

# **2012 Build Safe | Live Safe Conference**

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#### **Course Description**

Concrete testing and placement is a critical component of the construction of a building. This course will provide attendees with an understanding of the Building Code as it relates to Concrete Testing and Placement, and how it's enforced by the Department of Buildings Concrete Enforcement Bureau. The course will examine how to comply with Concrete Testing and Placement through the use of examples. This course will describe testing requirements for concrete in the field and laboratory and how to avoid common mistakes through examples.

The participants will learn the role of the concrete manager and responsibilities. Attendees understand how a concrete safety manager can avoid common design and placement of concrete mistakes through examples and best practices. In the end, participants will understand the testing and placement of concrete requirements of Building Code and how to improve construction sites to accommodate these requirements.



#### **Learning Objectives**

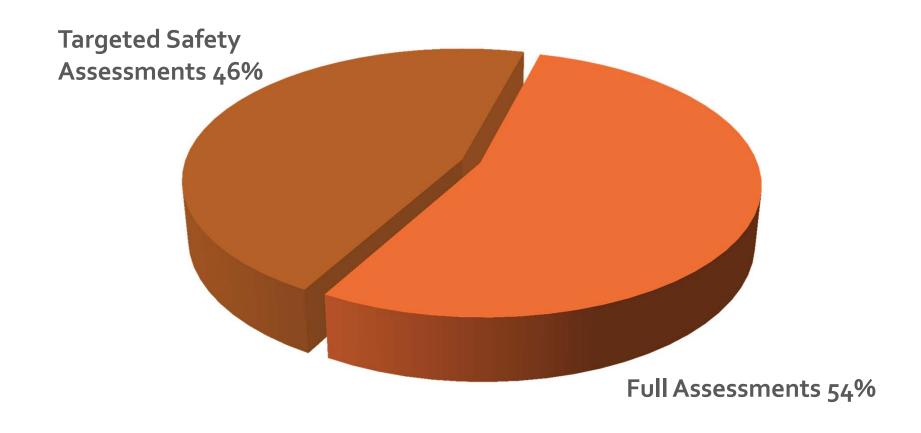
At the end of this program, participants will have learned:

- The Building Code requirements of Concrete Testing and Placement and how to comply with these requirements at construction sites
- How to apply concrete testing requirements to case studies in order to understand logistics
- How to analyze concrete placement defects and learn how to avoid them
- How to improve the safety of concrete formwork placement using examples and review best practices





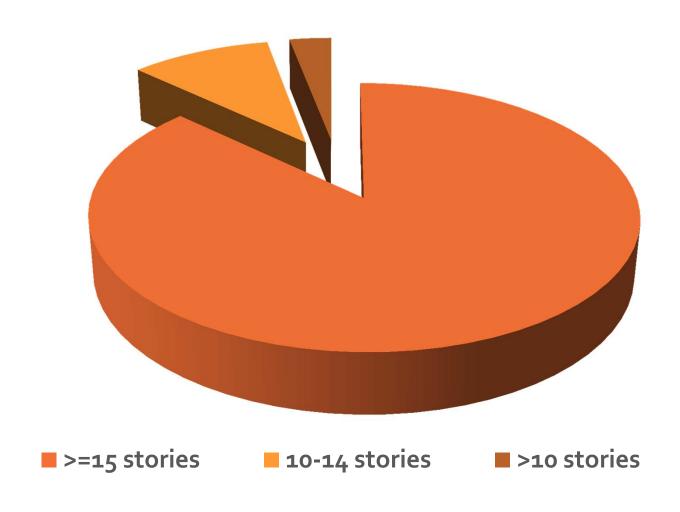
#### **HRCO High-Rise Concrete Site Visits**





By Type of Assessment

#### **High-Rise Concrete Operations Site Visits**





#### **HRCO Concrete Recommendation Areas**

- ENHANCING inspection and testing
- IMPROVING formwork standards
- RAISING structural design standards
- STRENGTHENING site safety practices



#### **Concrete Enforcement Unit (CEU)**

- Created in September 2009
- Mission: Support the Agency's oversight of all concrete placement and testing at construction projects throughout New York City



#### **Concrete Enforcement Unit (CEU):**

# **Primary Operations**

- Inspect and Audit Licensed Concrete Laboratories
- Site Visits and Inspect all Concrete Placement Activities
- Perform Parallel Concrete Testing of Selected Construction Sites
- Perform Engineering Audit of Concrete Operations



#### **Concrete Testing Requirements:**

#### **1968 & 2008 Building Codes**

#### DOB Licensed Lab Required to:

- Perform Mix Designs
- Sample Concrete at Construction Sites
- Perform Field Tests
- Perform Laboratory Tests





#### **Buildings Bulletin 2009-026**

- Clarifies field testing requirements
- Specifies minimum information to be provided on laboratory test reports
- Provides exemption from concrete testing requirements for small projects



NYC Buildings Department 280 Broadway, New York, NY 10007

Robert D. LiMandri, Commissioner



#### **BUILDINGS BULLETIN 2009-026**

Supersedes: None

Issuer: Fatma M. Amer, P.E.

Purpose: This document clarifies the requirement of special inspection and field and laboratory testing of cast-

in-place concrete

Related Code BC 1704.4 BC 1905.6.2 BC 1905.6.3.2 Section(s): BC 1905.6.1 BC 1905.6.3.1

Subject(s): Concrete, cast-in-place, special inspection; Concrete, test cylinders; Concrete, design mix; Concrete, special inspection; Concrete, testing, licensed concrete testing laboratory; Concrete, test cylinders,

approved testing agency; Concrete, strength test

#### Special inspection of cast-in-place concrete

Special inspection and testing shall be required for all cast-in-place concrete work that requires a building permit pursuant to section BC 1704.4 and Table BC 1704.4, unless the scope of the work falls into one of the specific exemptions listed in section BC 1704.4 or detailed in Item IV of this buildetin.

#### I. Identification of responsibilities for special inspection and testing

A. Special inspection by special inspection agency. The TR1 form ("Technical Report: Statement of Responsibility") identifying the special inspection agency must be submitted and accepted by the Department of Buildings ("department") prior to the issuance of a permit authorizing cast-in-place concrete work that is subject to special inspection. If the special inspection agency is later changed, a superseding TR1 form must be submitted and accepted by the department prior to commencement of concrete operations.

If the special inspector on site to conduct special inspections does not match the special inspection agency identified on the TR1 form, no concrete operations shall be commenced. In such cases, department's inspectors shall order all concrete work stopped. The department may take actions as appropriate against an inspection agency conducting inspections without having identified responsibility on a TR1 form.

B. Concrete testing by concrete testing laboratory. The TR3 form ("Technical Report: Concrete Design Mix") and TR2 form ("Technical Report: Concrete Pouring, Sampling and Compression Test Cylinders") identifying the concrete testing laboratory to perform the design mix and the test cylinders must be submitted and accepted by the department prior to the issuance of a permit authorizing cast-in-place concrete work that is subject to special inspection, unless concrete testing is exempted per Item IV of this bulletin. If econcrete testing laboratory is later changed, a superseding TR3 form and TR2 form must be submitted and accepted by the department prior to commencement of concrete operations.

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### **Concrete Testing:**

#### Requirements TR1, TR2, TR3

The Department accepts only the 10/09 version of the TR1, TR2, and TR3

Changes to Concrete Design Mix and Concrete Test Cylinder Required Items

 Identification of Responsibilities and Certification of Completion have been removed from the TR1

$\Box$	□ Ommeys		DO 1704.24		
	Firestop, Draftstop, and Fireblock systems		BC 1704.25		
	Aluminum Welding		BC 1704.26		
	Seismic Isolation Systems		BC 1707.8		1
	☐ Concrete Test Cylinders	TR2	BC 1905.	Submit TR2 to complete these items	)
	☐ Concrete Design Mix	TR3	BC 1905.3	Submit TR3 to complete these Items	



#### **Concrete Mix Designs**

#### 1968 Code and 2008 Code

- Concrete Mix Proportions based on one of two methods:
  - Trial Mixtures
  - Field Experience
- Both based on testing performed by a DOB licensed laboratory
- Nonstructural Concrete Can be based on other experience or information, subject to the approval of the engineer of record



#### **Concrete Mix Designs: Trial Mixtures**

Trial Mixtures – ACI 318 Section 5.3.3.2

- Laboratory batches
- Materials used shall be those for the proposed construction
- At least 3 different mixtures at varying water/cementitious material ratios must be tested
- Compressive strength is the average of 3 cylinders for each mixture tested
- Acceptable for one year provided no change in materials



# **Concrete Testing Requirements: TR3**

#### TR<sub>3</sub> Technical Report Concrete Mix Design

- Required prior to permit
- Up to 3 mixes can be filed on one form
- Additional mixes can be filed subsequently as needed on additional TR3 forms
- Mix Designs can be based on one of two methods
  - Trial Mixtures
  - Field Experience
- Revised form updated to incorporate more ingredients











# **Concrete Testing Requirements**



# **Concrete Testing Requirements**

- Sampling and testing required once per 50 cubic yards or once per 5,000 sq. ft. of slab or wall
- Minimum 5 strength tests per class of concrete



# Field Sampling and Testing

#### Requirements – ASTM C 172

- Temperature ASTM C 1064
- Slump ASTM C 143
- Unit Weight ASTM C 138
- Air Content: Two acceptable methods
  - Pressure Method ASTM C 231
    - Not applicable for concrete with light weight aggregates
  - Volumetric Method ASTM C 173
    - Acceptable method for light weight aggregates
- Making Cylinders ASTM C 31



### **Field Sampling and Testing**

### **Making Cylinders ASTM C 31**

Testing based on Standard Curing in Laboratory

- Initial Curing cylinders stored in curing box at construction site
- Final Curing cylinders stored in laboratory conditions









#### **Concrete Safety Manager Law (LL 40/2008)**

- Designated by the concrete contractor
- Oversee concrete operations
- Coordinate with Site Safety Manager or Coordinator (SSM/SSC)
- CSM information must be in the SSM /SSC log book
- CSM can only be responsible for concrete operations one site at a time





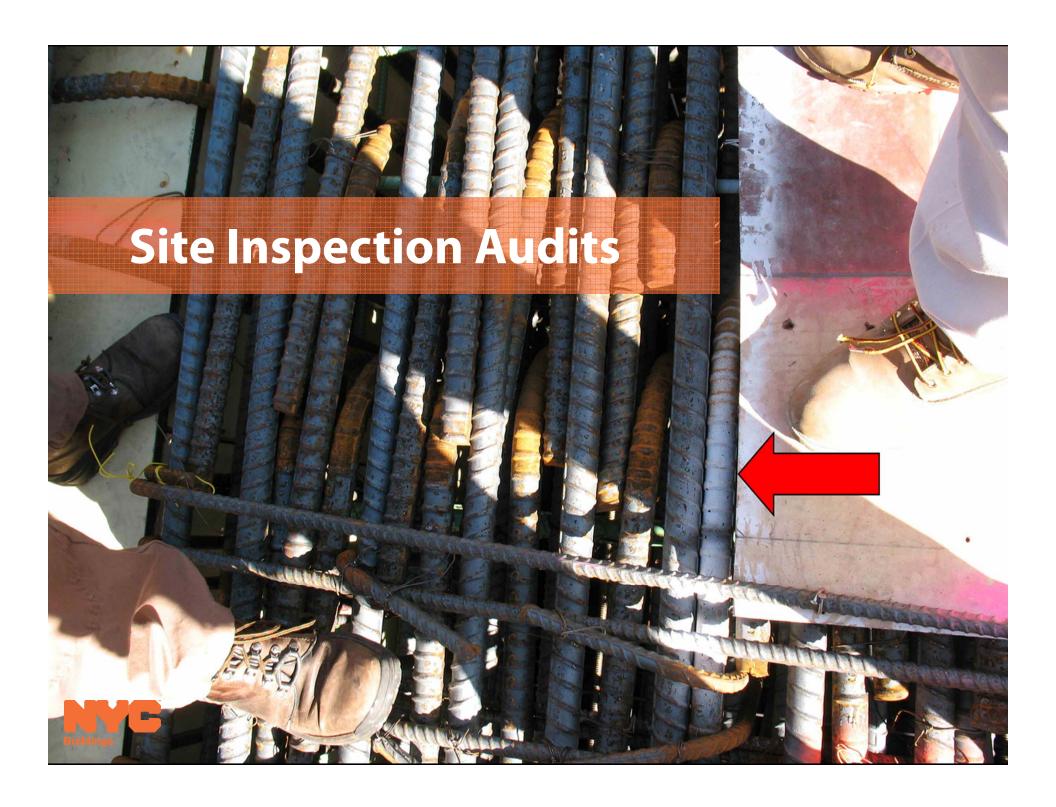
# **Construction Safety Manager**

#### **Duties and Responsibilities**

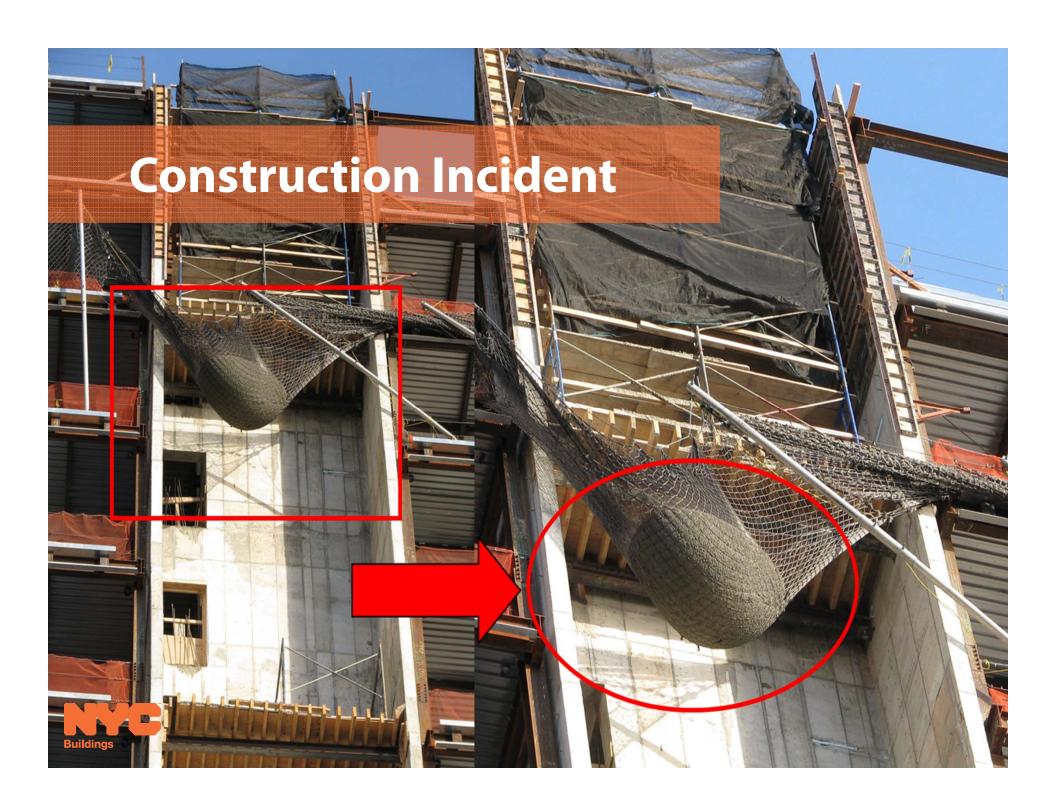
- Be onsite during concrete operations
- Monitor compliance with safety requirements of the code
- Coordinate with Site Safety Manager/Coordinators on site
- Maintain a Daily Log
- Report deficiencies to Contractor

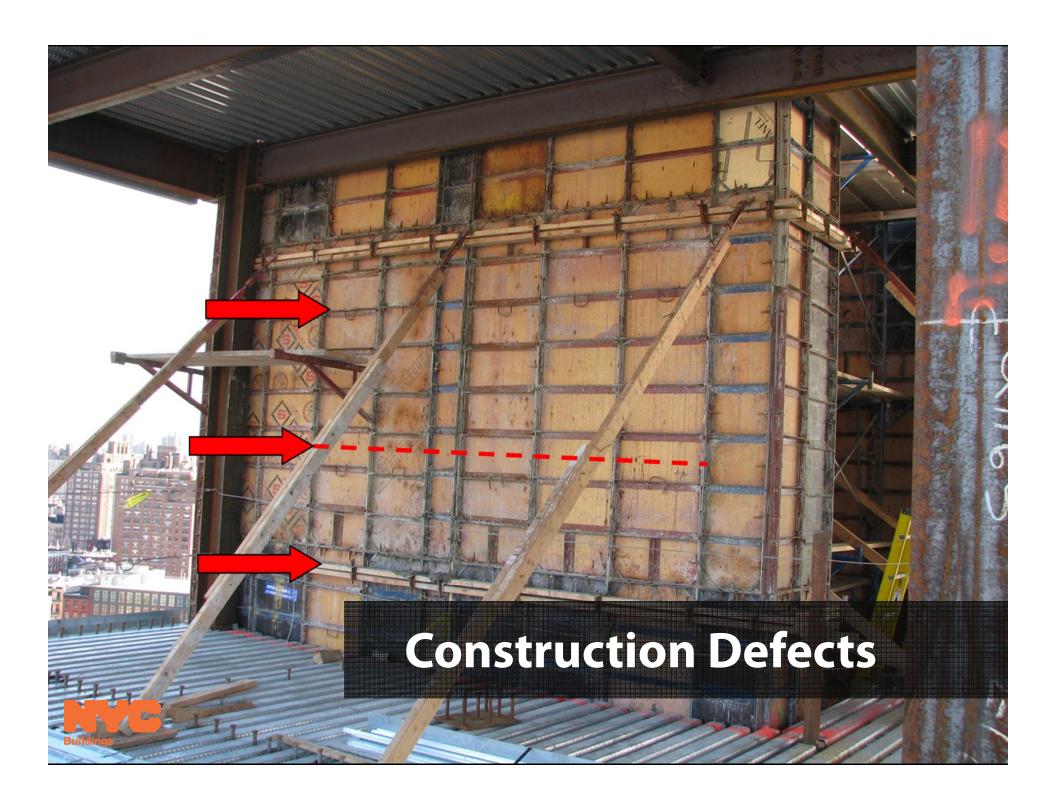














### Formwork Design

Rate of placement R, ft/h											
	90 °F	80 °F	70 °F	60 °F	50 °F	40 °F	7				
1	663	728	810	920	1074	1305					
2	694	763	850	967	1130	1375					
3	726	798	890	1013	1186	1445					
4	757	833	930	1060	1242	1515					
5					1		1				
6	Ra	ate of									
7	placement			Concrete temperature during placement, degrees F							
8		ft/h	parameter desired in the parameter degrees i								
9	-		+								
10			90	°F	80 °F		70 °F	60 °F	50 °F	40 °F	
11	-	100	+		40000	-					
12	7		85	850			1050	1200	1410	1725	
14			1,000	1	1002	-	1		3,-1-1		
16	1130	1253	1410	1620	1914						

1323

1393

1490

1570

1713

1807

2000 C.C. controls

10 Degree Temperature difference = 14% Increase in Load

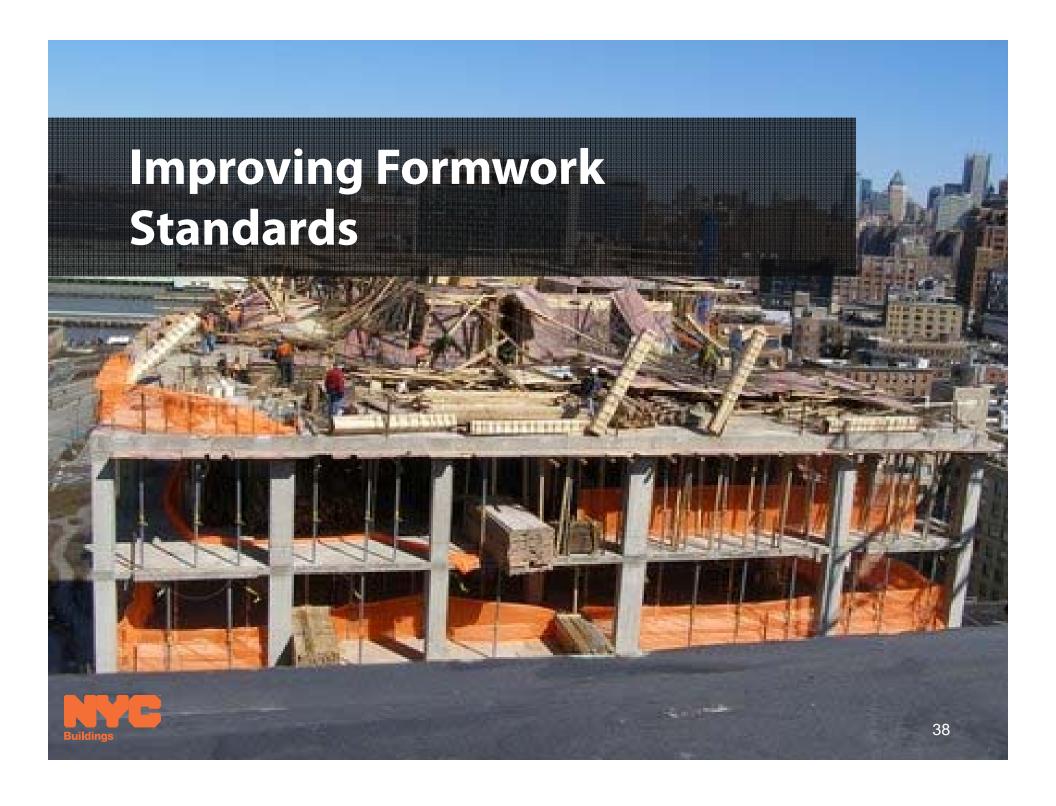


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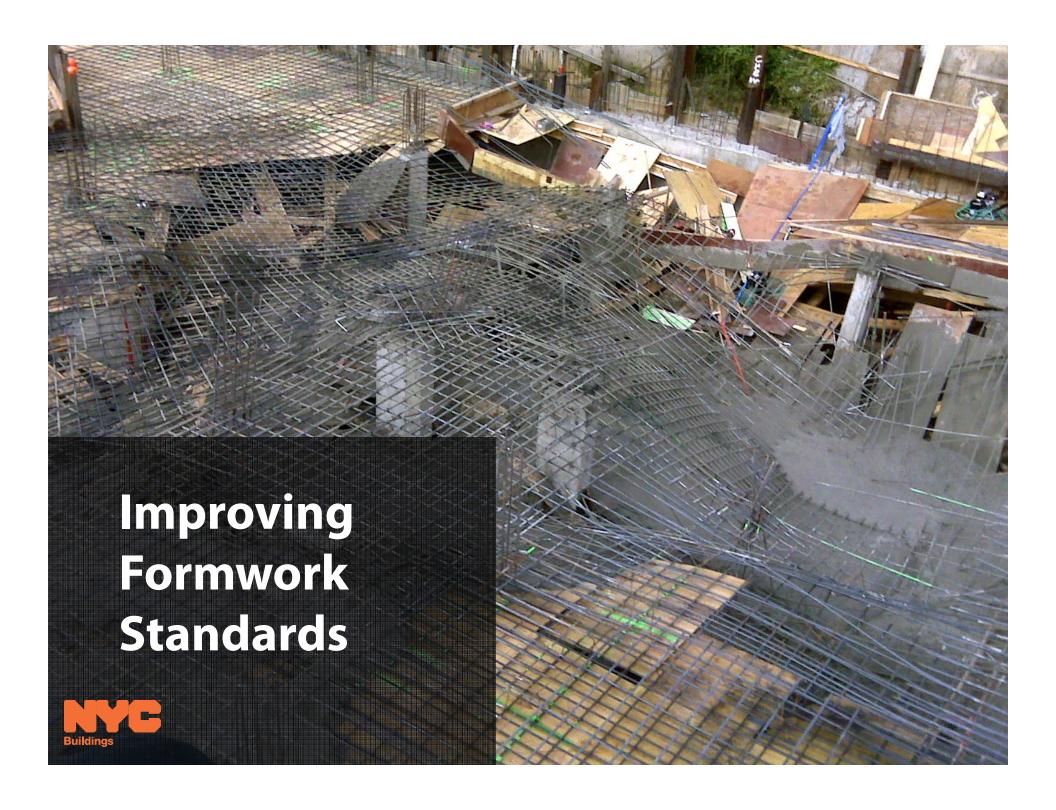
1192

1254

<sup>\*</sup>Base value of lateral pressure equals 150 + 4300/T = 2800 R/TNote: Maximum pressure is 2000 C C and minimum is 600 C. Do not use design pressures in excess of wh.







#### **Buildings Bulletin 2009-011**

Clarifies that concrete placed against an existing structure shall be evaluated by a registered design professional experienced in formwork design and in the evaluation of existing structure





#### **BUILDINGS BULLETIN 2009-011**

Technical

Supersedes: None

Related Code

Issuer: Fatma M. Amer, P.E.

missioner

ssuance Date: June 30, 2009

Purpose: This document clarifies the requirements for using existing structures to support the weight of concrete during placement and the inspection procedures and requirements for such concrete

ent.

placement.

BC 1704.4 BC 1906.2 BC 1906.1.1 BC 3301.7

Subject(s): Concrete; evaluation of structures, formwork; formwork design reinforced concrete;

Section BC 1906.1.1 requires concrete formwork to be proportioned so that it will safely support all vertical and lateral construction loads that might be applied until such loads can be fully supported by the permanent construction. In accordance with sections BC 3305.3 and 1906.1.2, these vertical and lateral loads shall be carried to the ground by the formwork system, by the new construction after it has attained adequate strength to support the loads, by existing structures, or a combination thereof.

Concrete placed against an existing structure imparts additional loads on the existing structure that may or may not be able support such loads. Such existing structures shall therefore be evaluated by a registered design professional experienced in formwork design and in the evaluation of existing structures. In accordance with section BC 1906.1.2, this design evaluation of the existing structure shall serve to determine what the loads that may be safely supported by the existing structure without causing damage.

Such design shall be documented by the registered design professional on signed and sealed drawings that indicate the results of the assessment as well as any specific limitations on the concrete placement methods and procedures such as maximum rate of concrete placement, minimum concrete temperature of placed concrete, and allowable lift height. Such drawings shall be maintained at the project site in accordance with section BC 3301.7.

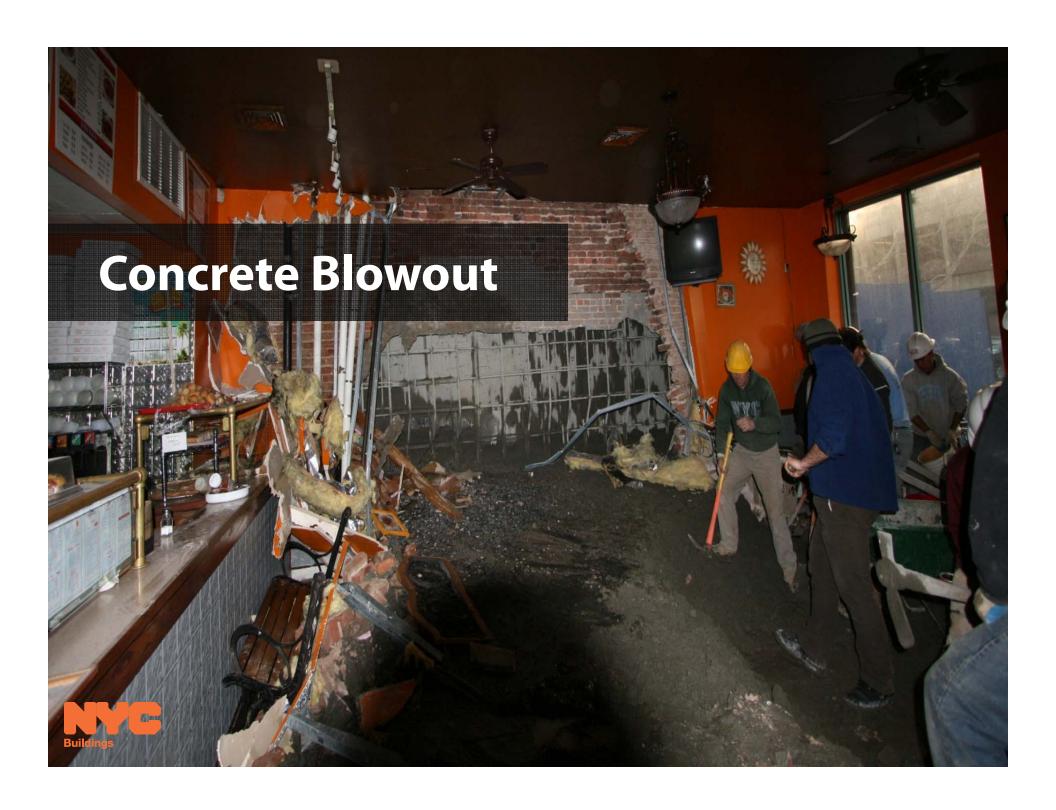
The inspector responsible for the special inspection of concrete, in accordance with section BC 1704.4, shall be provided with access to the formwork drawings, and shall monitor compliance with the specific placement limitations established in such drawings.

Buildings Builletin 2009-011 Page 1 of 2 safety • service • integrity











#### **More Information**

For more information, please visit the Department's Website: <a href="www.nyc.gov/buildings">www.nyc.gov/buildings</a>

If you have questions, email us at: ConcreteEnforcement@bb.nyc.gov



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# Questions?

This concludes the American Institute of Architects
Continuing Education Systems Course

NYC Department of Buildings
Buildings University
AIA Point of Contact:
Allison Ginsburg
allisongo@buildings.nyc.gov
212-566-4415

