

SECTION 014010 – STRUCTURAL TESTING AND INSPECTIONS

PART 3 - EXECUTION

3.1 **Jobsite Testing and Inspection Requirements - General**

A. General:

1. Scope of Work
 - a. The owner [design professional in responsible charge] will engage a qualified inspection and testing agency(s) to perform special inspections and testing for all structural members and assemblies as noted herein.
 - b. Special inspections are in addition to inspections by the authority having jurisdiction required by IBC 2021section 110.
 - c. Refer to architectural/mechanical/electrical/civil specifications and drawings for additional special inspection and testing that may be required.
2. Special inspections and testing are applicable to all revisions and/or future work added by amendments to the construction documents.
3. Definitions
 - a. Special inspector: the agency engaged by the owner and approved by the authority having jurisdiction to act as the designated representative to perform inspections.
 - b. Special inspection: inspection performed by the special inspector according to IBC 2021section 1704 to ensure compliance with approved construction documents and referenced standards.
 - c. (P) Periodic inspection: the part-time or intermittent observation by the special inspector of work being performed. Special inspector shall be present in the area where the work is being performed. Observation of all work (100% visual) shall be made at the completion of the work.
 - d. (C) Continuous inspection: the full-time observation by the special inspector of work being performed. Special inspector shall be present in the area where the work is being performed. Observation of all work (100% visual) shall be made at the completion of the work.
 - e. (100%): 100% observation / testing prior to concealment of indicated element.
 - f. Testing and Inspection Type 1: Material Verification and Workman Certifications.
 - g. Testing and Inspection Type 2: Site Inspection for Layout and Quantities.
 - h. Testing and Inspection Type 3: Site Inspection for Procedures and Workmanship.
 - i. Testing and Inspection Type 4: Site Testing for Material Properties and Workmanship.
 - j. Testing and Inspection Type 5: Fabrication Facility Inspection and Testing for Workmanship.
4. Deficiencies in Work
 - a. Correct deficiencies in work that tests and inspections indicate do not comply with the contract documents and referenced standards.
 - b. All cost of additional testing and/or inspections for corrective work shall be borne by the contractor.

B. Shop Fabrications:

1. General

- a. Perform inspections and testing for all shop fabricated structural members and assemblies as noted herein. Special inspector shall perform special inspections and testing unless the fabricator is registered and approved by the authority having jurisdiction to perform such work without special inspection or fabrication has a current ICC-ES evaluation report.
 - b. Special inspector shall verify the fabricator maintains and follows detailed shop fabrication and quality control procedures, unless fabricator is registered and approved.
 - c. At the completion of fabrication, the approved fabricator shall submit a certificate of compliance to the authority having jurisdiction according to IBC 2021 section 1704.2.5.1
 - d. Approved fabricators may perform testing noted herein except that nondestructive testing (NDT) shall only be performed by personnel with qualifications that meet or exceed the criteria of AWS D1.1 subclause 6.14.6 and American Society for Nondestructive Testing (ASNT) SNT-TC-1A or ASNT CP-189.
2. Shop Fabrications Included
- a. Shop fabricated structural steel including stairs and railing elements
 - b. Shop fabricated cold formed steel elements
 - c. Structural precast concrete
 - d. Pre-fabricated wood structural elements
 - e. Shop fabricated steel connections for structural wood connections

3.2 Jobsite Testing and Inspection Requirements for Soils and Foundations

A. Soils Inspection and Testing

1. Excavation Extents and Depths
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify excavations are extended to the proper depth and have reached the proper material.
 - c. Frequency: (P) Periodic inspection.
2. Subgrade Material Verification
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.
 - c. Frequency: (P) Periodic inspection.
3. Fill materials
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Perform classification and testing of compacted fill materials.
 - c. Frequency: (P) Periodic inspection.
4. Controlled Fill Placement
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify use of proper materials, densities, compaction, and lift thicknesses during placement and compaction of compacted fill.
 - c. Frequency: (C) Continuous inspection.
5. Bearing Material Verification
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Verify bearing material is adequate to achieve the design bearing capacity.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: Geotechnical Investigation Report.

6. See civil drawings and/or specifications for additional earthwork and utility inspection requirements.
7. See civil drawings and/or specifications for classification and testing requirements for compacted fill and/or controlled low-strength material.

3.3 Jobsite Testing and Inspection Requirements for Concrete

A. Cast-in-Place Inspection and Testing – Before Concrete Placement

1. Formwork Dimensional Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Prior to placement of concrete inspect formwork of first pour of each type (grade beam, column, structural slab, slab-on-deck, etc.).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 2.2-2.3
2. Reinforcing Steel Placement.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify grade, finish, size, bar quantity, location, spacing, cover, hook lengths, splice lengths, splice locations, bend diameters, coating, surface conditions, and supports.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 301-16 3.2-3.3.
3. Bolts and Embedments Placement.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify type, finish, diameter, length, quantity, embedment length, spacing and edge distances, use of placing template where specified.
 - c. Frequency: 100% observation / testing.
4. Bolts and Embedments Welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect per the jobsite testing and inspection requirements for steel.
 - c. Frequency: See jobsite testing and inspection requirements for steel.
5. Reinforcement Welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify ASTM A706 reinforcing steel. Inspect all welds.
 - c. Frequency: (C) Continuous inspection.
6. Reinforcement Field Bending.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect reinforcement field bending.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 3.3.2.8.
7. Mechanical Connectors.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect mechanical connectors.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.
8. Epoxy or Galvanized Reinforcing.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Inspect epoxy or galvanized reinforcing.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 301-16 3.2.1.2.
9. Construction of Reshores.

- a. Type 3: Site Inspection for Procedures and Workmanship
- b. Criteria: Verify construction is compliant with construction documents and approved shop drawings.
- c. Frequency: (P) Periodic Inspection.
- d. Standard: ACI 318-14 26.13.3.3

B. Cast-in-Place Inspection and Testing – During Concrete Placement.

- 1. Verify Design Mix.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify use of approved design mixture for each truck load.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ACI 318 Ch. 19, 26.4.3, 26.4.4.
- 2. Concrete Placement Inspection.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect placement of concrete per standard (see below).
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ACI 301-16 5.3.2.
- 3. Concrete Curing Inspection.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Inspect curing of concrete per standard (see below).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ACI 301-16 5.3.6.

C. Structural Concrete Testing.

- 1. Note: Nondestructive testing may be permitted by the architect but will not be used as sole basis for approval or rejection of deficient concrete.
- 2. Welding.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Welding testing and inspection per the jobsite testing and inspection requirements for steel.
 - c. Frequency: See jobsite testing and inspection requirements for steel.
- 3. Composite Concrete Sample – $f'_c < 5000$ PSI.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Obtain sample at point of placement. For drilled piers obtain near beginning of load prior to placement in shaft.
 - c. Frequency: At least once a day or at least once for each 100 cubic yards of concrete or at least once for each 5,000 square feet of surface area for slabs and walls. Adjust frequency as required to provide minimum 5 total tests per mix but not more than one sample per truck load.
 - d. Standard: ASTM C172.
- 4. Slump/Slump Flow.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Specified slump shall be as submitted in the mix design $\pm 1\ 1/2"$. perform additional tests when concrete consistency appears to change.
 - c. Frequency: Each composite sample (see above).
 - d. Standard: ASTM C143 (slump) or ASTM C1611 (slump flow).
- 5. Air content when air entrainment is specified and lightweight concrete.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below).
 - c. Frequency: Each composite sample (see above).

- d. Standard: ASTM C231 pressure method for normal weight concrete or ASTM C173 volumetric method for light weight concrete.
 - 6. Temperature.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below). Required when air temperature is 40 °F and below or 80°F and above.
 - c. Frequency: Each composite sample (see above) and at 60 minute intervals.
 - d. Standard: ASTM C1064.
 - 7. Unit weight for structural lightweight concrete.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test per standard (see below).
 - c. Frequency: Each composite sample (see above).
 - d. Standard: ASTM C138.
 - 8. Cold Weather Curing.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Record maximum and minimum concrete temperature during curing period when daily average air temperature of 40 °F or below is expected for 3 successive days during curing period.
 - c. Frequency: N/A
 - d. Standard: ASTM C1074.
 - 9. Compressive Strength.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Reports of compressive strength tests shall contain the following information: date of concrete placement, location of concrete batch in work, design 28-day compressive strength, concrete supplier and mixture ID number, time of batch and placement, ambient air temperature, site added water and admixtures, unit weight, and as required by ASTM C39. Acceptance criteria per ACI 318.
 - c. Frequency: Test per schedule below:
 - 1) 7 days: 6x12 or 4x8
 - 2) 28 days: 6x12 or 4x8
 - 3) 56 days: 6x12 or 4x8 (if 28 day tests do not achieve specified 28 day strength).
 - d. Standard: ASTM C31, ASTM C39. Either 6x12 or (6) 4x8 cylinders.
- D. Expansion, Sleeve and Screw Anchor Inspection and Testing – Before Anchor Installations
 - 1. Verify Installation Procedure.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review contractor's installation procedure.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
 - 2. Verify Anchor Type, Diameter, and Materials.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify anchor products to be used for compliance of anchor type, diameter, materials and product
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
 - 3. Verify Max Allowed Impact Wrench Torque.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: For screw anchors, confirm the maximum allowed impact wrench torqued as defined by the manufacturer.
 - c. Frequency: (C) Continuous inspection.

- d. Standard: ICC-ES Report.
- E. Expansion, Sleeve and Screw Anchor Inspection and Testing – During Anchor Installations
- 1. Continuous inspection required regardless if periodic inspection is permitted by ICC-ES report.
 - 2. Verify Hole Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole layout matches the contract documents. Review of layout should include number of anchors, spacing, edge distances, and quantity.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 3. Grout Extents Around Masonry Anchors.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: At masonry anchors, confirm the grout extents surrounding the anchor have been satisfied.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 4. Verify Hole Diameter, Depth, Cleaning
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole diameter and depth meet the manufacturer requirements and the requirements shown on the contract documents. Observe the hole cleaning procedure is in accordance with the anchor manufacturers recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 5. Verify Anchor Installation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify the anchor installation of the anchor is in accordance with the anchor manufacturer recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
- F. Expansion, Sleeve and Screw Anchor Inspection and Testing – After Anchor Installations
- 1. Verify Installation of Attached Assembly.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify number, edge distances, and anchor flush with and perpendicular to the receiving surface.
 - c. Frequency: (C) Continuous inspection.
 - 2. Torque Test Anchors.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Test anchor with calibrated torque wrench to 100% of the installation torque noted in ICC-ES report. Attain specified torque within 1/2 turn of the nut.
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- G. Adhesive Anchors and Reinforcing Inspection and Testing - Before Anchor / Reinforcing Installation
- 1. Verify Installation Procedure.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review contractor's installation procedure. Verify adhesive to be used for product type, manufacturer recommendations, expiration dates, pot life, working temperature ranges for adhesives, substrates and anchors.

- c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
 - 2. Verify Anchor Type, Diameter and Materials.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify anchor to be used for compliance of anchor type, diameter, length, finish, and base material. Verify solid grouted area around anchors in grouted masonry
 - c. Frequency: 100% observation / testing.
 - d. Standard: ICC-ES Report.
- H. Adhesive Anchors and Reinforcing Inspection and Testing - During Anchor/Reinforcing Installation
 - 1. Continuous inspection required regardless if periodic inspection is permitted by ICC-ES report.
 - 2. Verify Hole Layout.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole layout matches the contract documents. Review of layout should include number of anchors, spacing, edge distances, and quantity.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 3. Grout Extents Around Masonry Anchors.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: At masonry anchors, confirm the grout extents surrounding the anchor have been satisfied.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 4. Verify Hole Diameter, Depth and Cleaning.
 - a. Type 2: Site inspection for Layout and Quantities.
 - b. Criteria: Verify the hole diameter and depth meet the manufacturer requirements and the requirements shown on the contract documents. Observe the hole cleaning procedure is in accordance with the adhesive manufacturer's recommendations.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
 - 5. Verify Anchor Installation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify the anchor installation of the anchor is in accordance with the adhesive manufacturer's recommendations. Verify the temperatures of the adhesive, substrate and anchors are within the manufacturer recommended ranges.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: ICC-ES Report.
- I. Adhesive Anchors and Reinforcing Inspection and Testing - After Anchor / Reinforcing Installation
 - 1. Verify Installation of Attached Assembly.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify number, edge distances, and anchor flush with and perpendicular to the receiving surface. Verify full cure time has elapsed prior to application of torque or load to anchor.
 - c. Frequency: (C) Continuous inspection.
 - 2. Tension Test Anchors / Reinforcing
 - a. Type 4: Site Testing for Material Properties and Workmanship.

- b. Criteria: Test the installation of the first 3 of each type, base material, and position (down, horizontal, overhead). Observe ASTM E488 minimum edge distances for determining test locations. Submit Proposed test locations and requests for required tension test load values to engineer.
- c. Frequency: First 3 and 1% of remaining.
- d. Standard: ASTM E488 Static Tension.

3.4 Jobsite Testing and Inspection Requirements for Steel

A. Steel Testing and Inspection Definitions.

- 1. UT – Ultrasonic Testing.
- 2. MT – Magnetic Particle Testing.
- 3. PT – Penetration Testing.
- 4. SFRS – Seismic Force Resisting System.
- 5. TTT – Tension Through Thickness.

B. Steel Framing – General.

- 1. HDAS, HAS, DAS, Threaded studs.
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Review manufacturer certifications for fastener materials.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.
- 2. Non-USA Material $\geq 3/4$ " loaded in tension through-thickness (ASTM A435).
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Any discontinuity causing a total loss of back reflection that cannot be contained within a circle 3 inches in diameter shall be rejected. Required where noted as 'TTT' in drawings.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N, ASTM A435.
- 3. Non-USA Material $\geq 3/4$ " embedded plate assemblies - UT Testing.
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Test along centerline of plate width after welding.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.
- 4. Non-USA Material $\geq 1\ 1/2$ " loaded in tension through-thickness (ASTM A898).
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: Not required for steel produced in USA. Criteria to be met 6 inches above and below each weld. Required where noted as 'TTT' in drawings
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N, ASTM A898 (Level 1 Criteria).
- 5. MT or PT for thermally cut beam copes and access holes where material ≥ 2 ".
 - a. Type 5: Fabrication Facility Inspection and Testing for Workmanship.
 - b. Criteria: MT or PT for thermally cut beam copes and access holes where material ≥ 2 ". Any crack shall be deemed unacceptable regardless of size or location.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AISC 360, Chapter N.

C. Prior to Bolting.

- 1. Verify Manufacturer's Certifications

- a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify manufacturer's certifications available for fastener materials.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
 - 2. Preinstallation bolt testing.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used. Not applicable for snug tight joints.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
 - 3. Verify bolt material, diameter, handling.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify bolt material, diameter, and handling. Verify proper storage for fastener components. Verify fasteners marks in accordance with ASTM requirements.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 4. Verify bolting procedure.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper fasteners (grade, type, bolt length if threads are to be excluded from shear plane) and bolting procedure selected for joint detail.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 5. Verify connecting element preparation.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify connecting elements meet requirements (if specified), including hole preparation and faying surface condition.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
- D. During Bolting.
- 1. Verify bolts in all holes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify fastener assemblies of suitable condition placed in all holes and washers are positioned as required.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
 - 2. Verify bolts positioned as required.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify fasteners placed in all holes and positioned as required.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
- E. After Bolting.
- 1. Document acceptance/rejection of joints.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Document acceptance/rejection of bolted connections, member or joint.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.

F. Prior to Welding.

1. Verify welder qualifications and ID system.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Review manufacturer certifications for welding consumables and welding procedure specifications. Verify welder identification system. Note: 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.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
2. Verify WPS available.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify Welding Procedure Specification available.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
3. Verify base material and weld material.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify base material and weld material are in conformance with approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
4. Verify weld procedures and weld equipment.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify weld procedures and weld equipment are in conformance with approved documents.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
5. Verify joint fit-up, prep, backing, etc.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify fit up of groove welds (including joint geometry) meet requirements for joint preparation, dimensions (alignment, root opening, root face, bevel), cleanliness (condition of steel surfaces), tacking (tack weld quality and location), and backing type and fit (if applicable). Verify fit up of fillet welds meet requirements for dimensions (alignment, gaps at root), cleanliness (condition of steel surfaces), and tacking (tack weld quality and location). Verify configuration and finish of access holes.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

G. During Welding.

1. Use of qualified welders.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify welder certifications.
 - c. Frequency: (P) Periodic Inspection.
 - d. Standard: AISC 360, Chapter N.
2. Handling of welding consumables.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper control and handling of welding consumables including packaging and exposure control.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

3. No welding over cracked tack welds.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify no welding over cracked tack welds.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
4. Environment conditions (wind/temp, etc.).
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify Welding Procedure Specification is followed for Environment conditions. Verify wind speed, precipitation, and temperature are within limits.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
5. Verify WPS followed.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify use of qualified welders. Verify Welding Procedure Specification is followed for settings on welding equipment, travel speed, selected welding materials, shielding gas type/flow rate, preheat applied, interpass temperature maintained (minimum and maximum), proper position (F, V, H, OH).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
6. Welding techniques.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify proper welding techniques for single and multi-pass welds (interpass and final cleaning, each pass within profile limitations, each pass meets quality requirements).
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.

H. After Welding.

1. Verify welds cleaned.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds cleaned in accordance with standard.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AISC 360, Chapter N.
2. Verify weld size, length and location.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify weld size, length and location conform to approved documents.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
3. Welds meet visual acceptance criteria.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds meet visual acceptance criteria for crack prohibition, weld/base metal fusion, crater cross section, weld profiles, weld size, undercut, and porosity. Where inspector observes questionable welds, non-destructive testing shall be performed.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N, AWS D1.1.
4. Arc strikes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify no arc strikes are present in the base material. Arc strikes shall be tested using non-destructive methods and repaired if necessary.
 - c. Frequency: (C) Continuous inspection.

- d. Standard: AISC 360, Chapter N.
- 5. Verify no cracking in k-areas and at weld access holes.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: When welding of doubler plates, continuity plate, or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 inches of the weld.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 6. Repair activities.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify repair activities conform to standard. Backing and weld tabs removed, and fillet welds added where required.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 7. Document acceptance/rejection of joints.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Document acceptance/rejection of welded joints and/or members.
 - c. Frequency: (C) Continuous inspection.
 - d. Standard: AISC 360, Chapter N.
- 8. UT CJP welds, material $\geq 5/16"$, I and II.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Only applies for buildings assigned to Risk Category I or II. Ultrasonic testing of complete joint penetration groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials thicker than $5/16"$.
 - c. Frequency: 10% observation / testing. The rate of UT shall be increased to 100% if the reject rate of the first 20 inspections is greater than 5%.
 - d. Standard: AISC 360, Chapter N.
- 9. UT CJP welds, material $\geq 5/16"$, III and IV.
 - a. Type 4: Site Testing for Material Properties and Workmanship.
 - b. Criteria: Only applies for buildings assigned to Risk Category III or IV. Ultrasonic testing of complete joint penetration groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials thicker than $5/16"$.
 - c. Frequency: 100% observation / testing. It is acceptable for the rate of UT to be decreased to 25% if the reject rate of the first 40 inspections is less than or equal to 5%.
 - d. Standard: AISC 360, Chapter N.

3.5 Jobsite Testing and Inspection Requirements for Cold Formed Steel

A.

- 1. Members and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, size, location, spacing.
 - c. Frequency: (P) Periodic inspection.
- 2. Bridging and blocking layout and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, location, and attachment.
 - c. Frequency: (P) Periodic inspection.

3. No field cuts / notches through flanges.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No cuts or notches through section flanges permitted.
 - c. Frequency: (P) Periodic inspection.
4. No member splices except where shown.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No splicing of structural members permitted unless specified on the construction documents.
 - c. Frequency: (P) Periodic inspection.
5. Punchouts are away from bearings/connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify spacing requirements from bearings and connections and reinforcing is used where required.
 - c. Frequency: (P) Periodic inspection.
6. Studs seated in tracks per details.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify stud seated tightly within the top and bottom track with gap not exceeding permitted dimension, where gap is exceeded verify shims are provided.
 - c. Frequency: (P) Periodic inspection.
7. Floor framing aligned with studs.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify framing is aligned over a bearing stud within permitted dimension
 - c. Frequency: (P) Periodic inspection.

B. Sheathed Shear Walls.

1. Panel sheathing type and thickness.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing type and thickness. are installed in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
2. Attachment type / spacing at boundaries and field.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing boundary and field fasteners and attachment at all edges of shear wall are installed in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
3. Hold-downs type, size, layout, and connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify hold-downs type, size, layout, connections are installed in accordance with the approved documents.
 - c. Frequency: 100% observation / testing.

C. Welded Attachments.

1. Procedures, materials, qualifications.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify filler materials, welding procedures, welder qualifications, and manufacturer's certificate of compliance.
 - c. Frequency: 100% observation / testing.
 - d. Standard: AWS D1.1/D1.3.
2. During welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.

- b. Criteria: Verify welds type, size, layout, and procedure are in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AWS D1.3.
 - 3. After welding.
 - a. Type 3: Site Inspection for Procedures and Workmanship.
 - b. Criteria: Verify welds type, size, layout, and procedure are in accordance with the approved documents.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: AWS D1.3.
- D. Screwed Attachments.
 - 1. Type, diameter, length, spacing, edge distance.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, diameter, length, spacing, and edge distance are installed in accordance with the approved documents. Verify installation is in conformance with ICC-ES Report.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.
 - 2. Penetration.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify screws are fully driven with a minimum penetration of 3 threads through the last material joined.
 - c. Frequency: (P) Periodic inspection.
 - 3. Connected materials drawn together.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify connected materials have been drawn together.
 - c. Frequency: (P) Periodic inspection.
 - 4. No popped screw heads/stripped threads.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: No popped screw heads/stripped threads are permitted. All damaged screws shall be replaced.
 - c. Frequency: (P) Periodic inspection.
- E. Power-Actuated Fasteners.
 - 1. Type, diameter, length, spacing, edge distance.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, diameter, length, spacing, finish, base material, and edge distance are installed in accordance with the approved documents. Verify connected materials have been drawn together.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
 - 2. Conformance with ICC-ES Report.
 - a. Type 1: Material Verification and Workman Certifications.
 - b. Criteria: Verify installation is in conformance with ICC-ES Report.
 - c. Frequency: (P) Periodic inspection.
 - d. Standard: ICC-ES Report.

3.6 Jobsite Testing and Inspection Requirements for Wood

A. Sheathed Shear Walls and Diaphragms.

1. Sheathing type and thickness.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, thickness, panel size and orientation are in conformance with the approved documents.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
2. Attachment type / spacing at boundaries and field.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify panel sheathing boundary, panel edge, and field fasteners and attachment at all edges of diaphragm are in conformance with the approved documents.
 - c. Frequency: (P) Periodic inspection. First of each fastener type and base material type.
3. Hold-downs type, size, layout, connections.
 - a. Type 2: Site Inspection for Layout and Quantities.
 - b. Criteria: Verify type, size, location, fasteners, and anchorage are in conformance with the approved documents.
 - c. Frequency: 100% observation / testing.

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