up of parts</td>
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<td>X</td>
</tr>
<tr>
<td>Test for freedom from obstructing material</td>
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<td>X</td>
</tr>
<tr>
<td>Test for freedom from obstructions</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Test for freedom from sharp edges</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Test for freedom from burrs, sharp edges, or rough surfaces</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

American Institute of Steel Construction, AISC 360-16 ©

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Inspections & Tests

- **Steel Construction (IBC 1705.2)**
  - Structural Steel → per AISC 360
  - Periodic & continuous not used
  - Observer (O) → Observes items on a random basis
  - Perform (P) → Performed for each connection/weld

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**Steel Construction (IBC 1705.2)**

- Cold-formed Steel Deck → SDI QA/QC
- SDI requires...
  - Verify deck materials (mill certificates)
  - Field welding per AWS D1.3 & SDI
  - Mechanical fasteners per SDI
  - Deck installation per approved construction documents

---

Inspections & Tests

- **Steel Construction (IBC 1705.2)**
  - Open-web Steel Joists & Girders → per Table 1705.2.3

---

**Steel Construction (IBC 1705.2)**

- Cold-formed Trusses > 60-feet
- Temporary and permanent bracing/restraint
Inspections & Tests

**Concrete Construction (IBC 1705.3)**
- Per Table 1705.3
- Rebar welding per AWS D1.4
- In absence of data or documentation required by Chapters 19 & 20 of ACI 318
- Testing per those chapters

---

**Concrete Construction (IBC 1705.3)**

<table>
<thead>
<tr>
<th>Required Inspections and Tests of Concrete Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
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<tr>
<td>3</td>
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</table>

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**Masonry Construction (IBC 1705.4)**
- Requirements removed in 2015 IBC
- Now refers to TMS 402 & 602
- Can you recall some of the masonry special inspection and testing requirements?
Inspections & Tests

• **Masonry Construction (IBC 1705.4)**
  • TMS 402 → Table 3.1

<table>
<thead>
<tr>
<th>Designed in accordance with</th>
<th>Risk Category I, II or III</th>
<th>Risk Category IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 3 or...</td>
<td>Level 2</td>
<td>Level 3</td>
</tr>
<tr>
<td>Appendix B, or...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appendix C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescriptive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 4</td>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>Appendix A</td>
<td>Level 1</td>
<td>Not permitted</td>
</tr>
</tbody>
</table>

Minimum Verification

- Prior to construction, verification of compliance submittals R R R Art. 1.5
- Prior to construction, verification of $f'_u$ and $f'_{cmu}$ except where specifically exempted by the Code. NR R R Art. 1.4 B
- During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site. NR R R Art. 1.5 & 1.6.3
- During construction, verification of $f'_u$ and $f'_{cmu}$ for every 5,000 square feet. NR NR R Art. 1.4 B
- During construction, verification of proportions of materials delivered to the project site for prestressed or preblended mortar, prestressing grout, and grout other than self-consolidating grout. NR NR R Art. 1.4 B

Includes criteria for:
- Prior to grouting
- During construction
- Specimen observation

Inspections & Tests

• **Masonry Construction (IBC 1705.4)**
  • TMS 602 → Must comply with Tables 3 & 4

<table>
<thead>
<tr>
<th>Minimum Verification</th>
<th>Required for Quality Assurance</th>
<th>Reference for Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. As masonry construction begins, verify that the following are in compliance:</td>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>a. Proportions of site-prepared mortar</td>
<td>NR</td>
<td>P</td>
</tr>
<tr>
<td>b. Grade and size of prestressing tendons and anchorages</td>
<td>NR</td>
<td>P</td>
</tr>
<tr>
<td>c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages</td>
<td>NR</td>
<td>P</td>
</tr>
<tr>
<td>d. Prestressing technique</td>
<td>NR</td>
<td>P</td>
</tr>
<tr>
<td>e. Properties of thin-bed mortar for AAC masonry</td>
<td>NR</td>
<td>C</td>
</tr>
<tr>
<td>f. Sample panel construction</td>
<td>NR</td>
<td>P</td>
</tr>
</tbody>
</table>

Includes criteria for:
- Prior to grouting
- During construction
- Specimen observation

Inspections & Tests

• **Wood Construction (IBC 1705.5)**
  • Prefabricated assemblies per IBC 1704.2.5
  • High-load diaphragms → sheathing & nailing
  • Trusses > 60-feet → truss bracing
### Inspections & Tests

**Soils (IBC 1705.6)**
- Per Table 1705.6
- Shall use soils report & approved construction documents

<table>
<thead>
<tr>
<th>Required Special Inspections and Tests of Soils</th>
<th>Continuous Special Inspection</th>
<th>Periodic Special Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify materials below shallower foundations are adequate to sustain the design bearing capacity.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>2. Verify excavations are extended to proper depth and have needed proper material.</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td>3. Perform classification and testing of compacted (f) materials.</td>
<td>—</td>
<td>X</td>
</tr>
<tr>
<td>4. Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>5. Prior to placement of compacted fill, inspect subgrade and verify that site has been properly drained.</td>
<td>—</td>
<td>X</td>
</tr>
</tbody>
</table>

### Driven Deep Foundations (IBC 1705.7)
- Per Table 1705.7
- Shall use soils report & approved construction documents

<table>
<thead>
<tr>
<th>Required Special Inspections and Tests of Driven Deep Foundation Elements</th>
<th>Continuous Special Inspection</th>
<th>Periodic Special Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify element materials, sizes and lengths comply with the requirements.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>2. Determine capacities of test elements and conduct additional load tests, as required.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>3. Inspect driving operations and maintain complete and accurate records for each element.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and base elevations and document any design in foundation elements.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>5. For test elements, perform additional special inspection in accordance with Section 1705.2.</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6. For accurate elements and concrete filled elements, perform tests and additional special inspection in accordance with Section 1705.5.</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Inspections & Tests

**Cast-in-Place Deep Foundations (IBC 1705.8)**
- Per Table 1705.8
- Shall use soils report & approved construction documents

<table>
<thead>
<tr>
<th>Required Special Inspections and Tests of Cast-in-Place Deep Foundation Elements</th>
<th>Continuous Special Inspection</th>
<th>Periodic Special Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inspect drilling operations and maintain complete and accurate records for each element.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing stress capacity. Record concrete or grout volumes.</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3.</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Helical Pile Foundations (IBC 1705.9)
- Per Table 1705.9
- Shall use soils report & approved construction documents

- **Helical Pile (§202):**
  “Manufactured steel deep foundation element consisting of a central shaft and one or more helical bearing plates. A helical pile is installed by rotating it into the ground. Each helical bearing plate is formed into a screw thread with a uniform defined pitch.”
**Inspections & Tests**

- **Helical Pile Foundations** *(IBC 1705.9)*
  - Shall record...
  - Equipment used
  - Pile dimensions
  - Tip elevations
  - Final depth
  - Installation torque
  - Other pertinent data
  - Construction documents & soils report

- **Fabricated Items** *(IBC 1705.10)*
  - Per 1704.2.5
  - If an approved fabricator → ???
  - If not approved → per applicable section of IBC 1705

**Inspections & Tests**

- **Special Inspections for Wind** *(IBC 1705.11)*
  - Exposure 'B' → $V_{asd} \geq 120\text{mph} \quad (V_{ult} \geq 155\text{mph})$
  - Exposure 'C or D' → $V_{asd} \geq 110\text{mph} \quad (V_{ult} \geq 140\text{mph})$
  - **Structural Wood**
    - Continuous during gluing operations
    - Periodic for nailing, bolting, anchoring (≤ 4" o.c.)
  - **Cold-Formed**
    - Welding operations
    - Screws, bolting, anchoring (≤ 4" o.c.)
    - Not required if gypsum sheathing

- **Wind-Resisting Components**
  - Roof coverings, roof deck & roof framing connections
  - Exterior wall covering and wall connections to roof and floor diaphragms and framing
Inspections & Tests

**Special Inspections for Seismic (IBC 1705.12)**

- Remember the exceptions...
  - Light-frame construction \( S_{DS} \leq 0.5g \) & height \( \leq 35\text{-ft} \)
  - Concrete or Masonry \( S_{DS} \leq 0.5g \) & height \( \leq 25\text{-ft} \)
  - Detached 1- or 2-family residence no more than 2-stories & having limited structural irregularities.

**Structural Steel**

- **SFRS** \( \rightarrow \) per AISC 341
- Uses the following terms...
  - **Observe (O):** Random, daily basis
  - **Perform (P):** Performed prior to final acceptance of the item
  - **Document (D):**
    - Written reports
    - Fabricated – piece mark of item inspected
    - Field – grid lines and floor of item inspected
    - Highlight items not in compliance

**Structural Wood**

- Continuous during gluing operations
- Periodic for nailing, bolting, anchoring \( (\leq 4\text{"o.c.}) \)
- Cold-Formed
  - Welding operations
  - Screws, bolting, anchoring \( (\leq 4\text{"o.c.}) \)
  - Not required if gypsum sheathing
Inspections & Tests

- **IBC § 202:**
- **Designated Seismic System:**
  "Those nonstructural components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, $I_p$, is greater than 1 in accordance with Section 13.1.3 of ASCE 7.

---

**Special Inspections for Seismic (IBC 1705.12)**

- DSS → Nonstructural components with an $I_p > 1.0$
- What are nonstructural components?
- Definition not provided in the IBC or ASCE 7.
- Chapter 13 of ASCE 7 makes reference to architectural, mechanical, and electrical components.

---

**Special Inspections for Seismic (IBC 1705.12)**

- Table 13.5-1 of ASCE 7-16 provides design coefficients for "Architectural" components. Examples include:

---

**Table 10-2-1 Coefficients for Architectural Components**

<table>
<thead>
<tr>
<th>Category</th>
<th>Coefficient</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Ceilings</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Designers</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Elevator</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Fire doors</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Interior</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Moisture</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Paint</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Plumbing</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Roofing</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Structural</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Structural steel</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Sustainable design</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Technical</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Thermal</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Ventilation</td>
<td>1  2  2</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>1  2  2</td>
<td></td>
</tr>
</tbody>
</table>

---

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Inspections & Tests

- Special Inspections for Seismic (IBC 1705.12)
  - Table 13.6-1 of ASCE 7-16 provides design coefficients for “MEP” components. Examples include:

Inspections & Tests

- Special Inspections for Seismic (IBC 1705.12)
  - Component Importance Factor ($I_p$)
  - $I_p = 1.5$ if any of the following exist...
    - Required for life-safety purposes after an earthquake, including fire sprinklers & egress stairways
    - Contains hazardous materials
    - Attached to a Risk Category IV structure and it is needed for continued operation.
  - Otherwise, $I_p = 1.0$

Inspections & Tests

- Special Inspections for Seismic (IBC 1705.12)
  - Nonstructural architectural, electrical or mechanical systems or components having an importance factor ($I_p$) > 1.0.
  - $I_p = 1.5$ if any of the following exist...
    - Required to function for life-safety purposes after an earthquake.
    - Contains hazardous materials.
    - In or attached to a Risk Category IV structure and it is required for continued operation.
**Inspections & Tests**

**Special Inspections for Seismic (IBC 1705.12)**

- **IBC 1705.12.3:** “The registered design professional shall specify on the construction documents the requirements for certification... for nonstructural components and designated seismic systems.”
- In accordance with ASCE 7-16, Section 13.2

https://skghoshassociates.com/06/4/blog/viewpost.php?id=52

**Designated Seismic System (DSS) Quiz:**

1. What are DSS?
2. What are nonstructural components?
3. When is $I_s > 1.0$?
4. Should DSS be listed on the plans?
5. How can seismic qualification be obtained? (Hint – 3 ways)
6. Is there any way out of requiring certificate?
Inspections & Tests

• Special Inspections for Seismic *(IBC 1705.12)*
  • Architectural Components
    • SDC ‘D-F’ → Erection and fastening of…
      • Exterior cladding
      • Interior & exterior non-bearing walls
      • Interior & exterior veneer

• Special Inspections for Seismic *(IBC 1705.12)*
  • Access Floors
    • SDC ‘D-F’ → Anchorage of access floors
    • Standard access floors: $R_p = 1.5$
    • “Special” access floors: $R_p = 2.5$

• Special Inspections for Seismic *(IBC 1705.12)*
  • MEP Components
    • SDC ‘C-F’: Anchorage/bracing of…
      • Emergency & standby power systems
      • Piping systems, and associated equipment, carrying hazardous materials
      • Ductwork carrying hazardous materials
      • Vibration isolation systems with ≤ ¼-inch clearance from support frame and restraint
      • To ensure 3-inches of clearance from fire sprinkler drops and sprigs adjacent to mechanical & electrical equipment, ductwork, and piping systems.
    • SDC ‘E-F’: Anchorage of electrical equipment

• Special Inspections for Seismic *(IBC 1705.12)*
  • Storage Racks
    • Racks ≥ 8-feet tall and SDC ‘D-F’ → Anchorage
  • Seismic Isolation Systems
    • SDC ‘B-F’ → isolator units and energy dissipation devices in seismically isolated structures
Inspections & Tests

• **Special Inspections for Seismic** *(IBC 1705.12)*
  • Cold-Formed Steel Special Bolted Moment Frames
    • SDC ‘D-F’ Periodic during installation

• **Testing for Seismic** *(IBC 1705.13)*
  • Structural Steel
    • SDC ‘B-F’ → nondestructive testing of SFRS per AISC 341
    • Demand critical welds → part of the SFRS and require special weld filler material in addition to NDT
    • SMF Example:
      - Column splices
      - Column-to-base plate
      - CJP welds of beams to columns

Inspections & Tests

• **Testing for Seismic** *(IBC 1705.13)*
  • Nonstructural Components
    • SDC ‘B-F’ & qualification is required:
      - EOR to list requirements on plans (analysis, testing or experience data)
      - Provide certificates of compliance to B.O.
  • Designated Seismic Systems
    • SDC ‘C-F’ & qualification is required:
      - EOR to list requirements on plans (analysis, testing or experience data)
      - Provide certificates of compliance to B.O.

Inspections & Tests

• **Testing for Seismic** *(IBC 1705.13)*
  • Seismic Isolation Systems
    • Seismically isolated structures in SDC ‘B-F’...
    • Testing per Section 17.8 of ASCE 7
Inspections & Tests

**Sprayed Fire-Resistant Materials (IBC 1705.14)**
- When applied to floor, roof or wall assemblies
- Based on fire-resistance design on approved construction documents
- After rough installation of electrical, mechanical, plumbing, fire sprinklers & suspension systems for ceilings

**Mastic & Intumescent Coatings (IBC 1705.15)**
- Per AWCI 12-B

**Exterior Insulation & Finish Systems (IBC 1705.16)**
- Not required for…
  - EIFS installed over water-resistant barrier with means of draining moisture to exterior
  - EIFS over masonry or concrete
  - Water-resistive coating over sheathing requires special inspection

**Sprayed Fire-Resistant Materials (IBC 1705.14)**
- Items to inspect:
  - Condition of substrates
  - Thickness of application
  - Density (pcf)
  - Bond strength (adhesion)
  - Condition of finished application
Inspections & Tests

• **Fire-Resistant Penetrations & Joints** *(IBC 1705.17)*
  - Required for high-rise buildings, Risk Category III and IV
  - The following items…
    • Through penetrations
    • Membrane penetrations
    • Fire-resistant joint systems
    • Perimeter fire barrier systems

--

• **Testing for Smoke Control** *(IBC 1705.18)*
  - Testing scope includes…
    • Prior to concealing ductwork to perform leakage testing and recording location of devices, and…
    • Prior to occupancy and after sufficient completion to perform pressure difference testing, flow measurements and detection and control verification

--

Inspections & Tests

• **Special Cases** *(IBC 1705.1.1)*
  - Items that are "in the opinion of the building official, unusual in nature".
  - This includes…
    • Alternative materials and systems
    • Unusual design applications
    • Specific Manufacturer requirements
  - What are some examples of special cases?
Inspections & Tests Quiz

1. Can driven deep foundation inspections be performed on a periodic basis?
2. Provide three examples of “special cases” that may require special inspections.
3. Can all nonstructural components be considered designated seismic systems?
4. Should all soil special inspections and tests be performed on a continuous basis?

Statement of Special Inspections

- **IBC 1704.3**: Must be provided by Registered Design Professional in Responsible Charge
- It shall identify the following…
  - Materials, systems, components & work to be inspected/tested
  - Type and extent of each special inspection/test
  - Additional requirements for seismic/wind
  - Continuous or periodic

Statement of Special Inspections

- **IBC § 202:**
  - **Continuous**: “Special inspection by the special inspector who is present continuously when and where the work to be inspected is being performed.”
  - **Periodic**: “Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed.”
Statement of Special Inspections

- The BOCA and UBC did not address the required frequency of inspections and testing. This was left to the discretion of the registered design professional.
- “The registered design professional... should indicate the frequency of inspection that is required. The frequency varies depending on the size and complexity of the project.” - Structure Magazine, May 2006
- Frequency → IBC 1704.3.1: “…or performed in accordance with the notation used in the referenced standard where the inspections are defined.”

Statement of Special Inspections

- Let’s restate...
  - The SSI shall include...
    - Materials, systems and components requiring inspection
    - The type or extent of each inspection or test
    - The frequency of the inspections or tests

- AISC 360-16:
  - Observe & Perform versus Continuous & Periodic
    - “The terms perform and observe are not to be confused with periodic and continuous used in the IBC for other construction materials. Both sets of terms establish two levels of inspection. The IBC terms specify whether the inspector is present at all times or not during the course of the work. Chapter N establishes inspection levels for specific tasks within each major inspection area. Perform indicates each item is to be inspected and observe indicates samples of the work are to be inspected. It is likely that the number of inspection tasks will determine whether an inspector has to be present full-time but it is not in accordance with Chapter N to let the time an inspector is on site determine how many inspection tasks are done.” – Commentary

Statement of Special Inspections

- The IBC provides us with example schedules...

<table>
<thead>
<tr>
<th>TABLE 7.1</th>
<th>REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>CONTINUOUS SPECIAL INSPECTION</td>
</tr>
<tr>
<td>1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity</td>
<td>X</td>
</tr>
<tr>
<td>2. Verify excavations are extended to proper depth and have reached proper material</td>
<td>—</td>
</tr>
<tr>
<td>3. Perform classification and testing of compacted fill materials</td>
<td>—</td>
</tr>
<tr>
<td>4. Verify use of proper materials, densities and ft. thickness during placement and construction of compacted fill</td>
<td>X</td>
</tr>
<tr>
<td>5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly</td>
<td>—</td>
</tr>
</tbody>
</table>

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**Statement of Special Inspections**

- It is not okay to simply duplicate these schedules...

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Required Inspections</th>
<th>Schedule</th>
<th>Required Inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Masonry masonry, including product testing and quality assurance</td>
<td>N</td>
<td>2. Precast concrete, including testing and quality assurance</td>
<td>N</td>
</tr>
<tr>
<td>3. Reinforced masonry, including testing and quality assurance</td>
<td>N</td>
<td>4. Special inspection, including testing and quality assurance</td>
<td>N</td>
</tr>
</tbody>
</table>

**Statement of Special Inspections**

- Several past IBC examples have been removed.

**Statement of Special Inspections**

- Real-World Example: Single-story masonry retail building
  - What items require special inspections?
  - This is what was actually provided...

**Special Inspection:** Special inspection is required in accordance with IBC 1701.

A. All concrete masonry units and reinforcing.
B. Field welding.
C. Epoxy bolts.

**Statement of Special Inspections**

- Real-World Example: Single-story masonry retail building
  - Plan Review Comment #1:

The “special inspection” portion of sheet Sxxx does not meet the requirements for a “Statement of Special Inspections” as required by IBC 1704.3. Not only should the items requiring special inspection/testing be noted, but the extent of the inspections/tests should be defined and the frequency (i.e. continuous or periodic) noted. Additional items requiring special inspection for this project may include soils, concrete, etc. Please address.
**Statement of Special Inspections**

**Real-World Example:** Single-story masonry retail building
- The initial response/revisions provided follows...

Special Inspection: Special inspection is required in accordance with IBC 1701.
- All concrete masonry units and reinforcing, level II, periodic.
- Field welding, Periodic.
- Epoxy bolts if apply. During installation.
- Inspection of soil as noted on soil report. Periodic.

---

**SSI Quiz**

1. Which of the following is not required to be part of the SSI?
   - A. Frequency of inspections or tests
   - B. Qualifications of special inspectors
   - C. Materials to be inspected or tested
   - D. Type and extent of inspections or tests

2. True or false, perform or observe means the same as continuous or periodic?

3. True or false, it is the structural engineer’s responsibility to put together the SSI?

---

**Statement of Special Inspections**

- How do we create a project-specific SSI?

**Example Projects:**
- Example #1 – New single-story masonry retail building
- Example #2 – New 2-story wood-framed residence
- Example #3 – New 2-story wood-framed residence
- Example #4 – New 4-story steel-framed office building
- Example #5 – New single-story prefab warehouse
- Example #6 – Existing 2-story URM building
- Example #7 – Existing concrete tilt-up building

---

**Example #1**

- **Single-story masonry retail building**
- See Pages 54-57 for an example of what we should be providing in regard to a Statement of Special Inspections.
Example #1

**Single-story masonry retail building**

- The main structural walls consist of CMU construction.
- The front of the building has special RBS steel moment frames so that an open front can be provided.
- There are a couple of tower pop-ups at the roof which are framed using metal stud shear walls.
- For this example we will assume that only snug-tight bolting is required, that structural fill is required beneath the footings and that post-installed anchors are specified.

Example #1

4. Duties and responsibilities of the Contractor:
   a. The Contractor shall submit a written statement of responsibility to the Owner and the Building Official prior to the commencement of work. In accordance with IBC 1704.4, the statement of responsibility shall contain acknowledgement of the special inspection requirements contained in this "Statement of Special Inspections".
   b. The Contractor shall notify the responsible Special Inspector that work is ready for inspection at least one working day (24 hours minimum) before such inspection is required.
   c. All work requiring special inspection shall remain accessible and exposed until it has been observed by the Special Inspector.

5. Please see the "Special Inspection Schedule" for the types, extent and frequency of specific items requiring special inspections and structural tests as part of this project.

Example #1

**STATEMENT OF SPECIAL INSPECTIONS**

1. Special inspections and structural testing shall be provided by an independent agency employed by the Owner for the items identified in this section and in other areas of the approved construction plans and specifications, unless waived by the Building Official (see IBC Chapter 17).
2. The names and credentials of the Special Inspectors to be used shall be submitted to the Building Official for approval.
3. Duties of the Special Inspector:
   a. The Special Inspector shall review all work listed below for conformance with the approved construction plans and specifications and the 2018 IBC.
   b. The Special Inspector shall furnish special inspection reports to the EOD, Contractor, Owner and Building Official on a weekly basis, or more frequently as required by the Building Official. All items not in compliance shall be brought to the immediate attention of the Contractor for correction, and if uncorrected, to the EOD and the Building Official.
   c. Once corrections have been made by the Contractor, the Special Inspector shall submit a final signed report to the Building Official stating that the work requiring special inspection was, to the best of the Special Inspector's knowledge, in conformance with the approved construction plans and specifications as well as the applicable workmanship provisions of the 2018 IBC.

<table>
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<th>SPECIAL INSPECTION SCHEDULE</th>
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<th>Observation Required</th>
<th>Description</th>
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<td>EXTERIOR WALLS (IBC 2309.3)</td>
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<tr>
<td>SPECIAL inspection reports</td>
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</tr>
</tbody>
</table>

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Example #1

**Nondestructive Testing (ACI 318.11, ASCE 318.12)**

- **CIP walls (ACI 318.11, 318.12)**: Ultrasonic testing shall be performed on 100% of CIP girders in both, T- and control joints subject to tensile stress applied during placement of the CIP wall. 50% or greater shall be tested when required by Table 11.4.4.1 of ACI 318.11.

- **Welded joints subject to fatigue**:
  - **Visual inspection**:
    - For welded joints subject to fatigue, visual inspection shall be conducted and recorded in accordance with the details shown in this approved plans.
  - **Radiographic testing**:
    - Radiographic testing shall be performed on 100% of welded girders and joints subject to tension stresses applied during placement of the CIP wall. 50% or greater shall be tested when required by Table 11.4.4.1 of ACI 318.11.

- **Other Stress calculations** (MCCE 6.25.1, ACI 318.10, Table 1, ACI 318.10):

- **Structural steel details**: All fabricated steel and connections shall be inspected and passed in accordance with the details shown in this approved plans.

- **General notes**:
  - **Nondestructive testing**:
    - All non-destructive testing shall be performed in accordance with the details shown in this approved plans.
  - **Quality assurance**: All quality assurance plans shall be submitted to the inspector for review and approval.

- **Reduced beam sections (RBS)**:

- **Protected areas**: Verify that no holes or untagged areas are made within the protected area (see Table 11 of ACI 318.10).

*Continued on next page...*

---

**Example #1**

**SPECIAL INSPECTION SCHEDULE (Continued)**

- **Areas requiring special inspection**:
  - **Concrete**:
    - Construction of concrete shall conform to ACI 318.11 (for below grade) or ACI 318.12 (for above grade).
    - Construction of concrete shall be inspected by the inspector at least once a week.
    - Inspectors shall validate that all required materials are in place and in accordance with the approved plans.

- **Structural steel construction (ACI 318.11, ASCE 318.12)**:

- **Welded connections**:
  - **Visual inspection**:
    - All welds shall be visually inspected and passed in accordance with the details shown in this approved plans.
  - **Radiographic testing**:
    - Radiographic testing shall be performed on 100% of welded girders and joints subject to tension stresses applied during placement of the CIP wall. 50% or greater shall be tested when required by Table 11.4.4.1 of ACI 318.11.

- **Other stress calculations** (MCCE 6.25.1, ACI 318.10, Table 1, ACI 318.10):

- **Structural steel details**: All fabricated steel and connections shall be inspected and passed in accordance with the details shown in this approved plans.

- **General notes**: All quality assurance plans shall be submitted to the inspector for review and approval.

*Continued on next page...*
Example #1

- Verify that the floor is free of moisture, water, and other debris.
- Verify that all connections (screws, nails, adhesives) are properly secured.
- Verify that the footings are flat and even.
- Verify that the concrete mix meets the specifications.
- Verify that the reinforcing steel is properly placed and secured.
- Verify that the footings are properly drained and insulated.
- Verify that the reinforcement is properly anchored.
- Verify that the construction plan is followed.
- Verify that the construction is performed by a licensed contractor.

Example #2

- 2-story Wood-framed Residence

- What items require special inspections?

- Conventional construction
- Isolated footings
- Continuous footings supporting light-framed construction
- Prescriptive foundations
- Flatwork
- What about nailing 4” o.c. or tighter?
Example #3

- 2-story Wood-framed Residence
  - This residence has several irregularities and structural items that would require special inspections.
  - Examples include:
    - Steel moment frames
    - Stepped foundation/retaining walls
    - Structural fill

Example #4

- 4-story Steel-framed Office Building
  - What items require special inspections?

- Special inspections likely include...
  - Structural steel welding, high-strength bolting, details, composite construction.
  - Concrete construction
  - Masonry construction
  - Soils
  - Deep foundations
  - AMEP components
  - Spray-applied fire proofing

Example #5

- Single-story Steel Prefab Warehouse
  - What items require special inspections?
Example #5

• **Single-story Steel Prefab Warehouse**
  • Items to consider:
    • Approved fabricator?
    • During field erection (AISC 360 § N2)
      • Field welding, high-strength bolting and details
      • Steel deck and headed stud anchor placement
      • Field cut surfaces
      • Field heating for straightening
      • Tolerances for field erection
  • Who provides the SSI?

Example #6

• **Existing 3-story URM Building undergoing a remodel and seismic upgrade**
  • Keep in mind the following, recommended in FEMA 547, for existing buildings:
    • “Can an adequate field quality assurance program be developed to verify that in-situ properties meet design assumptions?”
    • “Can a typical testing lab perform the inspection or testing or is special expertise needed?”

Example #5

• **Single-story Steel Prefab Warehouse**
  • Many fabricators feel that no special inspections are required for pre-fabricated metal buildings.
  • “After structural steel erection has been completed, the details of the steel frame must be inspected for compliance with the construction documents.” – CASE, Guide to Special Inspection & Quality Assurance.

Example #6

• **URM Building**: For this example let’s consider a three-story URM building undergoing a seismic upgrade.
Example #6

- **URM Building** (cont.):
  - Parapet bracing
  - Roof & floor ties
  - Wall center-coring
  - Re-pointing

---

Example #6

- **URM Building** (cont.):
  - Special Inspections:
    - All new construction per IBC Chapter 17.
    - Post-Installed Anchors:
      - Perform inspections & tests per ICC-ES Report
    - Diaphragm Improvements:
      - Verify wood framing size, species and grade
      - All straps, ties and hold-downs used to tie chords and collectors together are correct size, in correct locations and properly fastened
      - Size and spacing of boundary and edge nailing

---

Example #6

- **URM Building** (cont.):
  - Special Inspections:
    - Center-Coring:
      - Observe drilling operations
      - Verify size, grade and type of reinforcement
      - Overseen grout placement and verify space is clean
      - Prepare and test grout specimens
    - Re-Pointing:
      - Surface preparation
      - Verify type and proportions of site-prepared mortar
      - Monitor construction of mortar joints

---

Example #7

- **Concrete Tilt-up Building**: For this example let’s consider a concrete tilt-up constructed in 1975 that is undergoing a voluntary seismic upgrade in accordance with Appendix A2 of the 2018 IEBC.
  - All new construction per IBC Chapter 17.
  - New out-of-plane wall anchorages
  - Creation of new diaphragm cross-ties
  - Confirmation of existing conditions assumed
PART 7

Structural Observations

Structural Observations

- Structural Observations:
  - “Although it is customary for the (EOR) to perform structural observation as part of basic services on most projects, this is not always the case. Therefore, the code has made structural observation mandatory for certain projects. Where practical it is strongly recommended that structural observation services be performed by the (EOR) on all projects, whether or not required by code.” — CASE, Guide to Special Inspection & Quality Assurance

- IBC § 202:
  - Structural Observation:
    “The visual observation of the structural system by a registered design professional for general conformance to the approved construction documents.”

- IBC § 1704.6: Required for...
  - All Risk Category IV Structures
  - All high-rise buildings
  - When designated by the registered design professional
  - When specifically required by the B.O.
  - Also...
    - Risk Category III structures in SDC ‘D-F’ or $V_{ek} \geq 130$mph
    - Risk Category I or II in SDC ‘E’ if > 2 stories
Structural Observations

- **IBC 1704.6:**
  - Owner “…shall employ a registered design professional to perform structural observations.”
  - These observations do not waive special inspections or tests.

- **Prior, “…shall submit to the building official a written statement identifying the frequency and extent of structural observations.”
  - “At the conclusion of the work… shall submit to the building official a written statement that the site visits have been made and identify any reported deficiencies… that have not been resolved.”

How do you determine what requires observation?
- The code does not specify, but **SEAONC** lists recommendations for…
  - Foundations
  - Steel Framing
  - Wood Framing
  - Concrete Construction
  - Masonry Construction
Structural Observations

• **Foundations:**
  • **When:** During early stages of concrete work, at the engineer's discretion thereafter.
  • **What:** Footing layout, anchor bolts & dowels, formwork, reinforcing steel coverage/splicing/congestion, utility penetrations, construction joints.

Structural Observations

• **Steel Framing:**
  • **When:** After initial erection of the first section for large projects and after installation of most steel for smaller projects, at the engineer's discretion thereafter.
  • **What:** Frame joints & protected zones, trusses or long-span members, penetrations, complex connections, column splices.

Structural Observations

• **Wood Framing:**
  • **When:** During rough framing; prior to covering nailing of diaphragm and shear wall nailing.
  • **What:** Member sizes, spacing & grade, diaphragm & shear wall nailing, drags & collectors, sole plate and double top plate nailing, connections, notches/holes in members.

Structural Observations

• **Concrete Construction:**
  • **When:** During the early stages of concrete work, at the engineer's discretion thereafter.
  • **What:** Formwork, sleeves & blockouts, reinforcing cover/splicing/congestion, PT tendon layout, embedded items, quality of surface finish.
Structural Observations

- **Masonry Construction:**
  - **When:** Early during the layup of wall, prior to first grout pour, and the engineer’s discretion thereafter.
  - **What:** Wall materials, reinforcing steel size/position, sleeves/openings/blockouts, lintels/jambs, embedded items, grout space & cleanouts.

- **SEAONC** also lists the following strategies…
  - Walk the jobsite.
  - Be open to the unexpected.
  - Look at other building systems (i.e. Architectural, MEP)
  - Common problems on similar projects.
  - Look for field fixes.
  - Work associated with RFI’s.
  - Complicated detailing items.
  - Spot check dimensions, spacing or other features.

- **IEBC § 106:** Construction Documents
  - Notice the difference from the IBC…
    - **IBC:** “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 application for a permit.”
    - **IEBC:** “Submittal documents consisting of construction documents, special inspection and structural observation programs, investigation and evaluation reports, and other data shall be submitted in two or more sets with each application for a permit.”

- **IEBC § 1402.7:**
  - The B.O. _may require_ a professional to inspect the various structural parts of a relocated building to verify that structural components and connections have not sustained structural damage.
1. Which of the following projects would not require structural observations?
   A. A 12-story high-rise
   B. A police station
   C. A 5-story office building
   D. An elementary school in SDC ‘D’

2. Can an engineer-in-training (EIT) perform structural observations?

3. Are periodic observation reports required?

4. Can the B.O. require structural observations on a project that would not specifically require it by code?

Roles & Responsibilities

- Who are the major players?
  - Registered Design Professional
  - Owner
  - Contractor
  - Building Official
  - Special Inspector

Roles & Responsibilities

- “In order for the special inspection program to run smoothly, all parties must perform their duties when they are required and must work cooperatively with all other parties.” – ICC’s “Special Inspections Manual”
Roles & Responsibilities

- **Registered Design Professional**: Responsible for preparing “Statement of Special Inspections” (SSI).
- Who is the Registered Design Professional?
  - Architect?
  - Structural Engineer?
  - Mechanical Engineer?
  - Electrical Engineer?
  - Special Inspector?
  - There may be more than one per discipline.

 Roles & Responsibilities

- **The Owner**: Responsible for engaging the Special Inspection and Testing Agencies.
- The Owner is responsible for the cost of the inspection and testing program.

 Roles & Responsibilities

- **The Contractor**: Responsible for providing a written statement of responsibility to the Building Official and the Owner prior to commencing work.
- “The special inspection program does not relieve the Contractor of his or her responsibility to perform Quality Control.” – CASE, Guide to Special Inspection & Quality Assurance

 Roles & Responsibilities

- **Contractor’s Responsibility** (IBC 1704.4)
  - “Each contractor responsible for the construction of a main wind- or seismic force-resisting system…”
  - “…shall submit a written statement of responsibility to the building official and owner…”
  - “…shall contain acknowledgment of awareness of the special requirements contained in the (SSI).”
Roles & Responsibilities

• The Building Official: Should...
  - Review the SSI and verify that all mandated inspections and tests are included.
  - Verify that the Special Inspector/Agency are qualified to perform their roles.
  - Review the qualifications of fabricators seeking exemption from shop inspections per IBC 1704.2.5.
  - Review inspection and testing reports and take appropriate actions if identified deficiencies are not corrected.

Roles & Responsibilities (cont.)

• The Building Official (cont.):
  - A Certificate of Occupancy should not be issued until a Final Report has been provided by the Special Inspector stating that all inspections and tests have been performed and all discrepancies corrected.

Roles & Responsibilities

Ensuring the competence of special inspectors is the responsibility of the Building Official. Although the IBC lacks specific qualification requirements, this fact does not lessen the importance of diligence in the critical process of approving Special Inspectors.” — ICC's “Model Program for Special Inspections”
**Roles & Responsibilities**

• **The Building Official (cont.):**
  - “A poorly executed Special Inspection program with unqualified inspectors could be worse than having no special inspections at all, especially if reports are distributed indicating that all of the work is in compliance with the Contract Documents. In this case, the Building Official… would be left with a *false sense of security.*” – CASE, Guide to Special Inspection & Quality Assurance

• **The Special Inspector:**
  - Should know and understand the scope of the SSI.
  - Verify that work complies with the approved construction documents.
  - Must notify the Contractor of any deficiencies that require corrective action.
  - Has no control over the Contractor’s means and methods.
  - *Does not have the authority* to stop the work.
  - Shall not direct the Contractor as to how to correct a deficiency. That is the responsibility of the Registered Design Professional.

**Roles & Responsibilities Quiz**

1. True or false, the Special Inspector is allowed to stop the work?
2. True or false, the Contractor may hire the special inspection agencies?
3. True or false, the B.O. does not need to review the special inspection reports, they simply need to ensure that a final report is provided prior to issuing C.O.?
4. Who is responsible for providing a Statement of Responsibility to the B.O.?
PART 8

Special Inspection Program

Foreward, from Ron Lynn:
• “I strongly recommend this manual be on every code official's desk, whether you develop a program or not. In your professional life there will come a time that an unusual structure, such as a 550-foot Ferris wheel or a volcano or even an ancient Egyptian sphinx, will appear under your purview, and having this tool available will be critical to your effective administration of the building code and to serving your community.”

Special Inspection Program
• Based on local needs and conditions.
• Items to Consider:
  • Staffing
  • Efficiency
  • Responsibilities
  • Ensuring competence
  • Approval criteria

Special Inspection Program
• Seven Basic Steps:
  1) Establish qualifications
  2) Approve agencies and inspectors
  3) Report requirements
  4) Special inspection agreements
  5) Report review procedure
  6) Implement the program
  7) Re-evaluate periodically
Special Inspection Program

1. Establish Qualifications
   • What is required to become…
     • An approved special inspection agency?
     • An approved special inspector?
   • What needs to be provided?
   • What minimum criteria must be met?
   • Remember the examples previously discussed

2. Approve Agencies & Inspectors
   • Will you create a list of approved agencies & inspectors?
   • Will you charge a fee?
   • Will this be re-evaluated on a yearly basis?
   • Will you be approving them on a case-by-case basis?

3. Report Requirements
   • Will the building department create its own reports?
   • How frequent should reports be submitted?
     • Daily?
     • Weekly?
   • Will it be required that reports remain on the job site?
   • Any specific criteria for discrepancy notification?
   • Final report criteria?

4. Special Inspection Agreements
   • Protects the jurisdiction!
   • Formal document signed by pertinent parties.
     • Sample → design professional, owner & contractor
   • Should clarify what the inspection agency is expected to do
   • Permit should not be issued unless all parties have signed
   • Addendums may be needed!
Special Inspection Program

5. Report Review Procedure

- “...necessary for the building department to perform audits and to review the reports that are submitted.” – ICC’s “Model Program for Special Inspections”
- “…the auditing process is a quality control measure and not a sign of lack of trust.” – ICC’s “Model Program for Special Inspections”
- Importance
  - More likely to maintain a high level of quality.
  - Special inspector cannot stop the work, only the B.O. can.

Special Inspection Program

6. Implement the Program

- At this point the program has been established. Now it is time to enforce the requirements.
- What happens if it is not enforced?

Special Inspection Program

7. Re-evaluate Periodically

- ICC’s Special Inspections Manual recommends that this occur on a semi-annual or annual basis.
- Can help to...
  - Streamline the process
  - Stay current with code requirements
  - Provide clearer information to owners, design professionals, inspection agencies, special inspectors and contractors

Special Inspection Program

Sample Documents:

- Special Inspection Agreement (Pages 58-60)
- Structural Observation Program (Pages 61-62)
- Fabricator’s Certificate of Compliance (Page 63)
- Contractor’s Statement of Responsibility
Special Inspection Program

• **Report/Submittal Tracking:**
  • Does your jurisdiction track special inspection & testing reports?
  • Structural observation reports?
  • Certificates of compliance from approved fabricators?
  • What are the dangers of not tracking these items?

Special Inspection Program Quiz

1. Who is responsible for providing a Statement of Special Inspections?
2. Who is responsible for putting together a Special Inspection Program?
3. Who is required to provide a Statement of Responsibility?
4. Who is responsible for paying for special inspections and material testing?

Any Questions?

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http://www.wc-3.com
EXAMPLE STATEMENT OF SPECIAL INSPECTIONS (SSI)

For this example, let’s consider a single-story retail shell building. The main structural walls consist of CMU construction with the front of the building having special RBS steel moment frames so that an open front can be provided. There are a couple of tower pop-ups at the roof which are framed using metal stud shear walls. For this example, we will assume that only snug-tight bolting is required, that structural fill is required beneath the footings and that post-installed anchors are specified.

The following “Statement of Special Inspections” should address the special inspection and structural testing items required by IBC Chapter 17 for this particular project. You should see something similar to this on the construction documents approved for a building permit. Often times the SSI provided on the plans does not meet the full requirements of the IBC. Per IBC 1704.3 the SSI should list all items requiring special inspections or structural tests as well as describe the extent and frequency (i.e. periodic or continuous) of the tests and inspections.

STATEMENT OF SPECIAL INSPECTIONS

1. Special inspections and structural testing shall be provided by an independent agency employed by the Owner for the items identified in this section and in other areas of the approved construction plans and specifications, unless waived by the Building Official (see IBC Chapter 17).

2. The names and credentials of the Special Inspectors to be used shall be submitted to the Building Official for approval.

3. Duties of the Special Inspector:
   a. The Special Inspector shall review all work listed below for conformance with the approved construction plans and specifications and the 2018 IBC.
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   a. The Contractor shall submit a written statement of responsibility to the Owner and the Building Official prior to the commencement of work. In accordance with IBC 1704.4, the statement of responsibility shall contain acknowledgement of the special inspection requirements contained within this “Statement of Special Inspections”.
   b. The Contractor shall notify the responsible Special Inspector that work is ready for inspection at least one working day (24 hours minimum) before such inspection is required.
   c. All work requiring special inspection shall remain accessible and exposed until it has been observed by the Special Inspector.

5. Please see the “Special Inspection Schedule” for the types, extents and frequency of specific items requiring special inspections and structural tests as part of this project.
# SPECIAL INSPECTION SCHEDULE

## Areas requiring special inspection:

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<tr>
<th>Frequency</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Continuous</td>
<td>Periodic</td>
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</tbody>
</table>

### FABRICATORS (IBC 1704.2.5)

If fabricator is approved, on-site inspection is not required but a certificate of completion must be provided to the B.O. (IBC 1704.2.5.1)

### SOILS (IBC 1705.6)

- Verify adequate materials below footings: Prior to placement of concrete.
- Excavation extend to proper depth and materials: Prior to placement of compacted fill or concrete.
- Classification and testing of fill materials: Check classification and gradations at each lift, but not less than once for each 10,000ft² of surface area.
- Verify proper fill materials, lift thicknesses and in-place densities:
- Verify properly prepared site and subgrade: Prior to placement of concrete.

### CONCRETE CONSTRUCTION (IBC 1705.3)

- Reinforcing steel placement: Verify size, clearances, splices and proper ties.
- Embedded bolts or plates:
- Verify required design mix: Verify mix design meets strength and exposure requirements listed on approved plans.
- Concrete placement/sampling: Includes sampling for air, slump, strength and temperature techniques
- Inspect formwork: Verify shape, location and member dimensions.

### COLD-FORMED STEEL CONSTRUCTION (IBC 1705.11.3)

- Components of wind- and seismic-force resisting systems: Verify proper screw attachment, bolting and anchoring of shear walls, braces and holdowns having a fastener spacing ≤ 4"o.c.

### OTHER THAN STRUCTURAL STEEL (IBC 1705.2.2)

#### Steel Roof & Floor Deck:

- Material verification of steel deck: Identification markings per applicable ASTM standard
- Roof and deck welds: Verify that welds conform to AWS D1.3.

#### Open-Web Steel Joists & Girders:

- Verify end conditions and bridging: Per IBC Table 1705.2.3

#### Welding of Reinforcing Steel:

- Verification of weldability (except A706 bar): Verify material is able to conform to AWS D1.4.

### STRUCTURAL STEEL CONSTRUCTION (IBC 1705.2, 1705.11.2, 1705.12)

#### Prior to Welding (Table N5.4-1, AISC 360-16):

- Verify welder qualifications & welding procedures:
- Material identification:
- Welder identification: Verify there is a system in place to identify the welder who has welded a joint or member.
- Fit-up groove welds: Verify joint preparation, dimensions, cleanliness, tacking and backing.
- Access holes: Verify configuration and finish.
- Fit-up fillet welds: Verify alignment, gaps at root, cleanliness of steel surfaces, tack weld quality and location.

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<tr>
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<td>Observe</td>
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<tr>
<td><strong>SPECIAL INSPECTION SCHEDULE</strong></td>
<td>(continued)</td>
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**STRUCTURAL STEEL CONSTRUCTION (continued)**

**During Welding (Table N5.4-2, AISC 360-16):**

- Control and handling of welding consumables
- Cracked tack welds
- Environmental conditions
- WPS followed
- Welding techniques
- Steel headed stud anchors

**After Welding (Table N5.4-3, AISC 360-16):**

- Welds cleaned
- Size, length and location of welds
- Welds meet visual acceptance criteria
- Arc strikes
- k-area
- Backing & welding tabs removed
- Repair activities
- Document acceptance/rejection of weld
- Prohibited

**Nondestructive Testing (N5.5, AISC 360-16):**

- CJP welds (Risk Cat. II, III & IV)
- Welded joints subject to fatigue
- Documentation

**Other Steel Inspections (N5.8, AISC 360-16; Table J8.1, AISC 341-16):**

- Structural steel details
- Anchor rods/embeds supporting structural steel
- Reduced beam sections (RBS)
- Protected zones

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*Continued on next page...*
### SPECIAL INSPECTION SCHEDULE (continued)

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<th>Areas requiring special inspection:</th>
<th>Frequency</th>
<th>Comments:</th>
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<td>MASONRY CONSTRUCTION (IBC 1705.4)</td>
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</tbody>
</table>

**Minimum Testing (Article 3.1, TMS-402/602-16):**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Frequency</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification of Slump Flow and Visual Stability Index (VSI) for self-consolidating grout.</td>
<td>✔</td>
<td>Compressive strength tests per ASTM C 1019 for slump flow and ASTM C 1611 for VSI.</td>
</tr>
<tr>
<td>Verification of f’&lt;sub&gt;m&lt;/sub&gt;.</td>
<td>✔</td>
<td>Determine compressive strength per “unit strength” or “prism test” as specified in Article C-32 of TMS-402/602-16 prior to construction.</td>
</tr>
</tbody>
</table>

**Prior to Construction (Article 1.5, TMS-602-16):**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Frequency</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review material certificates, mix designs, test results and construction procedures</td>
<td>✔</td>
<td>Verify materials conform to approved construction documents. Mix design, test results, material certificates, and construction procedures should be submitted for review. Mortar mix designs shall conform to ASTM C 270 while grout shall conform to ASTM C 476. Material certificates shall be provided for the following: reinforcement; anchors, ties, fasteners, and metal accessories; masonry units; mortar and grout materials. Review cold-weather or hot-weather construction procedures.</td>
</tr>
</tbody>
</table>

**As Construction Begins (Table 4, TMS-602-16):**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Frequency</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportions of site-prepared mortar</td>
<td>✔</td>
<td>Verify that mortar is type and color specified on approved plans, it conforms to ASTM C 270, and is mixed per Article 2.6.A of ACI 530.1.</td>
</tr>
<tr>
<td>Construction of mortar joints</td>
<td>✔</td>
<td>Verify mortar joints meet Article 3.3.B of ACI 530.1.</td>
</tr>
<tr>
<td>Location of reinforcement, connectors and anchorages.</td>
<td>✔</td>
<td>Verify reinforcement is placed in accordance with Article 3.4 of ACI 530.1.</td>
</tr>
</tbody>
</table>

**Prior to Grouting (Table 4, TMS-602-16):**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Frequency</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grout space</td>
<td>✔</td>
<td>Verify grout space is free of mortar droppings, debris, loose aggregate, and other deleterious materials and that cleanouts are provided per Article 3.2.D and 3.2.F of ACI 530.1.</td>
</tr>
<tr>
<td>Grade, type and size of reinforcement, anchor bolts and anchorages.</td>
<td>✔</td>
<td>Verify reinforcement, joint reinforcement, anchor bolts and veneer anchors comply with approved plans and Section 1.6 of ACI 530.</td>
</tr>
<tr>
<td>Placement of reinforcement, connectors and anchorages.</td>
<td>✔</td>
<td>Verify reinforcement, joint reinforcement, anchor bolts and veneer anchors are installed per approved plans and Articles 3.2.E, 3.4, and 3.6.A of ACI 530.1.</td>
</tr>
<tr>
<td>Proportions of site-prepared grout.</td>
<td>✔</td>
<td>Verify grout proportions meet ASTM C 476 and a slump between 8-11 inches. Self-consolidated grout shall not be proportioned onsite.</td>
</tr>
<tr>
<td>Construction of mortar joints</td>
<td>✔</td>
<td>Verify mortar joints placed in accordance with Article 3.3.B of ACI 530.1.</td>
</tr>
</tbody>
</table>

**During Construction (Table 4, TMS-602-16):**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Frequency</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size and location of structural elements</td>
<td>✔</td>
<td>Verify locations of structural elements per approved plans and confirm tolerances meet Article 3.3.F of ACI 530.1.</td>
</tr>
<tr>
<td>Type, size and location of anchors, frames, etc.</td>
<td>✔</td>
<td>Verify correct anchorages and connections are provided per approved plans and Sections 1.16.4.3 and 1.17.1 of ACI 530.</td>
</tr>
<tr>
<td>Preparation, construction and protection of masonry during cold weather (&lt;40°F) or hot weather (&gt;90°F).</td>
<td>✔</td>
<td>Verify cold-weather construction complies with Article 1.8.C of ACI 530.1 and hot weather construction per Article 1.8.D of ACI 530.1.</td>
</tr>
<tr>
<td>Observation of grout specimens, mortar specimens, and/or prisms.</td>
<td>✔</td>
<td>Confirm specimens/prisms are performed as required by Article 1.4 of ACI 530.1.</td>
</tr>
</tbody>
</table>
SPECIAL INSPECTION AGREEMENT

(All references are per the 2018 International Building Code)

Project Name: _____________________________________________________________

Project Address: ____________________________________________________________________

Building Permit Number: ________________________________

Date Issued: ___________

BEFORE A PERMIT CAN BE ISSUED: The registered design professional in responsible charge shall fill out the Agreement and include the name of each inspector as well as their appropriate license/certification number. Two (2) copies of this form are to be submitted to the City prior to the issuance of a building permit. If changes are made as to who will perform the special inspections a new form shall be submitted and turned into the Building Permits & Inspections Division for approval.

STATEMENT OF SPECIAL INSPECTIONS: In addition to this Agreement, a “Statement of Special Inspections” shall be provided per IBC 1704.3. This Statement shall be made as part of the approved plans, and be placed in a conspicuous location, such as the first page of the construction plans or the first page of the structural sheets.

SPECIAL INSPECTORS: All special inspectors shall be approved by the Building Department prior to performing any duties. The special inspector shall provide proof of certification as a special inspector for each inspection item.

SPECIAL INSPECTION REPORTS: Special inspection reports are to meet the requirements of IBC 1704.2.4. Copies of each report are to be sent to the address listed in the letterhead noting the Project Address and Permit Number. A final report shall be submitted stating that all special inspection and structural testing items were completed and are in conformance with the approved design drawings and specifications. Items not in conformance, unresolved items, or any discrepancies in inspection coverage (i.e. missing inspections, periodic inspections when continuous was required, etc.) shall be specifically itemized in the final report.

<table>
<thead>
<tr>
<th>Areas requiring special inspection:</th>
<th>Name of Agency:</th>
<th>Name of Inspector:</th>
<th>License/Cert. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Unapproved Fabricators (IBC 1704.2.5)</td>
<td></td>
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<tr>
<td>Other than Structural Steel</td>
<td></td>
<td></td>
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<tr>
<td>□ Steel floor &amp; roof decks (IBC 1705.2.2)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>□ Steel joists &amp; girders (IBC Table 1705.2.3)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>□ Cold-formed Trusses &gt; 60ft (IBC 1705.2.4)</td>
<td></td>
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<tr>
<td>□ Cold-formed (IBC 1705.11.2 &amp; 1705.12.3)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Structural Steel (IBC 1705.2.1 &amp; 1705.12.1)</td>
<td></td>
<td></td>
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<tr>
<td>□ Welding (Per N5.4 &amp; N5.5 of AISC 360-16)</td>
<td></td>
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<tr>
<td>(For SDC ‘D-F’, also J6 of AISC 341-16)</td>
<td></td>
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<tr>
<td>□ High-strength bolts (Per N5.6 of AISC 360-16)</td>
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<tr>
<td>(For SDC ‘D-F’, also J7 of AISC 341-16)</td>
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<tr>
<td>□ Details (Per N5.8 of AISC 360-16)</td>
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<tr>
<td>(For SDC ‘D-F’, also J8 of AISC 341-16)</td>
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<tr>
<td>□ Composite Members (Per Chapter C-N)</td>
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<tr>
<td>(For SDC ‘D-F’, also J9 of AISC 341-16)</td>
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<tr>
<td>□ H-Piles (For SDC ‘D-F’, also J10 of AISC 341-16)</td>
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</tbody>
</table>
GENERAL SPECIAL INSPECTION ITEMS (per IBC Chapter 17) - continued

<table>
<thead>
<tr>
<th>Areas requiring special inspection:</th>
<th>Name of Agency:</th>
<th>Name of Inspector:</th>
<th>License/Cert. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Construction (per IBC Table 1705.3)</td>
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<tr>
<td>□ Reinforcement, embeds, anchors</td>
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<tr>
<td>□ Formwork</td>
<td></td>
<td></td>
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<tr>
<td>□ Materials</td>
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<tr>
<td>□ Shotcrete</td>
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<tr>
<td>□ Post-tensioned/Pre-stressed Concrete</td>
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<tr>
<td>□ Erection of precast concrete</td>
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</tr>
<tr>
<td>Masonry Construction (IBC 1705.4)</td>
<td></td>
<td></td>
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<tr>
<td>□ Prior to Construction (Art. 1.48 &amp; 1.5, TMS-602)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>□ As Construction Begins (Table 4, TMS-602)</td>
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<tr>
<td>□ Prior to Grouting (Table 4, TMS-602)</td>
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<tr>
<td>□ During Construction (Table 4, TMS-602)</td>
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<tr>
<td>Wood Construction</td>
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<td></td>
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</tr>
<tr>
<td>□ High-Load Diaphragms (IBC 1705.5.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Wood Trusses &gt; 60ft (IBC 1705.5.2)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>□ Structural Wood (IBC 1705.11.1 &amp; 1705.12.2)</td>
<td></td>
<td></td>
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<tr>
<td>□ Soils (IBC Table 1705.6)</td>
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<td></td>
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<tr>
<td>□ Driven Deep Foundations (IBC Table 1705.7)</td>
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<tr>
<td>□ Cast-in Deep Foundations (IBC Table 1705.8)</td>
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<tr>
<td>□ Helical Pile Foundations (IBC 1705.9)</td>
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<td></td>
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<tr>
<td>□ Sprayed Fire-Resistant Materials (IBC 1705.14)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>□ Mastic &amp; Intumescent Coatings (IBC 1705.15)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>□ EIFS (IBC 1705.16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Fire-Resistant Penetrations (IBC 1705.17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Smoke Control (IBC 1705.18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonstructural Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Roof &amp; Wall Coverings (IBC 1705.11.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Designated Systems (IBC 1705.12.4 &amp; 1705.13.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Architectural Components (IBC 1705.12.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ MEP Components (IBC 1705.12.6 &amp; 1705.13.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Storage Racks (IBC 1705.12.7)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>□ Other __________________ (IBC 1705.1.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Other __________________ (IBC 1705.1.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Declaration by Architect/Engineer

I, the design professional in responsible charge for this project, declare that the above listed special inspection and structural testing items are required for this project in accordance with IBC Chapter 17.

______________________________  _____________________________
Signature                                      Date

Declaration by Owner

I, the Owner of the project, declare that the above listed firm(s) or individual(s) are hired by me to perform special inspections and structural testing for the project pursuant to IBC 1704.2.

______________________________  _____________________________
Signature                                      Date

CONTRACTOR RESPONSIBILITY: Each contractor involved with the construction of wind or seismic force-resisting systems shall comply with the requirements of IBC 1704.4. The contractor is responsible for providing the special inspector access to approved plans and contract documents at the job site. All special inspection records shall be retained at the job site by the contractor and shall be made available to the Building Department upon request.

Declaration by General Contractor

I, the General Contractor of the project, agree to comply with the “Contractor Responsibility” items noted above.

______________________________  _____________________________
Signature                                      Date
(All references are per the 2018 International Building Code)

Project Name: ____________________________________________________________

Project Address: __________________________________________________________

Building Permit Number: __________________________________ Date Issued: ___________

Description of Work:
________________________________________________________________________

Owner: ________________________    Engineer of Record: ________________

Firm or Individual to be responsible for the Structural Observation:

<table>
<thead>
<tr>
<th>Name:</th>
<th>Phone: (    ) -</th>
<th>Professional License No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOUNDATION</td>
<td>WALL</td>
<td>FRAME</td>
</tr>
<tr>
<td>□ Footings &amp; Piers</td>
<td>□ Concrete</td>
<td>□ Steel Moment Frame</td>
</tr>
<tr>
<td>□ Mat Foundation</td>
<td>□ Masonry</td>
<td>□ Steel Braced Frame</td>
</tr>
<tr>
<td>□ Deep Foundations</td>
<td>□ Wood</td>
<td>□ Concrete Moment Frame</td>
</tr>
<tr>
<td>□ Stepped Foundation</td>
<td>□ Others:</td>
<td>□ Masonry Wall Frame</td>
</tr>
<tr>
<td>□ Grade Beams</td>
<td>□ Others:</td>
<td>□ Others:</td>
</tr>
<tr>
<td>□ Others:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Declaration by Owner

I, the Owner of the project, declare that the above listed firm or individual is hired by me to be the Structural Observer.

Signature ____________________________ Date ________

Declaration by Engineer of Record

[Required if different from the listed Structural Observer]

I, the Engineer of Record for this project, declare that the above listed firm or individual is designated by me to be responsible for the Structural Observation.

Signature ____________________________ Date ________

(SEAL)
1. **Submission of the Structural Observation Program**

Structural observations are required for projects within City limits, per Section 1704.6 of the 2018 IBC, where one or more of the following conditions exist:

   a) The structure is included in Risk Category III or IV;
   b) The height of the structure is greater than 75 feet above the base;
   c) The structure is in Seismic Design Category ‘E’ and is greater than two stories;
   d) When so designated by the registered design professional in responsible charge of the design;
   e) When such observation is specifically required by the building official.

For all projects meeting this requirement, the City’s “Structural Observation Program” form must be submitted by the Engineer of Record (EOR) prior to issuance of the building permit. The observation program should state what observations are required for the project. All of the main seismic-force-resisting elements of the structure shall be included in the scope of the observations. The Structural Observation Program shall be made a part of the approved plans, and be placed in a conspicuous location, such as the first page of the plans or the first page of the structural plans.

2. **The “Structural Observer of Record” and persons who perform the structural observation**

The Structural Observer of Record (SOR) is the individual or firm responsible for the structural observation. The SOR must meet all of the following conditions:

   a) It must be a person or firm licensed in the State to practice structural engineering.
   b) It must have a direct contractual relationship with the owner to provide the structural observation service.
   c) It must be either the EOR for the structural design, or another engineer designated by the EOR.

The person who actually performs the structural observation in the field may be either the SOR, or an engineer under the responsible control of the SOR.

3. **Submission of Structural Observation Reports**

The SOR is responsible for submitting “Structural Observation Reports” to the City at each significant construction stage and at the completion of the structural system, whether any deficiency is observed. The person who performs the observation may fill out a draft report, noting any observed deficiencies. The draft report shall be reviewed, completed, stamped, and signed by the SOR, who takes responsibility for the report. Whenever a structural observation is performed by someone other than the SOR, that person’s name and professional license number shall be identified in the report. Deficiencies observed must be reported in writing to the owner’s representative, relevant special inspectors, the contractor, and the City. **All reports submitted to the City shall be sent to the address provided in the letterhead and the envelope should explicitly state the Project Address and Permit Number of the project.**
* MUST BE FILED WITH THIS OFFICE AND APPROVED PRIOR TO ERECTION OF FABRICATED COMPONENTS *

Project Name: _________________________________________________ Permit #: _____________________

Fabrication Co. Name: __________________________________________ Office #: _____________________

Fabrication Shop Address: ______________________________________ Fax#: _______________________

City: _________________________________ State: _____________________ Zip Code: _________________

Description of Components Fabricated:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Fabricator is Currently Certified By: □ IAS □ AISC □ ACI □ PCI □ PTI □ Other _________________

Certificate #: _________________ Expiration Date: _______________ Date of Last Audit: ______________

Fabrication Drawings Reviewed and Accepted by Design Professional in Responsible Charge? □ Yes □ No

Structural Plans and Calculations Reviewed and Accepted by City Building Department? □ Yes □ No

Fabrication Commencement Date: _________________ Fabrication Completion Date: _________________

We hereby certify that the components described and listed herein comply with the approved permitted plans,
specifications and workmanship provisions of the 2018 International Building Code and other applicable regulations. We
further certify that each fabricated member or component has been inspected and meets all the requirements of the 2018
International Building Code and its referenced standards. We understand that this certificate shall be submitted to the
Building Department for approval prior to erection of the fabricated members and components.

NOTE: This certification is limited to fabrication of the members and components described above for this particular
project and is not transferrable to any other fabrication work or other construction sites.

Signature ___________________________ Date ___________________________

Name (Print) ___________________________ Title ___________________________