# SECTION 014110– STRUCTURAL SPECIAL INSPECTION

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Special Inspections as defined in Section 1704 of The Kentucky Building Code are required.

B. Seismic Design Category for the structure is shown in the General Notes section of the structural drawings.

C. Special inspections are required for the following materials and work:

1. Inspection of Fabricators per Section 1704.2 of the Kentucky Building Code.
2. Steel Construction per Section 1704.3 of the Kentucky Building Code.
3. Concrete Construction per Section 1704.4 of the Kentucky Building Code.
4. Prepared Fill per Section 1704.7 of the Kentucky Building Code.
5. Pier Foundations per Section 1704.9 of the Kentucky Building Code.

### 1.3 SCOPE

A. The scope of the construction work to be inspected / tested / observed is that structural and foundation work shown on the structural construction drawings (S- sheets) as well as the following:

1. Geotechnical fill immediately below and within the footprint of the building.

B. All inspections and tests performed are to be documented by report including, but not limited to, inspections for concrete placement, reinforcing inspection, curing, fabricators, plank attachment, etc.

### 1.4 DEFINITIONS

A. In accordance with the intent of the Building Code, inspection work specified to be “continuous” shall be inspected the full, uninterrupted time that the Contractor is performing said construction work. Work specified to be “periodic” may be inspected as convenient to the Inspector, except that all work must be inspected prior to being covered by other work, during the working hours of the Contractor, and in a fashion that does not delay the Contractor. Regardless as to whether inspections are performed in “continuous” or “periodic” fashion, 100% of the construction work shall be inspected, unless noted otherwise.

1.5 SELECTION AND PAYMENT

A. The Inspection Agency is to be retained by the Owner. Costs for reinspection and retesting, should discrepancies be found, will be paid for by the Owner, except where rework is due to negligence or omission deemed excessive by the Owner.

1. In case of excessive rework, such retesting and reinspection shall be paid for by the Owner as an additional service of the Inspection Agency, but will be backcharged by deductive change order to the Contractor's contract.
2. In case of excessive waste/lost time of the Special Inspector due to inadequate scheduling by the General Contractor, such time shall be paid for by the Owner as an additional service of the Inspection Agency but will be backcharged by deductive change order to the Contractor's contract.

B. Special Inspections are additional to testing and inspection requirements shown elsewhere in the specifications and on the drawings, which is to be paid for by the General Contractor. The General Contractor shall also pay for additional structural testing and inspection required for his convenience. Inspection work not part of the Structural Special Inspections may be performed by an Inspection Agency of the Contractor's choosing, unless noted otherwise.

1.6 QUALITY ASSURANCE

A. Qualified Certification Authorities: Subject to compliance with Kentucky Building Code Requirements, Qualified Certification Authorities providing certification which may be applicable to Project include:

1. American Concrete Institute (ACI).
2. American Institute of Steel Construction (AISC).
3. American Society of Nondestructive Testing (ASNT).
4. American Welding Society (AWS).
5. International Code Council (ICC).
6. National Institute of Certified Engineering Technology (NICET).
7. Prestressed Concrete Institute (PCI).

PART 2 – EXECUTION

2.1 PROGRESS MEETINGS

A. The Special Inspector's designated Project Manager is to attend any pre-construction meetings which may be conducted at the construction site by the Structural Engineer to discuss quality issues.

B. The Special Inspector's designated Project Manager is to attend construction progress meetings which will be held at the construction site by the Architect, Engineer, and General Contractor.

2.2 CONTRACTOR'S RESPONSIBILITIES

A. Provide a complete copy all structural shop drawings to the Structural Testing/Inspection Agency.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Structural Testing/Inspection Agency and provide access, including equipment with operator, to work. Access equipment includes, but is not limited to, man lifts, excavation equipment, etc.

E. Provide samples of materials to be tested in required quantities.

F. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples. If required by Special Inspector, General Contractor shall provide cure box with electricity, water, and blankets for curing concrete specimens.

G. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections. Labor includes, but is not limited to, construction of masonry prisms, etc.

H. All parties who are to receive inspection and testing reports shall maintain an active email account to receive reports by.

I. General Contractor shall create and maintain a discrepancy log on site. Log shall list each discrepancy documented by the Special Inspector; state the date of discovery and Special Inspector’s report number; and provide room for the Special Inspector to sign and date when said discrepancy is corrected. No work containing discrepancy shall be covered prior to having reinspection and approval by the Special Inspector.

J. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Architect/Structural Engineer shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

2.3 SPECIAL INSPECTOR’S RESPONSIBILITIES

A. Cooperate with the Contractor and provide timely service.

B. Notify Contractor of minimum advance notice for each type of inspection/test.

C. Upon arriving at the construction site, sign in and notify the Contractor of presence.

D. Select the representative samples that are to be tested/inspected.

E. Perform tests/inspections as outlined in Contract Documents, the applicable codes, and as directed by the Structural Engineer.

F. Keep records of all inspections.

G. Furnish inspection reports to the Architect, Structural Engineer, and General Contractor weekly as construction progresses.

H. Inform General Contractor and / or Fabricator of all discrepancies immediately for correction.

1. Document in writing correction of discrepancies.
2. Highlight discrepancies within the report.
3. If discrepancies are not corrected, the discrepancies shall be brought to the attention of the Code Official and the Structural Engineer prior to the completion of that phase of the work.

I. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of work or materials tested/inspected, whether the work or materials complies with Contract Documents and name of the Structural Testing/Inspection Agency's representative.

J. Immediately notify General Contractor, Architect, and Structural Engineer by separate letter if work yet to be inspected is found on site that is either being covered by other work or was to receive continuous inspection.

K. Structural Testing/Inspection Agency may not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Contractor.

L. Submit a final report of inspections documenting completion of **all** required Special Inspections and correction of any discrepancies noted in inspections to the Structural Engineer. Final report shall be prepared by, sealed, and signed by the Special Inspector and shall include a complete list of materials and work inspected during the course of the project. One copy of said report is to be provided to the Contractor for his records.

2.4 INSPECTION OF FABRICATORS

A. Inspect the fabrication of structural load-bearing members where such work is being performed on the premises of the Fabricator’s shop.

1. Fabricators shall be exempt from special inspection when a Qualified Certification Authority (as defined in section 1702 of The Kentucky Building Code) has periodically reviewed and approved Fabricator’s written procedural and quality control manuals and fabrication practices. Subject to compliance with Kentucky Building Code requirements, Qualified Certification Authorities providing certification which may be applicable to Project include, but are not limited to, the following:

a. Structural Steel Fabricators – AISC or AWS certified.
b. Precast Concrete Fabricators – PCI certified.

2. Fabricators exempt from special inspection shall submit a certificate of compliance to the structural engineer of record at the completion of fabrication stating that all work was completed in accordance with the approved construction documents.

B. Verify that the Fabricator maintains and review for completeness Fabricator’s detailed fabrication and quality control procedures which provide a basis for control of the

workmanship and ability to conform to the approved construction documents and reference standards.

C. Perform special inspections at Fabricator's shop as outlined in this specification for each type of construction.

2.5 INSPECTION OF STEEL CONSTRUCTION

A. Provide special inspection of the fabrication of steel structural elements and assemblies in accordance with the *Inspection of Fabricators*.

B. Verify that certification numbers on bolt, nut, and washer containers correspond to the identification numbers on mill test reports and that manufacturer's symbol and grade markings appear on all bolts and nuts. Also verify that bolts, nuts, and washers are being properly cared for at the site.

C. Verify that identification markings on structural steel members conform to ASTM standards specified on the approved construction documents.

D. Verify that identification markings on weld filler materials conform to ASTM standards specified on the approved construction documents. Also verify that weld filler material is being properly cared for.

E. Test and inspect high-strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Perform periodic inspection of bearing type connections.
2. Verify that twist-off-type tension-control assemblies have been properly tightened.

F. Inspect and test welds during fabrication (where applicable) and erection of structural steel as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Inspect all weld procedures and welders according to the requirements of AWS D1.1-2000.
3. Use non-destructive testing according to AWS D1.1-2000, Section 6.11, on all welds that appear to have excessive inclusions, porosities, cracks, and incomplete penetrations as described by AWS D1.1-2000, or have the questionable weld removed and rewelded.
4. Perform continuous non-destructive testing according to AWS D1.1-2000, Section 6.11, on all complete penetration and/or partial penetration groove welds and on all splices of main members where those splices are required.
5. Perform periodic inspection according to AWS D1.1-2000, Section 6.9 (visual inspection) on all single-pass fillet welds smaller than 5/16".

G. Inspect all steel frame connection details for compliance with approved construction documents and approved steel erection shop drawings.

1. Verify completeness and construction of all bracing, stiffening, and connections.

2. Verify location, completeness and accuracy of all members.

2.6 INSPECTION OF STRUCTURAL ANCHORS

A. Periodically proof load 25% of each type and size of drilled-in adhesive type anchor in accordance with recommendations of the Anchor Manufacturer. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Engineer. If more than 10% of the tested anchors fail to achieve the specified torque or proof load within the limits as defined in the Specifications, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.

1. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.

B. Periodically verify installed torque of 100% of all wedge type expansion anchors with a calibrated torque wrench. Coordinate minimum installed torque with manufacturer of anchors installed.

2.7 INSPECTION OF CONCRETE CONSTRUCTION

A. Provide special inspection of the fabrication of concrete structural elements and assemblies in accordance with the *Inspection of Fabricators*.

B. Periodically verify the use of the proper design mix.

C. Verify use of proper grade and ASTM designation of reinforcing steel.

D. Perform periodic inspection on placement, spacing, clear cover, number, and splice lap lengths of reinforcing steel.

E. Monitor concrete quality by means of site and laboratory tests. The Inspection Agency is authorized to reject plastic concrete not conforming to specifications. Immediately inform the Contractor, the Architect and the Structural Engineer of inadequacies in concrete quality. Sampling and testing for quality control during concrete placement shall include the following:

1. Sampling Fresh Concrete: ASTM C 172.

a. Slump: ASTM C 143; one test at point of discharge for each day’s pour of each type of concrete; additional tests when concrete consistency seems to have changed.
b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day’s pour of each type of air-entrained concrete.
c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store

cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
5. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

F. Perform continuous inspection of concrete placement for all walls, grade beams, drilled piers and footings to verify proper application techniques. Perform periodic inspection of concrete placement for all slab on grade to verify proper application.

G. Perform periodic inspection of ICF concrete walls after removal of insulation by Contractor, minimum (2) 1' x 1' removal/observation per 50' length of wall.

H. Perform periodic inspection of concrete curing procedures to verify maintenance of specified curing temperature, protection, and techniques.

I. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

J. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

K. Test the F-number tolerances of concrete slabs in accordance with the provisions set forth by ASTM Committee E6.21.10. All tests shall be performed within three working days after concrete placement and prior to any form removal.

## 2.8 INSPECTION OF SOILS

A. Inspect the existing site soil conditions, fill placement, and load-bearing requirements for compliance with the recommendations of the approved geotechnical investigation report.

1. Where the site is specified to be undercut by the geotechnical investigation report, verify all existing uncontrolled fills have been removed from below applicable foundation elements to the specified depth. Test native material at base of cut to ensure that removal of expansive clay material has been removed. Notify Architect if expansive material remains after completion of specified undercut.
2. Soil fills shall be exempt from special inspection when total fill placement is less than 12 inches deep.

B. Prior to placement of any engineered fill, determine that the site has been prepared in accordance with the recommendations of the approved geotechnical investigation report.

1. Test samples from proposed borrow on- and off- site sources of fill for compliance with the approved materials listing and other requirements of the geotechnical report and the specifications. Clay soils shall be checked for acceptable plasticity index prior to moving on site.

C. During placement and compaction of the engineered fill material, verify that the material being used, maximum lift thickness, and in-place dry density comply with the recommendations of the approved geotechnical report.

1. Testing agency to inspect and test subgrades and each fill or backfill layer.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 6938, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of building slab, but in no case fewer than 3 tests.

## 2.9 INSPECTION OF DRILLED PIER FOUNDATIONS

A. Test and inspect bottom of excavation of each drilled pier before concrete is placed. If unsuitable bearing stratum is encountered, notify Architect for adjustments to drilled piers.

B. Provide special inspection of concrete materials and reinforcement, installation, and curing procedures in accordance with the *Inspection of Concrete Construction.*

C. Prepare a report for each drilled pier as follows:

1. Actual top and bottom elevations.

2. Top of rock elevation.
3. Description of soil materials.
4. Description, location, and dimensions of obstructions.
5. Final top centerline location.
6. Variation of shaft from plumb.
7. Shaft excavating method.
8. Design and tested bearing capacity of bottom.
9. Depth of rock socket.
10. Levelness of bottom and adequacy of cleanout.
11. Ground-water conditions and water-infiltration rate, depth, and pumping.
12. Description, diameter, and top and bottom elevations of temporary or permanent casings.
13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
14. Date and time of starting and completing excavation.
15. Inspection report.
16. Position of reinforcing steel.
17. Concrete placing method, including elevation of consolidation and delays.
18. Elevation of concrete during removal of casings.
19. Location of construction joints.
20. Remarks, unusual conditions encountered, and deviations from requirements.
21. Concrete testing results.

END OF SECTION 014110