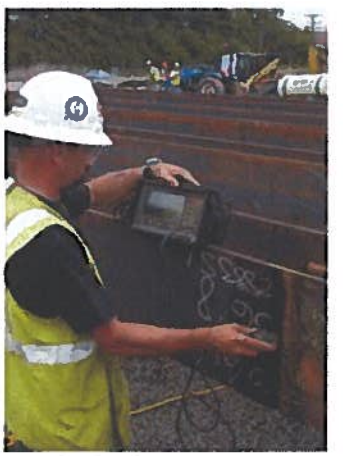
FROEHLING & ROBERTSON, INC.

INTERNATIONAL BUILDING CODE 2012

Addressing Special Inspections and Code Compliance



Sprayed Fire-Resistant Materials
Soils, Geotechnical & Foundations
Structural Steel
Concrete
Masonry

IBC 2012

AIA Approved Program # IBC2012CMT
AIA Provider # H470

CONTINUING EDUCATION AIA

Addressing Code Compliance – IBC 2012

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Addressing Code Compliance – IBC 2012
Special Inspections

Learning Objectives

1. To discuss IBC 2012, Chapter 17, "Special Inspections" required by IBC 2012, Chapter 17 as well as the major code changes in the transition from IBC 2009 to IBC 2012.
2. To explore some of the primary ancillary ASTM and ACI standards that comprise the basic CODE structure used to enforce the IBC 2012 code.
3. To discuss a strategy and methodology to monitor and track discrepancies (as set forth in IBC 2012) so that they are resolved prior to "substantial completion".

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United States Code History

1625 **First Building Codes in America** – New Amsterdam (New York) passed building material requirements after fire devastated the city. Boston passed similar requirements in 1683.
1871 Chicago Fire Code Changes and Modifications
1905 US Underwriter's Association Building Fire Protection
1906 Great San Francisco Earthquake Code Modifications
1915 Building Officials and Code Administrators (BOCA) *
1922 International Conference of Building Officials (ICBO)
1927 Uniform Building Code Established (UBC) *
1941 Southern Building Code Congress International (SBCCI) *
1990 BOCA arrived in eastern US and Virginia (SI born)
2003 International Code Council (IBC 2000, 2003, 2006, 2009)

* Legacy codes

IBC 2012

Kansas City Hyatt Disaster Leads to US Code Changes

- July 17, 1981
- Dance Contest
- Second and fourth floor walkways collapse
- 114 dead
- Over 200 injured

Special Inspections EMERGE

The term *Special Inspections* was introduced in BOCA 1308 in most Virginia jurisdictions around 1990 (BOCA 1990 edition)

Maryland, NC, and SC follow in the late 1990's

IBC 2012

What ARE Special Inspections?

Definition of Special Inspection
IBC 2012, Chapter 2

Inspection of construction requiring the expertise of an *approved special inspector* in order to ensure compliance with this CODE and the *approved construction documents*.

Ultrasonic Testing

IBC 2012

Two Types of Special Inspections
IBC 2012, Chapter 2

Continuous Special Inspection
Special inspection by the special inspector who is present when and where the work to be inspected is being performed.

Periodic Special Inspection
Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed.

IBC 2012

Who pays for Special Inspections?
IBC 2012, Section 1704.2

"...The OWNER or the registered design professional in responsible charge acting as the owner's agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under section 1705."

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

IBC 2012

TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

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

RISK Category Buildings and Other Structures IBC 2012, Table 1604.5

TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES (Continued)

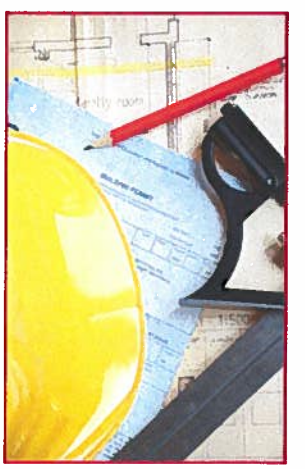
RISK CATEGORY	NATURE OF OCCUPANCY
IV **Essential Facilities**	Buildings and other structures designated as **essential facilities**, including but not limited to: • Group I-2 occupancies having **surgery or emergency treatment facilities**. • **Fire, rescue, ambulance** and **police stations** and emergency vehicle garages. • **Designated earthquake**, hurricane or other **emergency shelters**. • Designated emergency preparedness, **communications** and **operations centers** and other facilities required for **emergency response.** 911 Facilities • **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 are in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released[b]. • **Aviation control towers, air traffic control centers** and emergency aircraft hangars. • Buildings and other structures having **critical national defense** functions. • **Water storage facilities** and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.2 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.
b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

R-3 Exemption from Special Inspections DELETED IBC 2012, Section 1704.1

The **R-3 exemption** from special inspections (allowed in IBC 2006) was **deleted** in IBC 2009 and carried over into the IBC 2012 code cycle.

R-3 occupancies such as **selective adult care facilities, child care facilities, and congregate living facilities are subject to special inspection.**



Access for Special Inspections

IBC 2012, Section 1704.2.2

The construction of work for which special inspection is required shall remain accessible and exposed for special inspection purposes until completion of the required special inspections.

IBC 2012

Statement of Special Inspections

IBC 2012, Section

To be filed prior to the issuance of the building permit

DGS-30-052 (Rev. 04/11) R1
2009 Code Version

VUSBC SPECIAL INSPECTIONS
(STATE OWNED BUILDINGS)

CO-8b

Project Code: 216-A1216-008
Project Title: Small Wind Testing & Training Facility

MATERIAL/ ACTIVITY	TYPE OF INSPECTION (A/E add lines as needed to identify other required items)	REQ'D THIS PROJ ?	REFERENCE	INSPECTION / TEST BY * A/E	OWNER'S PROJ. INSP	OWNER'S TEST LAB	CONTRACTOR / SUPPLIER
FOUNDATIONS							
Soil	Classify & Test Fill Materials		Specs, 1704.7			X (Spot)	
Soil	Composition Of Fill Materials		Specs, 1704.7			X	
Soil	Bearing At Bottom Of Footing Excavations	X	Specs, 1704.7			X (Spot)	
Soil / Rock	Bottom Of Caissons		1704.9			X	
Piles	Driving Records, Tip & Cutoff Elevations		1704.8	4		X	
Piles	Load Test		1704.8	4		X	
Reinf. Bars	Size & Placement In Foundations	X	ACI, Specs	5	X	X (Spot)	
Piers	Size & Placement Of Reinf. Bars		1704.4	5	X	X (Spot)	
CONCRETE CONSTRUCTION							
Concrete	Ready-Mix Plant Quality Control		Specs, 1704.2	2			X, 1
Concrete	Mix Design Tests And Certificates	X	Specs, 1704.4	X			X, 1
Reinf. Steel	Shop Drawings Of Reinforcing Steel	X	Specs	X			
Reinf. Steel	Placement Of Reinforcing Steel	X	1704.4	5	X	X (Spot)	
Reinf. Steel	Welding		1704.4	2		X	X, 1
Formwork	Design, Size, Placement & Shoring		1704.4		X	X (Spot)	X
Formwork	Removal And Reshoring		1704.4			X (Spot)	X
Concrete	Test Cylinders	X	1704.4, 1905.6	4		X	
Concrete	Mix Proportions & Mix On Delivery Tickets	X	1704.4		X (Spot)		
Concrete	Slump Test	X	1704.4	4	X	X	
Concrete	Placement Procedures	X	1704.4	5	X (Spot)	X	
Concrete	Curing Temperatures & Techniques	X	1905.11		X		
Prestressed	Prestressing Procedures & Forces		1704.4	2		X	X, 1
Prestressed	Shop Drawings Of Prestressed Units		Specs	X			
Precast	Quality Control Of Manufacturer		1704.2	2			X, 1
Precast	Shop Drawings Of Precast		Specs	X			
Precast	Erection Of Precast		1704.4	5	X	X (Spot)	X
Precast	Inspection Of Connections		1704.4			X (Spot)	
Anchors	Anchors Cast In Concrete	X	Specs, 1911.5			X	

Statement of Special Inspections
Case 101 Form

To be filed prior to the issuance of the building permit

SCHEDULE OF SPECIAL INSPECTIONS

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT Y/N	EXTENT/REFERENCE	AGENT	COMPLETED
MASONRY					
Materials	Review of products supplied versus certificate of compliance and material submitted	Y	Submittal & Field Review, ACI 530.1; ASCE 6; TMS 602; IBC 1704.5	1	
Strength	Testing/review of strength	Y	Submittal & Field Review; ACI 530.1, ASCE 6; TMS 602; IBC 1704.5, 2105.2.2, 2105.3	2	
Mortar and Grout	Inspection of proportioning and mixing	Y	Field Review; IBC 1704.5, ACI 530.1; ASCE 6; TMS 602	2	
Reinforcement, prestress, tendons, and connections	Inspect condition, size, location, and spacing	Y	Field Review; IBC 1704.5; ACI 530.1; ASCE 6; TMS 402, 602	1	
Protection	Inspect procedures for protection during cold and hot weather	Y	Field Review; IBC 1704.5, 2104.3, 2104.4; ACI 530.1; ASCE 6; TMS 602	1 and 2	
Anchorage	Inspection of anchorages	Y	Field Review; ACI 530.1; ASCE 5, ASCE 6; TMS 402; TMS 602; IBC 1704.5	1	
Masonry Installation	Inspection of placement of masonry and joints	Y	Field Review; ACI 530.1; ASCE 6; TMS 602; IBC 1704.5	1 and 2	
STRUCTURAL STEEL					
Quality Control	In-plant inspection of quality control procedures**	Y	IBC 1704.2	1	
Bolts, nuts, and washers – materials	Material identification markings Review of certificate of compliance	Y	Submittal & Field Review; IBC 1704.3; ASTM; AISC 360, Section A3.3	1	
Bolts, nuts, washers – installation	Inspection of in-place high-strength bolts, bearing type, and slip critical connections	Y	Submittal & Field Review; IBC 1704.3.3, AISC 360 Section M2.5	1 or 2	
Structural steel – materials	Material identification markings and review of Certificate of Compliance	Y	Submittal & Field Review; IBC 1704.3, 1708.4, ASTM A6, A568	1	
Structural steel details – installation	Inspection of member locations, structural details for bracing, connections, stiffening	Y	Submittal & Field Review; IBC 1704.3.2	1	
Weld filler materials and welder certification	Review of identification markings, certificate of compliance, and welder certifications	Y	Submittal & Field Review; AISC 360 A3.5	1	
Welds	Inspection and testing of welds	Y	Field Review; IBC 1704.3.1; AWS D1.1, D1.3	2	
WOOD					
Verify fabrication/quality control procedures	Review submittal and as-built assemblies	Y	IBC 1704.2, 1704.6	1	
High-Load Diaphragms- Installation	Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing	Y	IBC 1704.1, 1704.6.1	1	
SPRAYED CEMENTITIOUS AND MINERAL FIBER FIRE RESISTIVE MATERIAL					
Structural member surface conditions	Field Review of surface conditions prior to application	Y	AWCI 12-B; IBC 1704.11	2	
Application/thickness	Field review of application operations and thickness	Y	AWCI 12-B; IBC 1704.11	2	
EXTERIOR INSULATION AND FINISH SYSTEMS					
Application	Field Review of application/installation	Y	IBC 1704.12	2	

Case 101 Form

IBC 2012

2009 VUSBC SCHEDULE OF SPECIAL INSPECTIONS

MATERIAL/ACTIVITY	TYPE OF INSPECTION: Scope	APPLICABLE TO THIS PROJECT Y/C/P/NA	EXTENT/REFERENCE	Agent Qualifications	AGENT	COMPLETED
		GENERAL				
Pre-construction conference	Meeting with parties listed in Section 6 of VTSIGP to discuss Special Inspection procedures prior to commencement of work	Y	Scheduled by SI with the Contractor prior to commencement of work	All Agencies	1 and 2	
		QUALITY ASSURANCE				
Seismic	Quality Assurance Plan; Seismic Classification (C, D, E, F)		1705.3	PE/SE/ME		
Wind	Quality Assurance Plan; Wind Speed >110 mph		1705.4	PE/SE/ME		
		FOUNDATION				
Soil	Compaction of Fill Materials: Perform sieve tests and modified Proctor tests of each source of fill material, per ASTM standards. Inspect placement, life thickness and compaction of controlled fill Test density of lift of fill by nuclear meth. Verify extent and slope of fill placement.		1704.7 Field Review	PE/GE	2	
Soil	Bearing at bottom of footing excavations: Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report; Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill		1704.7 Specifications Construction	PE/GE	2	
Soil/Rock	Bottom of Caissons		1704.9	PE/GE	2	
Piles	Driving records, tip and cutoff elevations: Inspect and log pile driving operations; Record pile driving resistance and verify compliance with driving criteria; Inspect piles for damage from driving and plum; Verify pile size, length, and accessories, Inspect installation of drilled pier foundations; Verify pier diameter, bell diameter, lengths, embedment into bedrock and suitability		1704.8 1810	PE/GE	2	

Statement of Special Inspections Form

IBC 2012, Section 1704.2.4 Report Requirements

"Reports shall indicate that work inspected was or was not completed in conformance to approved construction documents".

Discrepancies shall be brought to the immediate attention of the contractor for correction. Unresolved discrepancies shall be brought to the attention of the building official and the RDP.

IBC 2012

Section 1704.2.5.2 Fabricator Approval IBC 2012

Special inspections required by Section 1705 are **not required** where the work is done on the premises of a fabricator **registered** and **approved** to perform such work without *special inspection*. (AISC, PCI, 3rd Party)

Approval shall be based upon review of fabricator's written procedural and quality control manuals and **periodic auditing** of fabrication practices by an approved special inspection agency.

IBC 2012

Definition of Structural Observations
IBC 2012, Chapter 2

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

IBC 2012 Section 1704.5
Structural Observations

Where required by the provisions of Section 1704.5.1 or 1704.5.2, the owner shall employ a *registered design professional* (RDP) to perform **structural observations** as defined is Section 1702.

- Steel
- Seismic Resistance
- Seismic-force-resisting-systems
- Wind resisting components

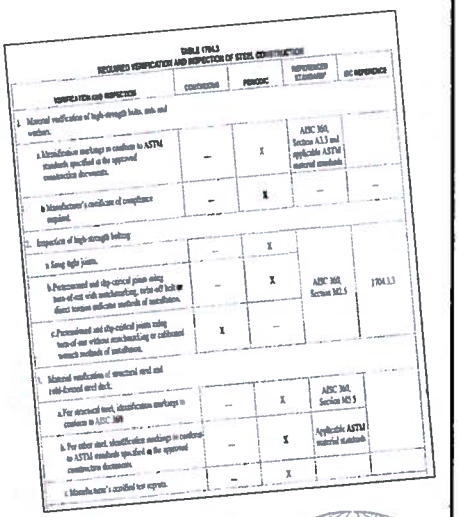
1704.4 Contractor's Statement of Responsibility

Steel Construction
IBC 2012, Section 1705.2.1

Table 1704.3 (IBC 2006 and 2009)
DELETED in IBC 2012

IBC 2012, Section 1705.2.1
Special inspection for structural steel **shall be in accordance** with the quality assurance inspection requirements of **AISC 360**.

AISC 360, Chapter N, Quality Control & Quality Assurance



IBC 2012

Inspection of Welding
AISC 360, Chapter N

AISC 360, Chapter N, N5, #4

O - Observe these items on a random basis
P - Perform these tasks for each welded joint or member

The terms "perform" and "observe" are not to be confused with the periodic and continuous terms used in IBC 2009. AISC 360, Chapter N establishes inspection levels for specific tasks within each major inspection area.

IBC 2012

AISC 360, Chapter N, Table N5.4-1
Inspection Tasks Prior to Welding

TABLE N5.4-1
Inspection Tasks Prior to Welding

Inspection Tasks Prior to Welding	QC	QA
Welding procedure specifications (WPSs) available	P	P
Manufacturer certifications for welding consumables available	P	P
Material identification (type/grade)	O	O
Welder identification system[1]	O	O
Fit-up of groove welds (including joint geometry) • Joint preparation • Dimensions (alignment, root opening, root face, bevel) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location) • Backing type and fit (if applicable)	O	O
Configuration and finish of access holes	O	O
Fit-up of fillet welds • Dimensions (alignment, gaps at root) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location)	O	O
Check welding equipment	O	-

[1]The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamp, if used, shall be the low-stress type.

AISC 360, Chapter N, Table N5.4-2
Inspection Tasks During Welding

TABLE N5.4-2
Inspection Tasks During Welding

Inspection Tasks During Welding	QC	QA
Use of qualified welders	O	O
Control and handling of welding consumables • Packaging • Exposure control	O	O
No welding over cracked tack welds	O	O
Environmental conditions • Wind speed within limits • Precipitation and temperature	O	O
WPS followed • Settings on welding equipment • Travel speed • Selected welding materials • Shielding gas type/flow rate • Preheat applied • Interpass temperature maintained (min./max.) • Proper position (F, V, H, OH)	O	O
Welding techniques • Interpass and final cleaning • Each pass within profile limitations • Each pass meets quality requirements	O	O

AISC 360, Chapter N, Table N5.4-3
Inspection Tasks After Welding

TABLE N5.4-3
Inspection Tasks After Welding

Inspection Tasks After Welding	QC	QA
Welds cleaned	O	O
Size, length, and location of welds	P	P
Welds meet visual acceptance criteria • Crack prohibition • Weld/base-metal fusion • Crater cross section • Weld profiles • Weld size • Undercut • Porosity	P	P
Arc strikes	P	P
k-area[1]	P	P
Backing removed and weld tabs removed (if required)	P	P
Repair activities	P	P
Document acceptance or rejection of welded joint or member	P	P

[1]When welding of doubler plates, continuity plates or stiffeners has been performed in the *k*-area, visually inspect the web *k*-area for cracks within 3 in. (75 mm) of the weld.

AISC 360, Chapter N, Table N5.6-1
Inspection Tasks Prior to Bolting

TABLE N5.6-1
Inspection Tasks Prior to Bolting

Inspection Tasks Prior to Bolting	QC	QA
Manufacturer's certifications available for fastener materials	O	O
Fasteners marked in accordance with ASTM requirements	O	O
Proper fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)	O	O
Proper bolting procedure selected for joint detail	O	O
Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	O	O
Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	P	O
Proper storage provided for bolts, nuts, washers and other fastener components	O	O

AISC 360, Chapter N, Table N5.6-1
Inspection Tasks During and After Bolting

TABLE N5.6-2 Inspection Tasks During Bolting		
Inspection Tasks During Bolting	**QC**	**QA**
Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required	O	O
Joint brought to the snug-tight condition prior to the pretensioning operation	O	O
Fastener component not turned by the wrench prevented from rotating	O	O
Fasteners are pretensioned in accordance with the RCSC *Specification*, progressing systematically from the most rigid point toward the free edges	O	O

TABLE N5.6-3 Inspection Tasks After Bolting		
Inspection Tasks After Bolting	**QC**	**QA**
Document acceptance or rejection of bolted connections	P	P

AISC 360, Chapter N, Table N.6.1
Steel Elements of Composite Construction

TABLE N6.1 Inspection of Steel Elements of Composite Construction Prior to Concrete Placement		
Inspection of Steel Elements of Composite Construction Prior to Concrete Placement	**QC**	**QA**
Placement and installation of steel deck	P	P
Placement and installation of steel headed stud anchors	P	P
Document acceptance or rejection of steel elements	P	P

IBC 2012, Chapter 17, Table 1705.2.2

Inspection of Steel Construction OTHER than Structural Steel

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

VERIFICATION AND INSPECTION	CONTINUOUS		PERIODIC	REFERENCED STANDARD[a]
1. Material verification of cold-formed steel deck:				
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	–		X	Applicable ASTM material standards
b. Manufacturer's certified test reports.	–		X	
2. Inspection of welding:				
a. Cold-formed steel deck:				
1) Floor and roof deck welds.	–		X	AWS D1.3
b. Reinforcing steel:				
1) Verification of weldability of reinforcing steel other than ASTM A 706.	–		X	AWS D1.4 ACI 318; Section 3.5.2
2) Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.		X	–	
3) Shear reinforcement.		X	–	
4) Other reinforcing steel.		–	X	

For SI: 1 inch = 25.4 mm.

IBC 2012 and Ultrasonic Testing (UT)

AISC 360, Chapter N

Code requires UT on selected project welds and individual welders

IBC 2012, Chapter 17, Section 1704.3.1

Registered Design Professional (RDP) must Identify (Statement of Special Inspections):

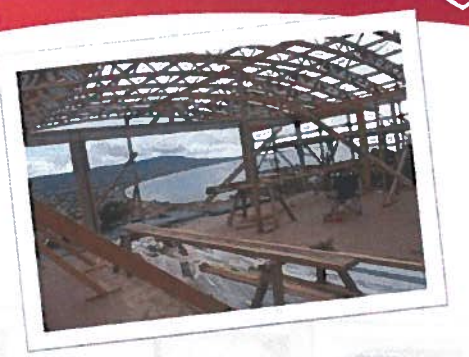
2) Type and extent of each test

5) For each type of special inspection, identification as to whether it will be continuous or periodic inspection.

Ultrasonic Testing

IBC 2012

IBC 2012, Section 1705.2.2.2
Cold formed steel Trusses



Spans 60 Feet or More

This code section requires that the special inspector verify that **temporary and permanent bracing** are installed in accordance with the approved truss submittal package.

IBC 2012

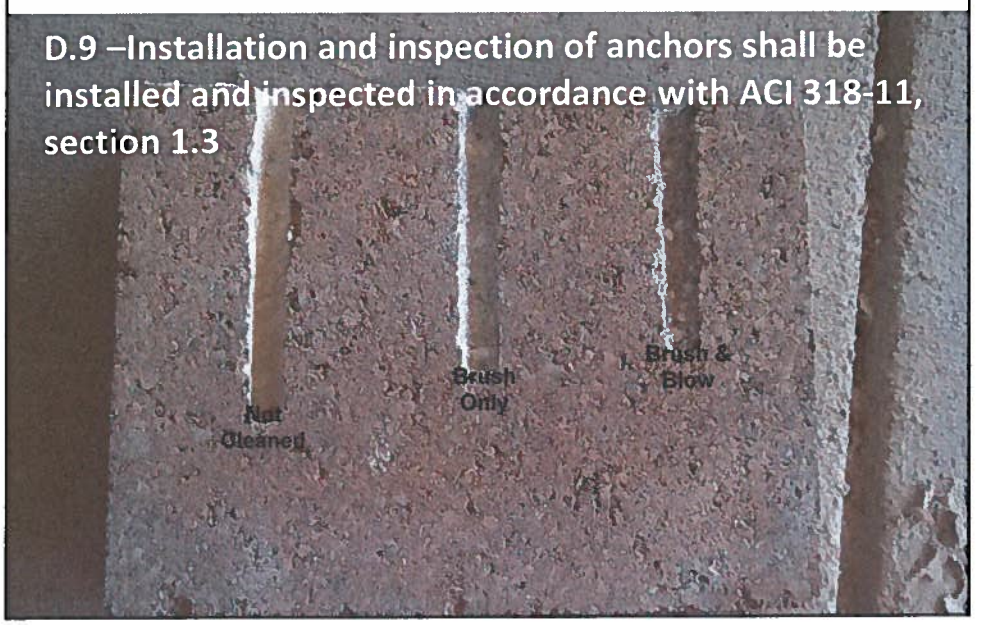
Concrete Special Inspections
IBC 2012, Table 1705.3 (slide 1 of 2)

TABLE 1705.3

REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	IBC REFERENCE
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	ALL –	X	ACI 318: 3.5, 7.1-7.7	1910.4
2. Inspection of reinforcing steel welding in accordance with Table 1705.2.2, Item 2b.	–	–	AWS D1.4 ACI 318: 3.5.2	–
3. Inspection of anchors cast in concrete where allowable loads have been increased or where strength design is used.	–	X	ACI 318: 8.1.3, 21.2.8	1908.5, 1909.1
4. Inspection of anchors post-installed in hardened concrete members[b].	–	X	ACI 318: 3.8.6, 8.1.3, 21.2.8	1909.1
5. Verifying use of required design mix.	–	X	ACI 318: Ch. 4, 5.2-5.4	1904.2, 1910.2, 1910.3
6. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	CONTINUOUS X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1910.10

Installation and special inspections related to anchors
ACI 318-11, Appendix D



Concrete Special Inspections
IBC 2012, Table 1705.3 (slide 2 of 2)

TABLE 1705.3
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION (Continued)

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	IBC REFERENCE
7. Inspection of concrete and shotcrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1910.6, 1910.7, 1910.8
8. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11-5.13	1910.9
9. Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the seismic force-resisting system.	X X	–	ACI 318: 18.20	–
10. Erection of precast concrete members.	–	X	ACI 318: 18.18.4	–
11. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	–	X	ACI 318: 6.2	–
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	–

For SI: 1 inch = 25.4 mm.

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

b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with ACI 355.2 or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work

Concrete Special Inspections
IBC 2012, Table 1705.3

Plastic Concrete Tests Required by Code

- Compressive Strength Tests
- Slump Tests
- Air Content Tests
- Temperature Determinations

- **ASTM C 172** Sampling of Concrete

- **ASTM C 31** Making Test Specimens (Initial Curing at 60° to 80° for 48 Hours)

ASTM C 143 Slump Test

ACI 318-11, sections 5.3.3.2 and 5.6.2.4 requires three test specimens at 28 days if the size of the test specimens are 4"x 8".

Concrete Special Inspections
IBC 2012, Table 1705.3

Concrete Placement (ACI 318, Sections 5.9, 5.10)

- Conveying from truck without segregation
- Consolidation
- Top surfaces of vertically formed lifts...level
- Construction Joints (Section 6.4) part of code

- Concrete (other than high early strength) shall be maintained above 50° in a moist condition for at least 7 days after placement (ACI 318, Section 5.11.1)

Initial Curing Requirements
60° to 80° for up to 48 hours

ACI 301-10, Section 1.6.2.2d Duties of Contractor

Provide space and source of electrical power on the project site for facilities to be used for initial curing of concrete test specimens as required by ASTM C 31, for the sole use of Owner's quality assurance testing agency.

Initial Curing – Responsibility of Testing Agency
ACI 301-10, section 1.6.3.2e

Responsibilities of Owner's Testing Agency

Owner's testing agency will conduct concrete strength tests during construction by making and curing test specimens according to ASTM C 31 and testing them according to ASTM C 39.

Concrete strengths for acceptance shall be the average of:

2 cylinders if 6"x 12"@ 28 days
3 cylinders if 4" x 8"@ 28 days

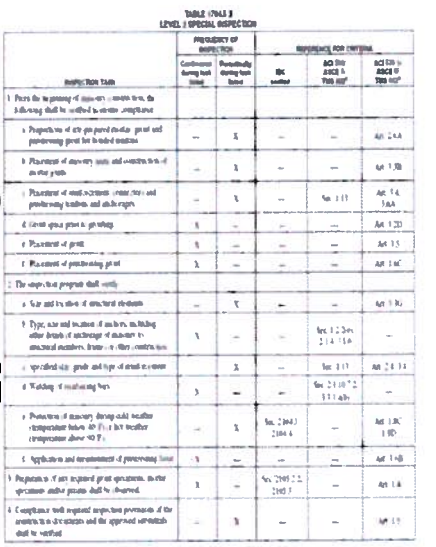
Snow Cured

Masonry Special Inspections, Chapter 17
Tables 1704.5.1 and 1704.5.3 DELETED in IBC 2012

IBC 2012
Chapter 17 Special Inspections

Masonry Special Inspection Tables
DELETED

Masonry Construction shall be inspected and verified in accordance with **ACI 530-11** quality assurance program requirements.



Masonry Special Inspections

Table 3 – Level A Quality Assurance

Table 3 – Level A Quality Assurance — **ACI 530.1-11 Masonry Specifications**

MINIMUM TESTS
None
MINIMUM INSPECTION
Verify compliance with the approved submittals

No inspections and/or testing required on Table 3 – Level A QA

IBC 2012, Chapter 17, Section 1705.4.1

The **minimum** special inspection program for empirically designed masonry (**masonry veneer**) classified as "Risk Category IV" is **Level B Quality Assurance.**

Table 4 – Level B Quality Assurance — **ACI 530.1-11 Masonry Specifications**

Old IBC Level 1	MINIMUM TESTS			
Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Article 1.5 B.1.b.3 for self-consolidating grout.				
Verification of f'_m and f'_{AAC} in accordance with Article 1.4 B prior to construction, except where specifically exempted by the Code.				
MINIMUM INSPECTION				
Inspection Task	**Frequency [a]**		**Reference for Criteria**	
Level B QA - Nonessential Facilities	**Continuous**	**Periodic**	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
1. Verify compliance with the approved submittals		X		Art. 1.5
2. As masonry construction begins, verify that the following are in compliance:				
a. Proportions of site-prepared mortar		X		Art. 2.1, 2.6 A
b. Construction of mortar joints		X		Art. 3.3 B
c. Grade and size of prestressing tendons and anchorages		X		Art. 2.4 B, 2.4 H
d. Location of reinforcement, connectors, and prestressing tendons and anchorages		X		Art. 3.4, 3.6 A
e. Prestressing technique		X		Art. 3.6 B
f. Properties of thin-bed mortar for AAC masonry	X[b]	X[c]		Art. 2.1 C
3. Prior to grouting, verify that the following are in compliance:				
a. Grout space		X		Art. 3.2 D, 3.2 F
b. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages		X	Sec. 1.16	Art. 2.4, 3.4
c. Placement of reinforcement, connectors, and prestressing tendons and anchorages		X	Sec. 1.16	Art. 3.2 E, 3.4, 3.6 A
d. Proportions of site-prepared grout and prestressing grout for bonded tendons		X		Art. 2.6 B, 2.4 G.1.b
e. Construction of mortar joints		X		Art. 3.3 B

Table 4 – Level B Quality Assurance (Old IBC Level 1) — **ACI 530.1-11 Masonry Specifications**

MINIMUM INSPECTION				
Inspection Task	**Frequency [a]**		**Reference for Criteria**	
Level B QA - Nonessential Facilities	**Continuous**	**Periodic**	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
4. Verify during construction:				
a. Size and location of structural elements		X		Art. 3.3 F
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction		X	Sec. 1.16.4.3, 1.17.1	
c. Welding of reinforcement	X		Sec. 2.1.8.7.2, 3.3.3.4 (c), 8.3.3.4 (b)	
d. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F (4.4°C)) or hot weather (temperature above 90°F (32.2°C))		X		Art. 1.8 C, 1.8 D
e. Application and measurement of prestressing force	X			Art. 3.6 B
f. Placement of grout and prestressing grout for bonded tendons is in compliance	X			Art. 3.5, 3.6 C
g. Placement of AAC masonry units and construction of thin-bed mortar joints	X[b]	X[c]		Art. 3.3 B.8
5. Observe preparation of grout specimens, mortar specimens, and/or prisms		X		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4

(a) Frequency refers to the frequency of inspection, which may be continuous during the task listed or periodically during the listed task, as defined in the table.
(b) Required for the first 5000 square feet (465 square meters) of AAC masonry.
(c) Required after the first 5000 square feet (465 square meters) of AAC masonry.

Table 5 – Level C Quality Assurance (Old IBC Level 2) — **ACI 530.1-11 Masonry Specifications**

MINIMUM TESTS				
Verification of f'_m and f'_{AAC} in accordance with Article 1.4 B prior to construction and for every 5,000 sq. ft (465 sq. m) during construction				
Verification of proportions of materials in premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout as delivered to the project site				
Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Article 1.5 B.1.b.3 for self-consolidating grout.				
MINIMUM INSPECTION				
Inspection Task	**Frequency [a]**		**Reference for Criteria**	
Level C QA - Essential Facilities	**Continuous**	**Periodic**	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
1. Verify compliance with the approved submittals		X		Art. 1.5
2. Verify that the following are in compliance:				
a. Proportions of site-mixed mortar, grout, and prestressing grout for bonded tendons		X		Art. 2.1, 2.6 A, 2.6 B, 2.6 C, 2.4 G.1.b
b. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages		X	Sec. 1.16	Art. 2.4, 3.4
c. Placement of masonry units and construction of mortar joints		X		Art. 3.3 B
d. Placement of reinforcement, connectors, and prestressing tendons and anchorages	X		Sec. 1.16	Art. 3.2 E, 3.4, 3.6 A
e. Grout space prior to grouting	X			Art. 3.2 D, 3.2 F

Table 5 - Level C Quality Assurance (Old Level 2) — **ACI 530.1-11 Masonry Specifications**

MINIMUM INSPECTION				
Inspection Task	Frequency [a]		Reference for Criteria	
Level C QA - Essential Facilities	Continuous	Periodic	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
f. Placement of grout and prestressing grout for bonded tendons	X			Art. 3.5, 3.6 C
g. Size and location of structural elements		X		Art. 3.3 F
h. Type, size, and location of anchors including other details of anchorage of masonry to structural members, frames, or other construction	X		Sec. 1.16.4.3, 1.17.1	
i. Welding of reinforcement	X		Sec. 2.1.8.7.2, 3.3.3.4 (c), 8.3.3.4 (b)	
j. Preparation, construction, and protection of masonry during cold weather (temperature below 40˚F (4.4˚C)) or hot weather (temperature above 90˚F (32.2˚C))		X		Art. 1.8 C, 1.8 D
l. Application and measurement of prestressing force	X			Art. 3.6 B
m. Placement of AAC masonry units and construction of thin-bed mortar joints	X			Art. 3.3 B.8
n. Properties of thin-bed mortar for AAC masonry	X			Art. 2.1 C.1
3. Observe preparation of grout specimens, mortar specimens, and/or prisms	X			Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4

(a) Frequency refers to the frequency of inspection, which may be continuous during the task listed or periodically during the listed task, as defined in the table.

Masonry Special Inspection Tasks
IBC 2012 – ACI 530.1-11

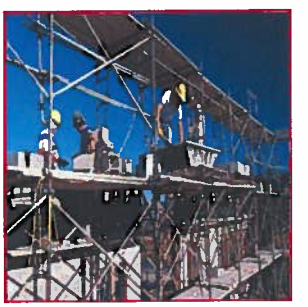
Verify compliance w/approved submittals Art 1.5

CMU, grout, mortar, aggregates ASTM C90, 144, 270, 404

Plans for cold/hot weather masonry Art 1.8, 1.8C, 1.8D

Obtain samples of project CMU ASTM C 90 and C 140

Mock-up panels, 1.6D



Prior to grouting

Grout space Articles 3.2D and 3.2F

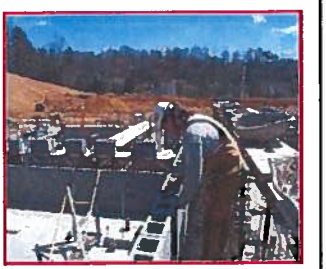
Grade, type, size, rebar, anchor bolts Section 1.16. Articles 2.4 and 3.4

Placement of rebar, connectors, anchors Sec 1.16 Articles 3.2E, 3.4, and 3.6E

Proportions of site prepared grout Art 2.6B,2.4G.1.b

Construction of mortar joints Art 3.3B

Masonry Special Inspection Tasks
IBC 2012 – ACI 530.1-11



Verify during construction:

Size and location of structural elements Art 3.3F

Welding of reinforcement Sec 2.1.8.7.2, 3.3.3.4(c)

Placement of grout Art 3.5 and 3.6C

Protect masonry in hot/cold weather Art 1.8C, 1.8D

Grout and mortar specimens Art 1.4 B.2.a.3, 1.4B.2.b.3, 1.4B.2.c.3, 1.4B.3, 1.4 B.4

Sampling and testing project masonry samples ASTM C 140 and ASTM C 90

Observe masonry sand for compliance ASTM C 144

Observe mortar/grout for compliance ASTM C 270, ASTM C 476, ASTM C 404

Grout key – Terminate grout lift 1 ½ inches below bed joint ACI 530.1.1 Art 3.F

Sampling and Testing CMU
(ASTM C 90-06b and ASTM C 140-11)

IBC 2012 through ACI 530.1-11 includes ASTM C 90 and C 140 in their entirety as a part of the masonry building code.

Project site CMU samples must be sampled and tested in accordance with C 140 and must comply with ASTM C 90. The CMU test specimens should be tested for compressive strength, absorption, unit weight (density), and moisture content. Fire rating should be calculated as well.

6 CMU for each lot of 10,000 or fraction thereof and 12 CMU for each lot of not more than 10,000 but less than 100,000.

For lots of more than 100,000 units, six CMU shall be selected for each 50,000 units or fraction thereof.

ASTM C 144-11, section 4.4
Standard Specification for Masonry Sand

When an aggregate fails the gradation limits specified in section 4.1 and 4.2, its use is permitted provided the mortar can be prepared to comply with the aggregate ratio, water retention, air content, and compressive strength requirements of the property specification (Table 2) of ASTM C 270.

ASTM C 270 Laboratory Mortar Mix Design

REPORT OF MORTAR PROPORTIONS AND PROPERTIES

Made For: Castle Sands Company
Services
Route 2 Box 757
New Castle, Virginia 24127

Project: Laboratory Testing
Mortar Mix Designs

MATERIALS USED TO PRODUCE THE MORTAR

Dark Castle Sand
Riverton Masonry Cement, Type N
Riverton Masonry Cement, Type S
Riverton Masonry Cement, Type M

Note 1:2:5 Proportions

All mixes were proportioned in general accordance with ASTM C-270 and C-91 with 1.0 Part Masonry Cement and 2.5 Parts Light Castle Sand

LABORATORY TEST DATA

		Type N Mix	Type S Mix	Type M Mix	C-91 Specifications
Normal Consistency (ASTM C-187), %		26.6	27.4	28.1	---
Time of Set (ASTM C-266, Gilmore Needles), minutes	Initial	125	110	102	>120 (N), >90 (S, M)
	Final	257	205	197	<1440
Autoclave Expansion (ASTM C-151), %		0.021	0.004	0.013	1.0 max.
Fineness (ASTM C-340, #325 Sieve) (Residue Retained), %		2.5	2.7	6.7	24 max.
Air Content (ASTM C-185), %		19.6	18.4	16.2	21 max (N), 19 max (S, M)
Water Retention (ASTM C-91), %		80.3	84.0	81.0	70 min.

Water Retention

ASTM C 270, Section 7.4 Tempering Mortars

RETEMPERING MORTAR

Mortars that have stiffened **shall be retempered** by adding water as frequently as needed to restore the required consistency.

No mortars shall be used beyond 2 ½ hours after mixing.

IBC 2012

IBC 2012, Section 1705.6 – Soils

A geotechnical subsurface exploration report detailing the existing soil conditions, fill placement, and load bearing requirements is required by Chapter 17 as well as **Section 1803.1** of the IBC 2012.

Plot showing location of test borings

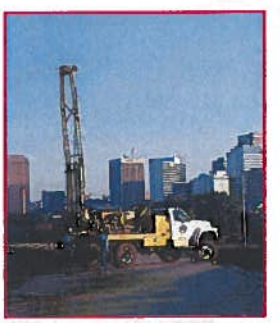
Soil samples, soil profile, water table data

Recommendations for foundation type

Anticipated total and differential settlement

Construction provisions

Section 1803 sets forth verbiage and criteria that should be included in geo report

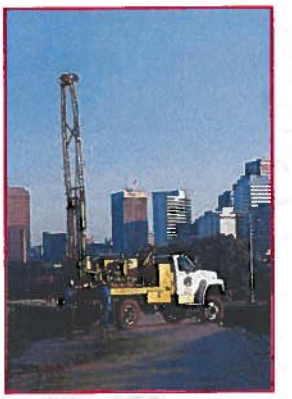


IBC 2012

IBC 2012 Section 1705.6 – Soils

"The *approved* geotechnical report, and the construction documents prepared by the registered design professionals shall be used to determine compliance."

During fill placement, the special inspector shall determine that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report. (Section 1803) ***continuous***



IBC 2012

IBC 2012, Table 1705.6
Soils Special Inspections

- ✓ Verify materials below shallow foundations are adequate to achieve the design bearing capacity
- ✓ Verify excavations are extended to proper depth and have reached proper material
- ✓ Perform classification and testing of compacted fill materials

Continuous

- ✓ Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill
- ✓ Prior to placement of fill, observe subgrade and verify that site has been prepared properly ***Proof Roll***

IBC 2012, Section 1705.7 through 1705.9
Deep Foundations

- ✓ Tables 1705.7 and 1705.8 set forth criteria requiring the special inspections of deep foundations
- ✓ Continuous presence required for special inspector
- ✓ Verify location, plumbness, elevations, end-bearing strata, and concrete and grout volumes (if applicable)
- ✓ For concrete elements, perform additional inspections in accordance with Section 1705.3

IBC 2012, Section 1705.13
Sprayed Fire-Resistant Materials

Verify that surfaces are prepared in accordance with the approved design for both SFRM and intumescent materials.

Thickness and Density (ASTM E 605)

Floor decking and roof thickness: 4 tests per 1,000 sq. ft.

Structural member thickness: 25% of structural members on each floor

Floor density: 1 test per 2,500 sq. ft.

Framing density: 1 test per type of element per 2,500 sq. ft.

Sprayed Fire-Resistant Material

IBC 2012

IBC 2012, Section 1705.13.4.1
Minimum Allowable Thickness

For design thicknesses **1 inch or greater**, the minimum allowable individual thickness shall be the design thickness minus ¼ inch.

For design thicknesses **less than 1 inch**, the minimum allowable individual thickness shall be the design thickness minus 25%.

No more than 10% of the thickness measurements of the SFRM shall be less than the thickness required by the approved fire-resistance design. (Section 1704.13.4)

Sprayed Fire-Resistant Material

IBC 2012

Section 1705.13.6 Sprayed Fire-Resistant Material Bond Strength

Measure cohesive/adhesive bond strength in accordance with ASTM E 736

Floor, Roof, and Wall Assemblies
A test from each floor, roof, and wall assembly at the rate of not less than 1 per 2,500 sq. ft. or part thereof (of the sprayed area in each story).

Structural Framing Members
One sample for each type of framing member (beams, girders, joists, trusses, and columns) at the rate of not less than **1 sample per element type for each 2,500 sq. ft.** of floor area or part in each story.

IBC 2012

IBC 2012, Sections 1705.11 through 1705.11.8
Wind Resistance – Seismic Force-Resisting Systems

The code changes, additions, and deletions related to wind resistance, seismic-force-resisting-systems and special inspections are extensive and the entire code change text would be better understood if reviewed in the context of the "*2012 IBC Code Changes Resource Collection*".

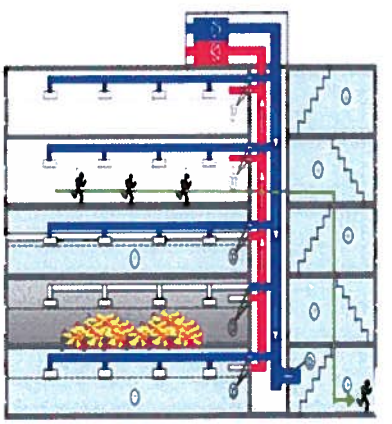
S129-09/10
S131-09/10
S132-09/10
S133-09/10
S134-09/10

IBC 2012

Section 1705.17 – Smoke Control

1. **Inspections are required during erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.**

2. **Inspections are required prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow, measurements, and detection and control verification.**



Smoke Control System Allowing Clear Escape Routes

IBC 2012

Any Questions?

For further information please contact:

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CODE COMPLIANCE & TRAINING

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IBC 2012