STRUCTURAL QUALITY ASSURANCE PLAN

GENERAL

This Structural Quality Assurance Plan includes:

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

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

Special Inspector will 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.

1. The following tables contain material, components and work that require special inspection or testing:
   a. 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.
   b. 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.
   c. See Steel section for additional information for inspection tasks.

SOILS	INSPECTION FREQUENCY	REFERENCED STANDARD
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 compacted 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 compacted fill. a. As a minimum, perform one test per lift for every 2500 square feet of fill placed.	C	Refer to specification for lift thicknesses and compaction.
5. Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly (e.g. proofrolling, etc.).	P	

CONCRETE CONSTRUCTION	INSPECTION FREQUENCY	REFERENCED STANDARD
1. Inspection of reinforcing steel placement and installation. Grade, size, quantity, quality, location, spacing, clearances.	P	ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3 / IBC 1908.4
2. Inspection of anchors cast in concrete. Verify compliance of the following: diameter, grade, type, length, number, placement, and embedment depth.	C	ACI 318 17.8.2 / AISC 360 N5.7
3. 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 17.8.2 Use of post installed anchors must be approved by Structural Engineer
4. Verify use of required design mix.	P	ACI 318 Ch. 19, 26.4.3 26.4.4 / IBC 1904.1, 1904.2, 1908.2, 1908.3
5. 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. a. 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. b. Remaining specimens(s) shall be broken as directed by the Structural Engineer if compressive strengths do not appear adequate. c. For each set molded, record: i. Slump ii. Air Content iii. Unit Weight iv. Temperature, ambient and concrete v. Batch and discharge times vi. Location and placement vii. Any pertinent information, such as addition of water, addition of admixtures, etc. d. 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. e. Verify compliance with construction documents.	C	ACI 318 26.5, 26.12 / IBC 1908.10 ASTM C172, ASTM C31
6. Inspection of concrete conveying and placement for proper application techniques.	C	ACI 318 26.5 / IBC 1908.6-1908.8
7. Inspection for maintenance of specified curing temperature and techniques.	P	ACI 318 26.5.3-26.5.5 / IBC 1908.9
8. Inspection of formwork for shape, location, and dimensions of the concrete member being formed.	P	ACI 318 26.11.1.2(b)

NON-SHRINK GROUTING	INSPECTION FREQUENCY	REFERENCED STANDARD
1. Compressive strength tests per ASTM C109. a. Number of Tests; One test for each ten bags of grout used or minimum of one test of each day of grouting. b. Cube Size: 2-inch x 2-inch c. Test Schedule: (1) cube at 30days, (2) cubes at 7-days, (3) cubes at 28-days.	C	
2. Perform one performance evaluation test prior placing grout under baseplates. Test shall be performed as outlined in ACI 351.1R-99	P	One test shall be performed at the beginning of the job prior to placement of grout under base plates.

CONCRETE MASONRY	INSPECTION FREQUENCY	REFERENCED STANDARD
1. Prior to construction, verification of compliance of submittals.	Required	TMS 602 - Art. 1.4 B
2. Prior to construction, verification of f 'm	Required	TMS 602 - Art. 1.4 B
3. During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site.	Required	TMS 602 - Art. 1.5 & 1.6.3
4. As masonry construction begins, verify that the following are in compliance:		
a. Proportions of site-prepared mortar	P	TMS 602 - Art. 2.1, 2.6 A, & 2.6 C
b. Grade, type and size of reinforcement, connectors, and anchor bolts	P	TMS 602 - Art. 3.4
c. Sample panel construction	P	TMS 602 - Art. 1.6 D
5. Prior to grouting, verify that the following are in compliance:		
a. Grout space	P	TMS 602 - Art. 3.2 D & 3.2 F
b. Placement of reinforcement, connectors, and anchor bolts	P	TMS 602 - Art. 3.2 E & 3.4 TMS 402 Sec. 6.1, 6.3.1, 6.3.6, & 6.3.7
c. Proportions of site-prepared grout	P	TMS 602 - Art. 2.6 B
6. Verify compliance of the following during construction:		
a. Materials and procedures with the approved submittals	P	TMS 602 - Art. 1.5
b. Placement of masonry units and mortar joint construction	P	TMS 602 - Art. 3.3 B
c. Size and location of structural members	P	TMS 602 - Art. 3.3 F
d. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	P	TMS 402 - Sec. 1.2.1(e), 6.2.1, & 6.3.1
e. Preparation, construction, and protection of masonry during cold weather (temperature below 40 deg. F) or hot weather (temperature above 90 deg. F)	P	TMS 602 - Art. 1.8 C & 1.8 D
f. Placement of grout is in compliance	C	TMS 602 - Art. 3.5
7. Observe preparation of grout specimens, mortar specimens, and/or prisms	P	TMS 602 - Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4B.2.c.3, 1.4 B.3, & 1.4 B.4

STRUCTURAL STEEL	INSPECTION FREQUENCY	REFERENCED STANDARD
Where the following tasks have been be performed by the fabricator's or erector's quality control program in accordance to Chapter N of AISC 360-16, it is permitted that these tasks be coordinated with the Special Inspector so that the inspection functions are performed by only one party. The Special Inspector shall review records of tasks performed by the erector's and fabricator's quality control program to verify completeness.	Obs. - Observe these items on a random basis. Operations need not be delayed pending these inspections. Perf. - Perform these tasks for each welded joint, bolted joint, or member.	
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.	Obs.	AISC 360-16 N5.8
2. Review the material test reports and certifications as listed below for compliance with the construction documents.	Perf.	AISC 360-16 N5.2 & N3.2
a. Anchor rods and threaded rods test reports		
3. Visual Inspection Tasks Prior to Welding		AISC 360-16 Table N5.4-1
a. Welding procedure specifications (WPSs) available	Perf.	AWS D1.1/D1.1M 6.3
b. Manufacturer certifications for welding consumables available.	Perf.	AWS D1.1/D1.1M 6.2
c. Material identification (type/grade)	Obs.	AWS D1.1/D1.1M 6.2
d. Welder identification system. The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.	Obs.	AWS D1.1/D1.1M 6.4 (welder qualification) (identification system not required by AWS D1.1/D1.1M)
e. Fit-up of fillet welds	Obs.	
i. Dimensions (alignment, gaps at root)		AWS D1.1/D1.1M 5.21.1
ii. Cleanliness (condition of steel surfaces)		AWS D1.1/D1.1M 5.14
iii. Tacking (tack weld quality and location)		AWS D1.1/D1.1M 5.17
f. Check welding equipment	Obs.	Only required for shop Fabrication.
4. Visual Inspection Tasks During Welding		AISC 360-16 Table N5.4-2
a. Use of qualified welders	Obs.	Delete in 2016
b. Control and handling of welding consumables	Obs.	
i. Packaging		AWS D1.1/D1.1M 5.3.1
ii. Exposure control		AWS D1.1/D1.1M 5.3.2 (for SMAW), AWS D.1/D1.1M 5.3.3 (for SAW)
c. No welding over cracked tack welds	Obs.	D1.1/D1.1M 5.17 (for SAW)
d. Environmental conditions	Obs.	
i. Wind speed within limits		AWS D1.1/D1.1M 5.11.1
ii. Precipitation and temperature		AWS D1.1/D1.1M 5.11.2
e. WPS followed	Obs.	AWS D1.1/D1.1M 6.3.3, 6.5.2, 5.5, 5.20
i. Setting on welding equipment		
ii. Travel speed		
iii. Selected welding materials		
iv. Shielding gas type/flow rate		
v. Preheat applied		
vi. Interpass temperature maintained (min./max.)		
vii. Proper position (F, V, H, OH)		AWS D1.1/D1.1M 5.6, 5.7
f. Welding techniques	Obs.	AWS D1.1/D1.1M 6.5.2, 6.5.3, 5.23
i. Interpass and final cleaning		
ii. Each pass within profile limitations		AWS D1.1/D1.1M 5.29.1
iii. Each pass meets quality requirements		
5. Visual Inspection Tasks After Welding		AISC 360-16 Table N5.4-3
a. Welds Cleaned	Obs.	AWS D1.1/D1.1M 5.29.1
b. Size, length and location of welds	Perf.	AWS D1.1/D1.1M 6.5.1
c. Welds meet visual acceptance criteria	Perf.	AWS D1.1/D1.1M 6.5.3
i. Crack prohibition		AWS D1.1/D1.1M Table 6.1(1)
ii. Weld/base-metal fusion		AWS D1.1/D1.1M Table 6.1(2)
iii. Crater cross section		AWS D1.1/D1.1M Table 6.1(3)
iv. Weld profiles		AWS D1.1/D1.1M Table 6.1(4), 5.24
v. Weld size		AWS D1.1/D1.1M Table 6.1(6)
vi. Undercut		AWS D1.1/D1.1M Table 6.1(7)
vii. Porosity		AWS D1.1/D1.1M Table 6.1(8)
d. Arc strikes	Perf.	AWS D1.1/D1.1M 5.28

WOOD	INSPECTION FREQUENCY	REFERENCED STANDARD
1. Verify wood products by official grade mark. If specified, verify fire-retardant-treated and preservative-treated wood is labeled.	P	
2. Verify that general arrangement and installation of wood members is in accordance with the approved truss shop drawings and the Construction Documents.	P	
3. For SFR and MWFR Systems, perform the following:		
a. Inspect during field gluing operations.	C	
b. Verify nailing, bolting, anchoring, and other fastening of components, including wood shearwalls, wood diaphragms, drag struts, braces, shear panels, and hold-downs.	P	

SHOP-FABRICATED WOOD TRUSSES	INSPECTION FREQUENCY	REFERENCED STANDARD
1. Verify wood products by official grade mark. If specified, verify fire-retardant-treated wood is labeled.	P	
2. Verify that general arrangement and installation of wood trusses is in accordance with the approved wood truss shop drawings and the Construction Documents.	P	
3. Verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved shop drawings.	P	
4. Verify that trusses and truss connections are not damaged or have not been field modified.	P	
5. Verify wood truss bearing lengths at all support points.	C	
6. Verify wood truss anchorage details at all support points.	C	
7. For trusses with clear spans of 60-feet or more, verify the temporary and permanent restraint/ bracing are installed in accordance with the approved truss submittal package.	P	IBC 1705.5.2
8. Quality control procedures shall as a minimum follow the requirements of ANSI/TPI 1.		

Special Inspector shall be responsible for additional Architectural and MPE inspections. See other disciplines for requirements.

CONTRACTOR RESPONSIBILITIES

1. Contractor shall submit to the Building Official, Owner, and the Architect a written statement of responsibility that contains the following:
   a. Acknowledgment of awareness of the special requirements contained in the Statement of Special Inspections.
2. 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.
3. 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.
4. Contractor has the following responsibilities to the Special Inspector:
   a. Provide copy of Construction Documents to Special Inspector and latest addenda (include change orders and field orders prior to inspection of work contained therein).
   b. Notify Special Inspector sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
   c. Cooperate with Special Inspector and provide access to work.
   d. Provide samples of materials to be tested in required quantities.
   e. Provide storage space for Special Inspector's exclusive use, such as for storing and curing concrete testing samples.
   f. Provide labor to assist Special Inspector in performing tests/inspections.
5. Contractor shall perform the following:
   a. SOILS
      i. Identify soils to be used as structural fill.
   b. CAST-IN-PLACE CONCRETE
      i. Submit manufacturer's certification that reinforcing materials comply with Construction Documents.
      ii. Establish concrete mix design proportions in accordance with the specifications and ACI 318, Chapter 26.
      iii. Submit manufacturer's certification that concrete materials meet the requirements of the Construction Documents.
      iv. Submit manufacturer's data for tension and compression splicers.
   c. NON-SHRINK GROUTING
      i. Submit product data sheets for non-shrink grout that shows compliance with the Construction Documents and with ASTM C1107 for fluid or flowable grouts, prior to placement of grout.
   d. CONCRETE MASONRY
      i. Submit a certification from each manufacturer or supplier stating that the following materials comply with the Construction Documents:
         1. Concrete masonry units.
         2. Mortar materials: Portland cement, hydrated lime, and aggregates.
         3. Grout materials: Portland cement and aggregates.
         4. Joint reinforcement steel.
         5. Reinforcing steel.
   e. STRUCTURAL STEEL
      i. If fabricator or erector is not AISC certified, the fabricator and/or erector shall establish and maintain quality control procedures and perform inspections to ensure that their work is performed in accordance with the Section N of the Specification for Structural Steel Building, AISC 360-16 and the construction documents. Payment of these Quality control tests and inspections, except for all NDT of welds completed in the field by the Special Inspector, shall be by the fabricator and Erector.
         1. Make available the documents listed in AISC 360-16 N3.2 in electronic or printed form for review by the EOR of the EOR's Designee prior to fabrication or erection unless otherwise required by the contract documents to be submitted.
      ii. If fabricator and erector are certified by the American Institute of Steel Construction (AISC) Quality Certification Program for Structural Steel Buildings submit certification.
         1. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the Building Official stating that the materials supplied and work performed by the fabricator are in accordance with the construction documents.
         2. At completion of erection, the approved erector shall submit a certificate of compliance to the Building Official stating that the materials supplied and work performed by the erector are in accordance with the construction documents.
      iii. Provide non-destructive test (NDT) reports performed in shop by fabricator. Fabricator is responsible for cost of NDT performed in shop. Reports shall identify the tested weld by piece mark and location in the piece.
   f. POST-INSTALLED ANCHORS
      i. Contractor shall contact manufacturer's representative for product installation training. Submit a letter indicating that training has taken place.
   g. SHOP-FABRICATED WOOD TRUSSES
      i. Submit certification that truss fabricator is certified by the TPI Quality Assurance Program (QAP).
      ii. Submit fabricator's certificate of compliance that the manufactured trusses conform to the requirements of the Construction Documents.

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STRUCTURAL QUALITY ASSURANCE PLAN

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