

## Special Inspections

What are you missing?



Presented by - Chris Kehl, PE  
Braun Intertec Corporation

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## Topics for Today

- History of Special Inspection in the Building Code
- What are Special Inspections
- What is included in Chapter 17 of IBC
- What's New in the 2012 IBC
- What is the process for Special Inspections
- Questions

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## What are Special Inspections

Special inspections are observations of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to evaluate whether work meets approved construction documents and referenced standards



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## The Purpose of Special Inspections

Provide greater confidence that the contractor's work complies with the drawings and specifications.

What was designed, is what was built.



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## History Behind Special Inspections 1981: Hyatt Regency Walkway



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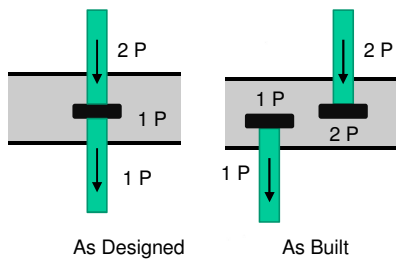
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## 1981: Hyatt Regency Walkway



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## 1981: Hyatt Regency Walkway



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## What is in Chapter 17 (IBC 2012)?

- 1701 General
- 1702 Definitions
- 1703 Approvals
- 1704 Special Inspections, contractor Responsibilities, Structural Observations
- 1705 Required Verification and Inspection
- 1706 Strength of Materials

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## Section 1701 to 1703

- 1701 - General Summary
- 1702 - Definitions
- 1703 - Approvals
  - As required by independent laboratories
  - Test Reports
  - Labeling



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Section 1704 Special Inspections, Contractor Responsibilities and Structural Observations

▪ What requires Special Inspections

- not be considered for work minor in nature
- Group U
- Structures not Cover by IBC
- Some light gauge metal



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Section 1704 Special Inspections, Contractor Responsibilities and Structural Observations

▪ 1704.2 Special Inspector Qualifications

- Written documentation of relevant **experience and training**
- **Relevant = same type of special inspections** on project with **similar complexity and material qualities**

▪ 1704.2.4 Report Requirements

- Special inspectors **shall** maintain records, and provide them to the building official and design professional
- Discrepancies **shall** be brought to attention of contractor, then if not corrected to the design professional and building official
- Final report **shall** be provided

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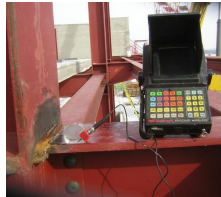
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Section 1704.2.5 Fabricators

- Fabricators require special inspection unless otherwise approved

▪ AISC Fabrication

- Fabricators quality procedures
- Materials traceability
- Training and certifications



- Precast or Wood
- Fabricators Quality Plan separate from Special Inspection

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## Section 1704.2.5 Fabricators

- Fabrication Shop Qualifications
  - Fabricator's pre-approval requirements have been in the code for years.
  - State has been more diligent about requiring pre-approval or inspections done of the shop work, especially of steel fabricators.
- The key is communicating requirements well before the steel is fabricated




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## Section 1704.3 Statement of Special Inspections

- Identify assemblies and materials that require special inspections and testing
- Identify type and extent of special inspections and testing
- Identify seismic and wind requirements
- Identify continuous or periodic

17 Special Inspection Testing and Inspection Program Summary Schedule

Item No.	Description	Frequency	Inspector	Remarks

1704.3.1 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.2 Seismic and Wind Requirements

1704.3.3 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.4 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.5 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.6 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.7 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.8 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.9 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.10 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.11 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.12 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.13 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.14 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.15 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.16 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.17 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.18 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.19 Special Inspection Testing and Inspection Program Summary Schedule

1704.3.20 Special Inspection Testing and Inspection Program Summary Schedule

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1704.3.30 Special Inspection Testing and Inspection Program Summary Schedule

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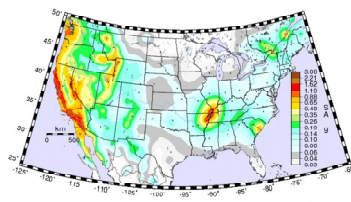
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## 1704.3.2 Seismic and wind

- All seismic deleted by Minnesota Building Code 1305
- ND has some




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### Section 1704.4 Contractor Responsibility

- For Wind and Seismic
- Written awareness of special inspection requirements by Contractor
- Quality Control Program description



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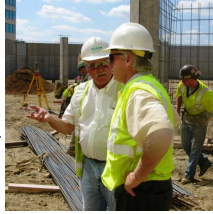
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### 1704.5 Structural Observations

- Visual observations of structural systems for general conformance at significant stages
- Written report to building official at the conclusion of the work
- For project:
  - Certain occupancies, seismic or wind
  - High rise
  - When designated by engineer or building official



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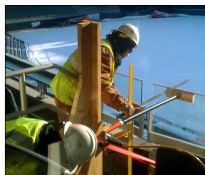
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### Section 1705.1 Special cases

- "Unusual" items as Identified by B.O.
- Special materials, systems, or unusual applications, unique designs
- Parking lots, waterproofing, pavements, sidewalks?
- Retaining walls



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**Section 1705.2 Steel Construction**

- Fabrication - unless approved
- Welding
- General detailing
- High strength bolts
- Light gauge framing
- Metal Decking/ studs



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**Section 1705.3 Concrete**

- Includes structural elements
- Not needed for
  - Some footing for buildings less than 3 stories
  - Slabs-on-grade or site work
  - Foundation walls that have been empirically designed



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### Section 1705.3 Concrete

- Rebar, embedded items and bolts
  - Size, Spacing, Location
  - Grade
  - Free of dirt, grease
  - Lap length
  - Secured
  - Coverage
  - Detailing
  - Conduits/sleeves



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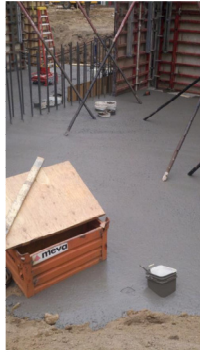
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### Section 1705.3 Concrete

- Concrete placement
  - Approved mix
  - Deposition/Consolidation
- Sample Preparation
  - Observe or serve as testing agency
- Curing
  - Cold and hot weather
  - Moisture
- General formwork
  - Dimensions
  - Joint locations
  - Not locations, not safety and stability of formwork



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### Section 1705.3 Concrete

- Post-tension reinforcement
  - Profiles
  - Anchorage Zone
  - Observe for displacement during pour
- Application of stressing forces
  - Concrete has meet strength
  - Calibrations
  - Stressing sequence
  - Stressing forces
  - Elongation
  - Capping



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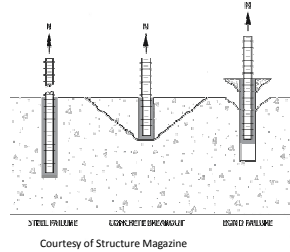
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## Drilled-in-place and Epoxyed Dowels and Anchors.

- Epoxy and Expansion connections
- Certified Installers overhead and horizontal



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## Drilled-in-place and Epoxyed Dowels and Anchors.

What to look for?

- Correct general location
- Depth of embedment
- Drill hole size
- Drill hole cleanliness
- Epoxy installation procedures
- Approved & non expired epoxies
- Certified installers

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## Concrete Testing

- QA vs QC
- Lab testing
- Field strength cure
- Where to test
- Are we just testing or are we apart of the team?



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### Section 1705.4 Masonry

- Materials “proportions”
  - Mortar, Grout, Block
  - Observe testing (building block prisms)
- Reinforcement and Grouting
  - Vibration/rodding (2 times)
  - “Keyway”
  - Bar placement - secured
  - Lift heights Cleanouts



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### Section 1704.5 Masonry

- Construction
  - Horizontal reinforcement - Durawall, lap, location grade
  - Mortar completeness of head and bed joints,
  - No more 1/2 inch into cells
  - Control joints
  - Running vs. stack bond
- Cold and Hot Weather
- Anchors and Epoxy



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### Section 1705.5 Wood

- Site built High-load diaphragms
- Prefabricated panels may require shop inspection
- High-load Diaphragms
  - Wood and sheathing as specified – grades and dimension
  - Fasteners - spacing, length and diameter



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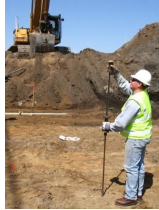
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## Section 1705.6 Soils

- In accordance with the soils report and the construction documents
  - Soils report is generally not a contract document
  - When we are SI we should agree with recommendations
- Observations:
  - Soils adequate for bearing or fill placement
  - Excavation proper depth and materials
  - Classification and testing of fill
  - Fill placement -Lift thickness, density, materials (Continuous- is this happening?)



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## Section 1705.7 Driven Deep Foundations (Piles)

- Continuous
- Materials as specified
- Load testing
- Maintain logs
- In accordance with the soils report and project documents
- Design governed by Chapter 18, Soils and Foundations and Geotechnical Evaluation



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## Section 1705.8 Cast-in-place Deep Foundations

- Continuous Inspections
- Basically same as pile
- In accordance with the soils report and project documents



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### Section 1705.9 Helical Anchors

- Continuous Inspections
- Basically same as pile
- In accordance with the soils report and project documents
- Observe
  - Equipment
  - Materials
  - Torque
  - Depth



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### Section 1705.11 & .12 Wind and seismic

- Can include architectural components like access floor, exterior cladding, roofing
- attachment of mechanical components
- Storage Racks
- Seismic isolators

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### Section 1705.13 Fireproofing

- Surface preparation
- Application
- Thickness
  - 4 measurements per 1,000SF on floors, roofs and walls
  - 25% of structural members per floor



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### Section 1705.13 Fireproofing

- Density
  - no frequency 2006, every 2,500 SF per story 2009 +
- Bond
  - 1 measurement per 10,000SF on floors, roofs and walls, per story, every 2,500 SF per story 2009 +
  - 1 measurement per type per 10,000SF on each type of Structural member per story, every 2,500 SF per story 2009 +

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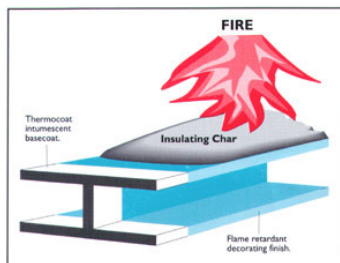
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### Section 1705.14 Mastic and Intumescent paint

- Preparation
- Application
- Thickness



Photograph Courtesy of Thermogaurd

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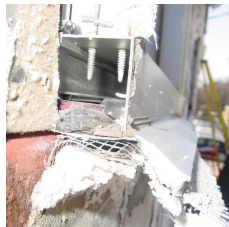
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### Section 1705.15 EIFS

- Not required when installed over surface with drainage water resistive barrier, concrete or masonry



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## Section 1705.16 Fire resistive Joints

- New
  - High rise or risk category 3 or 4

3 Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:

- Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
- Buildings and other structures containing elementary school, secondary school or day care facilities with an occupational load greater than 250.
- Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500.
- Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.
- Group I-3 occupancies.
- Any other occupancy with an occupant load greater than 5,000.

Power generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.

Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code; and

Are sufficient to pose a threat to the public if released.

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

- Group I-2 occupancies having surgery or emergency treatment facilities.
- Fire, police, ambulance and public stations and emergency vehicle garages.
- Designated earthquake, hurricane or other emergency shelters.
- Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.

Power generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.

Buildings and other structures containing quantities of highly toxic materials that exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code; and

Are sufficient to pose a threat to the public if released.

Air raid control towers, air traffic control centers and emergency aircraft hangars.

Buildings and other structures having critical national defense functions.

Water storage facilities and pump structures required to maintain water pressure for fire suppression.

You got all that right?

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## Section 1705.17 Smoke Control

- Ductwork erection prior to covering
- Pressure balancing and testing
- Performed by those with expertise in fire protection, mechanical engineers or air balancers

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## Section 1706 to 1707

1706 - Design should be based on accepted materials properties

1707- If materials are undocumented testing should be performed



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**Section  
1708 to 1710**

1708 – When construction can not be evaluated by engineering it shall be tested.

1709 – Insitu load test

1710 - Preconstruction testing



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**Section 1711 Material and Test Standard**

1711.1 - Joist Hangers

1711.2 – Concrete and Clay Roof Tile



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**Application of Chapter 17**



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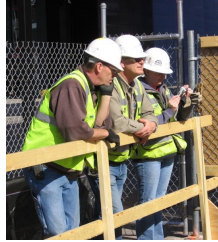
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## Parties Involved in Special Inspection

- Code Official
- Owner
- Structural Engineer
- Architect
- Special Inspector
- Testing Laboratory
- Contractor
- Fabricator




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## How is the Special Inspector Retained?

- Bid Process
- Negotiated Process
- Qualifications-Based Selection
- Multiple Special Inspectors




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## How much will it cost?

-% of Gross Cost – Total SI and Testing

	<b>Commercial / Office</b>	<b>Industrial</b>	<b>Monumental or High Rise</b>
P	0.12 - 0.25%	P 0.30 - 0.40%	
C	0.30 - 0.60%	C 0.40 - 0.65%	C 0.60 - 1.50%

Case-MN

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## Who Retains the Special Inspector

- The IBC says the owner or registered design professional in responsible charge acting as the owner's agent is to retain the services of the special inspector.
- This means the **contractor shall not.**



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## Who Retains the Special Inspector

Why Special Inspector is to work for the owner:

- Code required
- Better chance of qualifications based selection over most contractors
- "Fox guarding the hen house"
- However, the contractor sometimes retains the special inspector on small to medium projects.
  - Should get approval from Building Official and understanding from rest of team



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## What About Qualifications?

What does the code say?

- A qualified person who shall demonstrate competence to the satisfaction of Building Official with relevant experience of similar complexity and materials



No where is ICC or any other certification program required by the building Code. Some jurisdictions may have these requirements

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### What About Qualifications?

How about ICC certified special inspectors?

- Method to demonstrate one's ability to understand the requirements of the building code and to read and understand plans
- Some certifications have experience requirements
- Selection criteria for special inspectors based on qualifications and certifications (ICC included) have been used on several area large projects in the past 20 years
- Many cities and jurisdictions require ICC certifications and require proof of certification when asked
- Administered by the organization who developed the IBC.
- [www.iccsafeorg.org](http://www.iccsafeorg.org) – education and certification- search

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### What About Qualifications?

How about ACI certified special inspectors?

- Very similar to ICC
- Only 3 listed in Minnesota
- <http://www.concrete.org/Certification/VerifyACertification.aspx> – education and certification- search

How about PTI certified special inspectors?

- no listing by state much less common

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### Should the Structural Engineer provide SI?

- Engineer of record understands design – What level of experience does the individual have performing the inspections?
- Can provide quick resolution to discrepancies
- Are they available on short notice?
- Do they understand what all is included in special inspections?

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### Should the Structural Engineer provide SI?

- Is there documentation of the field modifications?
- Will they also perform testing or will you need to double up with testing firm?
- Will they take on the complete scope of work - Are they going to be there for the "less exciting parts"?

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### Documents

- Plans
- Shop drawings
- Specifications
- Materials and ES reports
- RFI, ASI's and Other Changes



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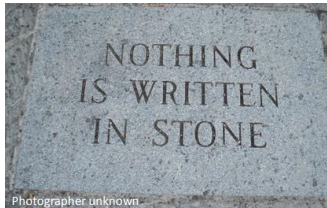
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### Documents

- Shop drawings are wonderful but not binding, code official did not approve shop drawings
- Need to inspect off approved plans, changes to design by shop drawings should be followed up by RFI – note in daily report



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# Special Inspection Schedule

**Special Structural Testing and Inspection Program Summary Schedule**

Project Name: \_\_\_\_\_ Project No. \_\_\_\_\_ (1)  
 Location: \_\_\_\_\_ Permit No. \_\_\_\_\_ (1)

Structure (1)	Substructure (1)	Type of Inspection (2)	Specific Report Category (3)	Assigned Inspector (4)

*Note: This schedule should be filled out and included in a Special Structural Testing and Inspection Program. It is not intended for general use and should be used for "Inspection for Special Inspection of Terminals" as required in the State Building Code or as modified by the state adopted IBC.*

*All complete inspection items must be inspected directly by visiting CSSTI/RP at www.asstic.org*

(1) Permits No. to be provided to the visiting official.  
 (2) Definitions of specific substructure sections in the program.  
 (3) For descriptions see CSSTI/RP Chapter 10, Section 101 authorized by Minnesota State Building Code.  
 (4) Special Inspector: Technical (TSI), Special Inspector - Structural (SIS).  
 (5) Inspectors, parallel, and see respective page reference.  
 (6) Name of firm contracted to perform services.

DATE WITH SIGNATURES  
(Each appropriate name/signature)

Owner: \_\_\_\_\_ Date: \_\_\_\_\_  
 Consultant: \_\_\_\_\_ Date: \_\_\_\_\_  
 Architect: \_\_\_\_\_ Date: \_\_\_\_\_  
 MEP: \_\_\_\_\_ Date: \_\_\_\_\_  
 SRA: \_\_\_\_\_ Date: \_\_\_\_\_  
 TA: \_\_\_\_\_ Date: \_\_\_\_\_  
 I: \_\_\_\_\_ Date: \_\_\_\_\_

If required by engineering/contract or building official, the individual names of all inspectors signed together and the work day remain to observe shall be identified in an attachment.

Legend: SIS - Structural Engineer of Record (SIS) - Special Inspector - Technical; TA - Trading Agency; SSI - Special Inspector - Structural; I - Inspector.

Accepted for the Building Department By: \_\_\_\_\_ Date: \_\_\_\_\_ (03/2021)(10/06/21)

- Filled out by design professional
- Watch for Added items

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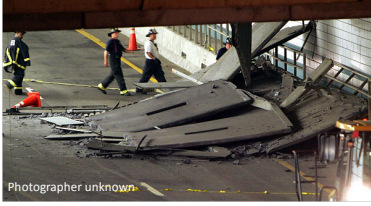
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# Discrepancy

- Work in place or about to be put in place which does not conform to project documents
- Missed inspections




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# Steps to improve your Special Inspection process

- Qualifications based selection
- Have owner retain services
- Have preconstruction meeting – discuss expectations
- Schedule with at least 24 hours in advance
- Copy them on changes and RFI's
- Develop working relationship with SER

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## Summary of Special inspections

- What is designed is what was built, changes are noted
- Improve communication among all parties
- Provide a valuable quality assurance program that benefits all parties
- Provide a structurally safe and successful project



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## What special inspections are not

- A replacement for a contractor's quality control program
- A design review for the Architect or Structural Engineer
- A warranty or insurance program for the owner
- A replacement or legal extension of the building official.



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## Thank You

-and please be careful with revision clouds, not everyone understands



Photographer unknown

Chris Kehl, PE  
Braun Intertec Corporation  
612.282.6513

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