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## Controlling Quality Construction - Part 2

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In my previous article entitled "Controlling Quality Construction, Part 1", I illustrated various aspects of how the construction process can and should incorporate Due Diligence and Quality Control systems and methods, as they relate to the Concrete phases of the work.

At the risk of being redundant, I want to repeat a portion of my previous article, and hopefully drive home the need for skilled supervision and Inspection by all contractors.

It is the duty of the contractor to complete the work covered by his or her contract, in accordance with the approved plans and specifications. The contractor must carefully study the approved plans and specifications and should plan their schedule of operations well ahead of time. If at any time it is discovered that the work which is being done is not in accordance with the approved plans and specifications, the contractor should immediately correct the work.

In order to assure that the work being done is in accordance with the approved plans and specifications, the contractor must provide for and furnish adequate, experienced, competent supervision, and coordination of all of the work he or she is contracted to perform.

Inspection is a crucial function that does not start with the Building Inspector, or the Special Inspector. Inspection must begin with the Superintendent. It is critically important that the Superintendent be thoroughly knowledgeable of each and every trade that he is supervising. This doesn't necessarily mean that he has to be an expert in all trades, but it does mean that the superintendent must be aware of the resources available to him to gather sufficient information to assure that the work is being performed in accordance with the approved plans and specifications, and the manufacturer's recommendations for the use and installation of the material products being used, and that the work is in conformance with the requirements of the Codes.

The following, is a recommended check list that should be followed by the Project Superintendent for MASONRY INSPECTIONS:

1. PLAN READING
  - 1.1 General Project Requirements:  
Review the general notes and/or specifications and typical details for general project requirements for masonry unit, mortar and grout strengths, reinforcing steel grade(s), clearances and Special Inspection requirements.
  - 1.2 Foundations and below-grade Walls:  
Review the approved plans for reinforced masonry construction requirements for foundations and below-grade walls.

- 1.3 **Bond Beams and Piers:**  
Review the approved plans for reinforced masonry construction requirements for bond beams and piers.
- 1.4 **Columns:**  
Review the approved plans for reinforced masonry column construction requirements.
- 1.5 **Slabs:**  
Review the approved plans for reinforcement and concrete slab to wall connection requirements.
- 1.6 **Miscellaneous Details:**  
Review the approved plans for reinforced masonry construction requirements for stairs, above grade walls and other special details.
- 1.7 **Revised Details:**  
Review the revised details for the changes from the approved plans. Verify that the revised detail(s) are approved by the Structural Engineer of Record, and the Building Official.
2. **GENERAL INSPECTION PRACTICE**
- 2.1 **Acceptable Conditions:**  
Verify that the Building Inspector, or previous Special Inspector has approved the conditions at the site as required.
- 2.2 **Plan Changes:**  
Verify that structural plan changes are properly documented and approved by the Structural Engineer of Record, and the Building Official.
- 1.3 **Record Keeping:**  
Maintain records of all work Inspected, including discrepancies and action(s) taken.
3. **MASONRY MATERIALS - CERTIFICATIONS AND STORAGE**
- 3.1 **Masonry Material Certifications:**  
Verify masonry material certifications, bills of materials, or other documentation of masonry units, cement, lime and approved additives for compliance with the approved plans and specifications. Verify that materials are in an acceptable condition.
- 3.2 **Storage of Materials:**  
Verify that cement, lime, block and brick are supported on pallets and covered to protect them from exposure to excessive moisture or drying. Verify that aggregates and sand are stored free from contamination and to minimize segregation (for aggregates).
- 3.3 **Masonry Reinforcing Material Mill Certifications:**  
Verify the masonry reinforcing material mill certifications or other documentation of masonry reinforcement for compliance with the codes, standards and the approved plans and specifications. Verify that the reinforcing materials are in an acceptable condition.
4. **MORTAR MIX**
- 4.1 **Mortar Sand:**  
Verify that the mortar sand is clean and free from contamination and have acceptable gradation.
- 4.2 **Mortar Cement:**  
Inspect the mortar cement for dryness, type, and conformance to the specified requirements.
- 4.3 **Mortar Water:**  
Verify that the water is clean, potable and that only approved additives are used.

- 4.4 Job-Mix Mortar Proportioning and Mixing:  
Verify job-mix mortar proportioning of cement, aggregates and admixtures, for consistency, workability and mixing time.
- 4.5 Ready-Mix Mortar:  
Inspect ready-mixed mortar for type and conformance with the requirements of the project specifications.
- 4.6 Mortar Use:  
Verify the mortar elapsed time since mixed. Verify that mortar is not retempered after set.
- 5. MASONRY PREPARATION AND PLACEMENT
- 5.1 Dowels and Anchors:  
Inspect the alignment and lap length of dowels and anchors extending out of the footings for masonry walls.
- 5.2 Base Conditions:  
Verify that masonry footing and footing steel surfaces are clean.
- 5.3 Condition of Units:  
Verify that all masonry units are clean and sound.
- 5.4 Placement:  
Inspect the laying of masonry units, checking temperature, dimensions and alignment of finished work, laying of masonry units for stack bond or variations as per the approved plans. Verify that there is no deep furrowing of the bed joints. Inspect the mortar joints for the proper thickness, tightness and finish (tooled or struck).
- 5.5 Joints:  
Inspect construction, expansion and contraction joints for conformity to the approved plans, location and continuity of the steel.
- 6. MASONRY REINFORCEMENT
- 6.1 Vertical Reinforcement:  
Inspect the placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect the length of lap splices, clearances between bars, clearances to masonry units and the outside face of walls, tying and positioning of the steel.
- 6.2 Horizontal Reinforcement:  
Inspect the placement and alignment of horizontal joint reinforcement (HJR) steel and masonry reinforcement bars for size, grade and spacing. Inspect the length of lap splices, clearances between bars, clearances to masonry units and the outside face of walls, tying and positioning of the steel.
- 6.3 Ties:  
Inspect the ties, stirrups and hooks in the masonry for straightness, imbedment, spacing, bends for minimum diameter and size.
- 6.4 Anchor Connections:  
Inspect the installation of masonry anchor bolts, joist anchors and straps to be in accordance with the requirements of the approved plans, specifications, and code.
- 7. GROUT MIX
- 7.1 Grout Aggregates:  
Verify that the sand and aggregates are clean and have acceptable gradation.
- 7.2 Grout Cement:  
Inspect grout cement for dryness, type and conformance to specified requirements.
- 7.3 Grout Water:  
Verify that clean potable water only and approved additives and admixtures are used.

- 7.4 Job-Mix Grout Proportioning and Mixing:  
Inspect job-mix grout proportioning of cement, aggregates and approved admixtures for consistency, workability and mixing time.
- 7.5 Ready-Mix Grout:  
Verify ready-mix grout for conformance with mix design, consistency and workability. Verify Batch Plant Inspection (if required), and review B.P.I. tickets.
- 7.6 Grout Use:  
Verify the grout elapsed time since mixed at the plant. Verify that the grout is at the proper slump (8" to 10") and not retempered after set.
8. MASONRY GROUTING AND CAPPING
- 8.1 Grout Spaces:  
Verify that the grout spaces are correctly sized, aligned and clean and free from excessive mortar. When cleanouts are required, verify that cleanouts and any openings are sealed and braced after inspection and any grout barriers are in place before grouting.
- 8.2 Dry Packing or Approved Non-Shrink Grout:  
Verify the proper preparation and application of the dry packing or approved non-shrink grout material.
- 8.3 Grouting:  
Before grout is placed, check the preparation of the wall(s) for all anchors, straps, reinforcing steel placement and securement, cleanouts sealed and braced, position of door frames and braces, shoring for windows and doors, inclusion and locations for any approved electrical and plumbing piping or sleeves. During grouting verify the proper slump, grouting technique including consolidation to approved height of grout space, reconsolidation and mechanical vibration.
- 8.4 Capping:  
Verify the construction of any specified wall cap for weather tightness.
9. SAMPLES AND TESTS  
When specified on the drawings, and as required by the Building Code, Continuous Special Inspection may be required. When required, the Special Inspector will conduct all of the above, and provide for masonry specimen testing, as follows:
- 9.1 Prisms:  
Inspect the construction of test prisms including those required prior to the beginning of construction. Verify that test prisms contain the same masonry units, moisture content, mortar, approved additives and workmanship as used in the building.
- 9.2 Test Type:  
Determine the type and number of mortar, grout and reinforcing steel tests required.
- 9.3 Tests and Specimens:  
Conduct field tests and prepare specimens of reinforcing steel (if not sampled by the Testing Laboratory, at the Fabricators' Facility), mortar and grout in accordance with the Uniform Building Code, and ASTM Standards.
- 9.4 Specimen Handling & Protection:  
Using a permanent broad tip marker pen, mark all specimen cylinders or blotters with the following:
- Name and Address of Project.
  - Date of sampling.
  - 28 day ultimate design strength.
  - Set or load number (if needed).

Properly handle and place the specimens in an insulated storage box (usually furnished by the General Contractor), after preparation. Arrange for transportation of the specimens to the testing laboratory.

10. MASONRY PROTECTION

10.1 Protection:

Verify that appropriate hot-weather and cold-weather measures are taken for the protection of the masonry units, mortar and grout from excessive heat or frost. Verify that all walls are kept covered while not worked on.

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