

# STRUCTURAL QUALITY ASSURANCE PLAN

## GENERAL

This Structural Quality Assurance Plan includes:

- The Statement of Special Inspections which defines the scope of testing and inspection that is required for this project.
- The responsibilities of the Contractor.
- Structural Observations

Refer to other portions of the Construction Documents for Special Inspections required of architectural, mechanical, electrical or other building components.

Special Inspector shall be hired by the Owner.

Special Inspector shall maintain records of inspections in accordance with Chapter 17 of the Building Code and shall distribute these records to the Building Official, Architect, and Structural Engineer on a weekly basis, unless noted otherwise below. Reports shall indicate that work inspected/tested was done in conformance to the Construction Documents. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, they shall be brought to the attention of the Building Official, Architect, and Structural Engineer prior to completion of that phase of the work.

At the conclusion of the project, the Special Inspector shall submit a final report documenting required special inspections and correction of any discrepancies noted in the inspections.

## STATEMENT OF SPECIAL INSPECTIONS

Special Inspector shall perform the following tests and inspections of all structural elements included within this Statement of Special Inspections.

- The following elements are part of the Main Wind-Force-Resisting (MWFR) System and require additional Special Inspections for Wind Resistance:
  - Shearwalls and their Foundations ( Elevator shaft walls)
  - Floor and Roof Diaphragms, including Collectors, Drag Struts, and Boundary Elements
  - Roof Cladding and Fastening Connections
- The following tables contain material, components and work that require special inspection or testing:
  - Inspection Frequency, C - Continuous special inspection. Special inspection by the special inspector who is present when and where the work to be inspected is being performed.
  - Inspection Frequency, P - 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. For structural steel observe the items on a random basis.
  - See Steel section for additional information for inspection tasks.

SOILS	Inspection Frequency	Remarks
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	- P	-
2. Verify excavations are extended to proper depth and have reached proper material.	- P	Inspection is required after excavation is complete and prior to placement of structural fills.
3. Perform classification and testing of controlled fill materials.	- P	Perform laboratory tests of field samples provided by contractor for verification of in place densities.
4. Verify use of proper materials, densities, and lift thickness during placement and compaction of controlled fill. <ol style="list-style-type: none"> <li>As a minimum, perform one test per lift for every 2500 square feet of fill placed.</li> </ol>	C -	Refer to specification for lift thicknesses and compaction.
5. Prior to placement of controlled fill, observe subgrade and verify that the site has been prepared properly ( e.g. proofrolling, etc.) .	- P	-

HELICAL PILES	Inspection Frequency	Remarks
1. Steel inspections of welded components ( splices, closure plates, etc.) in accordance with Structural Steel Section.	- -	-
2. Verify pile material, sizes and lengths comply with the requirements. <ol style="list-style-type: none"> <li>Observe the installation of all Helical Piles, maintaining complete and accurate records of each pile.                             <ol style="list-style-type: none"> <li>Location</li> <li>Helix Bearing Plate diameter and spacing</li> <li>Pile Length</li> </ol> </li> </ol>	C -	Record unusual conditions encountered during installation.
2. Verify compliance of approved equipment, method, and materials to be used in installing the Helical Piles.	- P	-

CONCRETE CONSTRUCTION	Inspection Frequency	Remarks
1. Inspection of reinforcing steel placement and installation. Grade, size, quantity, quality, location, spacing, clearances.	- P	ACI 318: 3.5, 7.1 - 7.7 / IBC 1910.4
2. Inspection of reinforcing steel welding: <ol style="list-style-type: none"> <li>Verify weldability of reinforcing steel other than ASTM A 706</li> <li>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.</li> <li>Shear reinforcement.</li> <li>Other reinforcement.</li> </ol>	- P C - - P	ACI 318: 3.5.2 / AWS D1.4 / IBC Table 1705.2.2
3. Inspection of anchors cast in concrete. Verify compliance of the following: diameter, grade, type, length, number, placement, and embedment depth.	C -	ACI 318: 1.3.2, 8.1.3, 21.1.8 / IBC 1908.5, 1909.1, AISC 360-10 N5.7
4. Inspection of post-installed mechanical anchors installed in hardened concrete members: verify anchor type, anchor dimensions, hole diameter and cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque.	C -	ACI 318: 3.8.6, 8.1.3, 21.1.8 / IBC 1909.1 Use of post installed anchors must be approved by Structural Engineer
5. Inspection of post-installed adhesive anchors and reinforcing steel installed in hardened concrete members: . Verify adhesive type, anchor rod dimensions, hole diameter and cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque.	C -	ACI App. D9.2.4
6. Verify use of required design mix.	- P	ACI 318: Ch. 4, 5.2 - 5.4, IBC 1904.2, 1910.2, 1910.3
7. Sampling fresh concrete from concrete discharge. Mold one set of specimens for compressive strength testing for each 150 cubic yards or each 5,000 square feet of slab or wall surface area for each mix design placed in any one day. No fewer than five tests for a given class of concrete for the entire project. <ol style="list-style-type: none"> <li>Mold (5) 4x8-inch compressive strength cylinders, break and report (1) at 7-days, (3) at 28-days, or mold (4) 6x12-inch compressive strength cylinders, break and report (1) at 7-days, (2) at 28-days.</li> <li>Remaining specimen (s) shall be broken as directed by the Structural Engineer if compressive strengths do not appear adequate.</li> <li>For each set molded, record:                             <ol style="list-style-type: none"> <li>Slump</li> <li>Air Content</li> <li>Unit Weight</li> <li>Temperature, ambient and concrete</li> <li>Batch and discharge times</li> <li>Location and placement</li> <li>Any pertinent information, such as addition of water, addition of admixtures, etc.</li> </ol> </li> <li>Verify compliance with construction documents</li> </ol>	C -	ACI 318: 5.6, 5.8 ACI ( 5.a, 5.b, II, III, IV, v, vi) , SDG ( 5b.vii, 5.c, 5.d) ASTM C 172, ASTM C 31  ACI 318: 5.6.1 Report in writing on the same day as tests are performed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing agency, concrete design compressive strength, location of concrete placement in structure, concrete mix proportions and materials, compressive breaking strength and type of break.

CONCRETE CONSTRUCTION CONT.	Inspection Frequency	Remarks
8. Inspection of concrete conveying and placement for proper application techniques.	C -	ACI 318: 5.9, 5.10
9. Inspection for maintenance of specified curing temperature and techniques.	- P	ACI 318: 5.11 - 5.13
10. Inspection of formwork for shape, location, and dimensions of the concrete member being formed.	- P	ACI 318: 6.1.1
11. Perform testing of floor Flatness and Levelness of concrete slab placements in accordance with ASTM E1155. See specification	- P	ACI 117-10

CONCRETE MASONRY	Inspection Frequency	Remarks
1. Verification of f'm in accordance with Specification TMS 602 Article 1.4 B prior to construction	- -	TMS 602 - Article 1.4 B
2. Verification of Slump flow and Visual Stability Index ( VSI) as delivered to the project site for self-consolidating grout	- -	TMS 602 - Article 1.5 B.1.b.3
3. Verify compliance with the following approved submittals <ol style="list-style-type: none"> <li>Mortar mix designs indicating type and proportions of ingredients in compliance with the proportion specification of ASTM C270</li> <li>Mortar mix designs and mortar tests performed in accordance with the property specification of ASTM C270.</li> <li>Grout mix designs indicating type and proportions of the ingredients according to the proportion requirements of ASTM C476</li> <li>Grout mix designs and grout strength test performed in accordance with ASTM C476</li> <li>Grout compressive strength tests performed in accordance with ASTM C1019; and slump flow and Visual Stability Index ( VSI) as determined by ASTM C1611/C1611M.</li> <li>Construction procedures cold weather ( temperature below 40°F) or hot weather ( temperature above 90°F)</li> </ol>	- - - P - P - P - P	- TMS 602 - Article 2.1 and 2.6 A TMS 602 - Article 2.1 and 2.6 A TMS 602 - Article 2.2 TMS 602 - Article 2.2
4. As masonry construction begins, verify that the following are in compliance: <ol style="list-style-type: none"> <li>Proportions of site-prepared mortar</li> <li>Construction of mortar joints</li> <li>Location of reinforcement and connectors</li> </ol>	- - - P - P	- TMS 602 - Article 2.1 and 2.6 A TMS 602 - Article 3.3 B TMS 602 - Article 3.4
5. Prior to grouting, verify that the following are in compliance: <ol style="list-style-type: none"> <li>Grout space</li> <li>Grade, type, and size of reinforcement and anchor bolts</li> <li>Placement of reinforcement and connectors ( including horizontal joint reinforcement)</li> <li>Proportions of site-prepared grout</li> <li>Construction of mortar joints</li> </ol>	- - - P - P - P - P	- TMS 602 - Article 3.2 D and 3.2 F TMS 402 - Sec 1.16 TMS 602 - Article 2.4 and 3.4 TMS 602 - Article 3.2 E and 3.4 TMS 602 - Article 2.6 B TMS 602 - Article 3.3 B
6. Verify during construction: <ol style="list-style-type: none"> <li>Size and location of structural elements</li> <li>Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction</li> <li>Preparation, construction, and protection of masonry during cold weather ( temperature below 40°F) or hot weather ( temperature above 90°F)</li> <li>Placement of grout is in compliance</li> </ol>	- - - P - P C -	- TMS 602 - Article 3.3 F TMS 402 - Sec. 1.16.4.3, 1.17.1 TMS 602 - Article 1.8 C and 1.8 D TMS 602 - Article 3.5
7. Observe preparation of grout specimens, mortar specimens, and/or prisms	- P	TMS 602 - Article 1.4 B.2.b.3, 1.4 B.3, 1.4 B.4

STRUCTURAL STEEL	Inspection Frequency	Remarks
1. Inspection of steel framing to verify compliance with details shown on the approved construction documents including member locations, bracing, stiffening application of joint details at each connection, proper fasteners, etc.	- P	-
2. Verify material identification markings and manufacture certificates/test reports conform to material standards in construction documents for: <ol style="list-style-type: none"> <li>Structural steel</li> <li>Weld filler material</li> </ol>	- - - P - P	- -
3. Inspection of welds shall be in accordance with AWS D1.1. <ol style="list-style-type: none"> <li>Verify welder certification.</li> </ol>	C - - -	Review and verify compliance of written welding procedures with AWS requirements and that welding procedures are being adhered to during field welding.
<ol style="list-style-type: none"> <li>Single-pass fillet welds less than or equal to 5/16".</li> </ol>	- P	-

STEEL JOISTS	Inspection Frequency	Remarks
1. Visual inspection of bolted and welded connections.	- P	-
2. Verify installation of bridging or braces.	- P	-
3. Verify connections for top and bottom chords.	- P	-
4. Verify reinforcement of members for concentrated loads.	- P	-
5. Verify proper bracing.	- P	-

STEEL DECK	Inspection Frequency	Remarks
1. Material verification of steel deck. <ol style="list-style-type: none"> <li>Identification markings to conform to ASTM standards specified in the approved construction documents</li> <li>Manufacturer's certified test reports.</li> </ol>	- P - P	- -
2. Verify general alignment and deck lap.	- P	-
3. Verify welds for size and pattern.	- P	-
4. Inspection of welding at floor and roof deck	- P	In accordance with AWS D1.3
5. Verify spacing and type of sidelap attachments.	- P	-
6. Verify installation of deck closures.	- P	-

## CONTRACTOR RESPONSIBILITIES

- Contractor shall submit to the Building Official, Owner, and the Architect a written statement of responsibility that contains the following:
  - Acknowledgment of awareness of the special requirements contained in the Statement of Special Inspections for the main wind- or seismic force-resisting system or a wind- or seismic-resisting component listed in the statement of special inspections.
- Contractor shall pay for any additional structural testing/inspection required for work or materials not complying with the Construction Documents due to negligence or nonconformance and shall pay for any additional structural testing/inspection required for his convenience.
- Contractor is responsible to ensure that the Special Inspector is on site as required to perform all tasks required by Statement of Special Inspection. Any work that requires special inspection and is performed without the Special Inspector being present is subject to being demolished and reconstructed.
- Contractor has the following responsibilities to the Special Inspector:
  - Provide copy of Construction Documents to Special Inspector and latest addenda ( include change orders and field orders prior to inspection of work contained therein) .
  - Notify Special Inspector sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
  - Cooperate with Special Inspector and provide access to work.
  - Provide samples of materials to be tested in required quantities.
  - Provide storage space for Special Inspector's exclusive use, such as for storing and curing concrete testing samples.
  - Provide labor to assist Special Inspector in performing tests/inspections.
- Contractor shall perform the following:
  - SOILS
    - Identify soils to be used as structural fill.
  - CAST-IN-PLACE CONCRETE
    - Submit manufacturer's certification that reinforcing materials comply with Construction Documents.
      - For SFR Systems, submit mill test reports for each shipment of reinforcement.
      - Establish concrete mix design proportions in accordance with the specifications and ACI 318, Chapter 5.
      - Submit manufacturer's certification that concrete materials meet the requirements of the Construction Documents.
      - Submit manufacturer's data for tension and compression splicers.
  - CONCRETE MASONRY
    - Submit a certification from each manufacturer or supplier stating that the following materials comply with the Construction Documents:
      - Concrete masonry units.
      - Mortar materials: Portland cement, hydrated lime, and aggregates.
      - Grout materials: Portland cement and aggregates.
      - Joint reinforcement steel.
      - Reinforcing steel.
  - STEEL JOISTS
    - Submit manufacturer's certificate of compliance that the steel joists comply with the Construction Documents.
  - STEEL DECK
    - Submit manufacturer's certificate of compliance that the supplied steel deck complies with the Construction Documents.

## STRUCTURAL OBSERVATIONS

The visual inspection of the structural system by the registered design professional for general conformance to the Construction Documents will be provided in accordance with Chapter 17 of the Building Code. Structural Observations will be made prior to or during installation of foundations, and the Structural Observation Reports will be submitted to the building official. At the conclusion of the project, the Structural Observer will submit to the building official a written statement that the site visits have been made and identify any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved.

