

# **SPECIAL INSPECTIONS CATAWBA COUNTY**

**(SICC-2009)**

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**Administered by**

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## CHAPTER 7 CAST-IN-PLACE CONCRETE

### SICC-701 GENERAL

**SICC-701.1 Scope.** The requirements of this chapter and NCBC-1704.4 shall apply when construction includes cast-in-place concrete as listed in SIC-302.3.

### SICC-702 FABRICATION AND ERECTION DOCUMENTS

**SICC -702.1 Review and approval.** The cast-in-place concrete fabrication and erection documents, including concrete mix designs, shall be submitted for review and approval to the **SER** prior to concrete construction and/or formwork erection, as appropriate. The **GC** shall provide **SER**-approved fabrication and erection documents for use by the **SIER** to conduct special inspections during construction.

**SICC-702.2 SER review and approval.** Each fabrication and erection document shall bear the review and approval stamp of the **SER** and be properly signed and dated. Prior to concrete construction and/or formwork erection, as appropriate, the fabrication and erection documents listed below shall be reviewed and approved by the **SER**:

- Non-prestressed mild steel reinforcement.
- Prestressing steel to be post-tensioned.
- Concrete mix designs, including any accelerators or other admixtures, for each class of concrete to be used.

### SICC-703 INSPECTIONS

**SICC-703.1 Special inspections.** The **SIER** shall perform special inspections in accordance with this chapter, NCBC-1704.4 and NCBC-Table 1704.4. NCBC -Table 1704.4 Item 2, *Reinforcing steel welding* requires continuous or periodic inspection, depending upon the use of the reinforcing steel. (see SIC-604.2 and NCBC -Table 1704.3 Item 5b).

**NCBC-1704.4.1 Materials.** In the absence of sufficient data or documentation providing evidence of conformance to quality standards for materials in Chapter 3 of ACI 318, the building official shall require testing of materials in accordance with the appropriate standards and criteria for the material in Chapter 3 of ACI 318. Weldability of reinforcement, except that which conforms to ASTM A 706, shall be determined in accordance with the requirements of Section 3.5.2 of ACI 318.

**NCBC-TABLE 1704.4**  
**REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD <sup>a</sup>	NCBC REFERENCE
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	—	X	ACI 318: 3.5, 7.1-7.7	1913.4
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5b.	—	—	AWS D1.4 ACI 318: 3.5.2	—
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	—	—	1911.5
4. Verifying use of required design mix.	—	X	ACI 318: Ch. 4, 5.2-5.4	1904.2.2, 1913.2,1913.3
5. 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.	X	—	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
6. Inspection of concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 5.9, 5.10	1913.6, 1913.7 1913.8
7. Inspection for maintenance of specified curing temperature and techniques.	—	X	ACI 318: 5.11-5.13	1913.9
8. 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 ACI 318: 18.18.4	—
9. Erection of precast concrete members.	—	X	ACI 318: Ch. 16	—
10. 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	—
11. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 6.1.1	—

a. Where applicable, see also Section 1707.1, Special inspection for seismic resistance.

### SICC-703.2 Particular Elements.

**a. Concrete formwork.** The **SIER** shall verify that the formwork materials, cleanliness, size, and installation conform to approved formwork fabrication and erection documents, prior to placement of concrete.

**b. Reinforcing steel.** The **SIER** shall verify that reinforcing steel is in compliance with County approved construction documents and SER approved fabrication and erection documents, including welding of reinforcement of the structural seismic-force-resisting system.

**c. Tendons to be post-tensioned.** The **SIER** shall verify that tendons to be post-tensioned are in compliance with County approved construction documents and SER approved fabrication and erection

documents, including full-time monitoring of grouting, consolidation and reconsolidation of bonded prestressing tendons. Inspections shall include tendon size and strength, chair height, tendon profile, tendon snaking elimination, horizontal ties between chairs and condition of sheathing.

**d. Stressing of tendons.** The **SIER** shall verify that tendon stressing operations are in compliance with project specifications. Stressing of tendons shall not start before the specified minimum strength of field-cured test cylinders has been achieved and verified by the **SIER** and approved by the **SER**. Continuous monitoring of stressing of tendons is required. Elongation records shall be made and checked against project specifications. Tendon failures or tendon elongations not in compliance with project specifications shall be rejected and the **SER** shall make recommendations in writing for remedial actions.

**e. Concrete.** The **SIER** shall verify use of proper concrete design mix, monitor placement of concrete, and perform inspections and testing listed in NCBC-Table 1704.4. Continuous monitoring shall be required at the point of discharge from trucks / batch plant, and at the point of deposit / consolidation of concrete. Verify that water added at the site does not exceed that allowed by the mix design.

**f. Weldability of reinforcement.** If steel reinforcement other than ASTM A 706 is to be welded, the **SIER** shall verify that the weldability of the reinforcement has been determined in accordance with ACI NCBC Section 1903 and ACI 318 R3.5.2.

**g. Welding of reinforcement.** Special inspection of welding of reinforcement is required in accordance with **both** NCBC -Table 1704.4 Item 2 **and** NCBC -Table 1704.3 Item 5b. Continuous monitoring of welding of reinforcing steel shall be provided where required by NCBC -Table 1704.3 Item 5b.

## **SICC-704 TESTING**

**Concrete shall be tested in accordance with NCBC-1905.6 and this section.**

**SICC-704.1 Testing required.** Material tests for concrete properties and strength, for determining the compressive strength of concrete prior to removal of concrete formwork and shoring, reshoring, stressing post-tensioning tendons, loading of vertical building elements and erection of structural steel, shall comply with the following:

**NCBC-1905.6 Evaluation and acceptance of concrete.** The criteria for evaluation and acceptance of concrete shall be as specified in Sections 1905.6.1 through 1905.6.5.

**NCBC-1905.6.1 Qualified technicians.** Concrete shall be tested in accordance with the requirements in Sections 1905.6.2 through 1905.6.5. Qualified field testing technicians shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory, and record the temperature of the fresh concrete when preparing specimens for strength tests. Qualified laboratory technicians shall perform all required laboratory tests.

**NCBC-1905.6.2 Frequency of testing.** The frequency of conducting strength tests of concrete and the minimum number of test shall be as specified in ACI 318, Section 5.6.2.

Exception: When the total volume of a given class of concrete is less than 50 cubic yards, strength tests are not required when evidence of satisfactory strength is submitted to and approved by the building official.

**NCBC-1905.6.3 Strength test specimens.** Specimens prepared for acceptance testing of concrete in accordance with Section 1905.6.2 and strength test acceptance criteria shall comply with the provisions of

ACI 318, Section 5.6.4.

**NCBC-1905.6.4 Field-cured specimens.** Where required by the building official to determine adequacy of curing and protection of concrete in the structure, specimens shall be prepared, cured, tested and test results evaluated for acceptance in accordance with ACI 318, Section 5.6.4.

**NCBC-1905.6.5 Low-strength test results.** Where any strength test (see ACI 318, Section 5.6.2.4) falls below the specified value of  $f'_c$ , the provisions of ACI 318, Section 5.6.5, shall apply.

**SICC-704.2 Low-strength concrete test results.** Investigation of low-strength concrete shall be in accordance with NCBC-1905.6.5 and this section. The following procedures shall apply when test results do not comply with the acceptance criteria of ACI 318 for concrete strength.

**a. Submittal of data and recommendations to CCBSD.** The **SIER** shall submit to **CCBSD** a copy of any records pertaining to under-strength concrete, with written recommendations of the **SER**.

### **SICC-705 COMPLETION OF CAST-IN-PLACE CONCRETE CONSTRUCTION**

Upon completion of cast-in-place concrete construction, the **SIER** shall submit a completion letter to **CCBSD**. The **SIER** shall also indicate the date of completion on the final report of special inspections for all cast in place concrete.

## Cast-in-Place Concrete (CASE Guidelines)

Item	Scope
1. Mix Design	<i>Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.</i>
2. Material Certification	
3. Reinforcement Installation	<i>Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters</i>
4. Post-Tensioning Operations	<i>Inspect placement, stressing, grouting and protection of post-tensioning tendons. Verify that tendons are correctly positioned, supported, tied and wrapped. Record tendon elongations.</i>
5. Welding of Reinforcing	<i>Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.</i>
6. Anchor Rods	<i>Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.</i>
7. Concrete Placement	<i>Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.</i>
8. Sampling and Testing of Concrete	<i>Test concrete compressive strength (ASTM C31 &amp; C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).</i>
9. Curing and Protection	<i>Inspect curing, cold weather protection and hot weather protection procedures.</i>
10. Other:	