
Section 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by Department of Veterans Affairs.

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T27-11 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - T96-02 (R2006) Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T99-10 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
 - T104-99 (R2007) Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - T180-10 Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
 - T191-02(R2006) Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
- C. American Concrete Institute (ACI):
 - 318-11 Building Code Requirements for Reinforced Concrete.
 - 301-10 Standard Specifications for Structural Concrete.
- D. American Society for Testing and Materials (ASTM):
 - A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A370-12 Standard Test Methods and Definitions for Mechanical Testing of Steel Products
 - A416/A416M-10 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
 - A490-12 Standard Specification for Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
 - C31/C31M-10 Standard Practice for Making and Curing Concrete Test Specimens in the Field

C33/C33M-11a	Standard Specification for Concrete Aggregates
C39/C39M-12	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-11b	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C136-06	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
C138/C138M-10b	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C140-12	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-10a	Standard Test Method for Slump of Hydraulic Cement Concrete
C172/C172M-10	Standard Practice for Sampling Freshly Mixed Concrete
C173/C173M-10b	Standard Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method
C330/C330M-09	Standard Specification for Lightweight Aggregates for Structural Concrete
C567/C567M-11	Standard Test Method for Density Structural Lightweight Concrete
C780-11	Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-11	Standard Test Method for Sampling and Testing Grout
C1064/C1064M-11	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
C1077-11c	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
C1314-11a	Standard Test Method for Compressive Strength of Masonry Prisms
D422-63(2007)	Standard Test Method for Particle-Size Analysis of Soils
D698-07e1	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
D1140-00(2006)	Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve
D1143/D1143M-07e1	Standard Test Methods for Deep Foundations Under Static Axial Compressive Load
D1188-07e1	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
D1556-07	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-09	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft lbf/ft ³ (2,700 KNm/m ³))
D2166-06	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
D2167-08)	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2216-10	Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2974-07a	Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-11	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
D3740-11	Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction
D6938-10	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
E94-04.....	(2010) Standard Guide for Radiographic Examination
E164-08.....	Standard Practice for Contact Ultrasonic Testing of Weldments
E329-11c.....	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
E543-09.....	Standard Specification for Agencies Performing Non-Destructive Testing
E605-93(R2011)	Standard Test Methods for Thickness and Density of Sprayed FireResistive Material (SFRM) Applied to Structural Members
E709-08.....	Standard Guide for Magnetic Particle Examination
E1155-96(R2008)	Determining FF Floor Flatness and FL Floor Levelness Numbers

- E. American Welding Society (AWS):
D1.D1.1M-10..... Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Project Engineer/VA-COR. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Project Engineer/VA-COR to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Project Engineer/VA-COR, Contractor, unless other arrangements are agreed to in writing by the Project Engineer/VA-COR. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Project Engineer/VA-COR immediately of any irregularity.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EARTHWORK:

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Project Engineer/VA-COR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Project Engineer/VA-COR extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
 2. Provide full time observation of fill placement and compaction and field density testing in building areas and provide full time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
 3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.
- B. Testing Compaction:
1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D698 and/or ASTM D1557.
 2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556, or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Project Engineer/VA-COR before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.

- e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Project Engineer/VA-COR. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Project Engineer/VA-COR.

3.2 LANDSCAPING:

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
 - 1. Test for organic material by using ASTM D2974.
 - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
- B. Submit laboratory test report of topsoil to Project Engineer/VA-COR.

3.3 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with ASTM D1557, Method D.
 - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with ASTM D1556.
 - 3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
 - 2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
 - 3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.4 SITE WORK CONCRETE:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

3.5 CONCRETE:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

3.6 REINFORCEMENT:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

3.7 MASONRY:

A. Mortar Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C780.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
 - d. Test one sample at 7 days and 2 samples at 28 days.
2. Two tests during first week of operation; one test per week after initial test until masonry completion.

B. Grout Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C1019.
 - b. Test one sample at 7 days and 2 samples at 28 days.
 - c. Perform test for each 230 m² (2500 square feet) of masonry.

C. Masonry Unit Tests:

1. Laboratory Compressive Strength Test:
 - a. Comply with ASTM C140.
 - b. Test 3 samples for each 460 m² (5000 square feet) of wall area.

- #### **D. Prism Tests:** For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m² (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.8 STRUCTURAL STEEL:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.

3.9 STEEL DECKING:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

3.10 SHEAR CONNECTOR STUDS:

Coordinate material testing requirements with SECTION 01 45 33, STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES.

3.11 SPRAYED-ON FIREPROOFING:

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Project Engineer/VA-COR.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.
 - 1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.
- E. Location of test areas for field tests as follows:
 - 1. Thickness: Select one bay per floor, or one bay for each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
 - 2. Density: Take density determinations from each floor, or one test from each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.

3.12 Expansion Anchors:

- A. Inspect installation. Verify that existing reinforcement is not cut. Verify installation per manufacturer specifications. Verify embedment and torque of anchors.

3.13 TYPE OF TEST:

- A. Earthwork:
Laboratory Compaction Test, Soils:

ASTM D1557),(ASTM D698)	_____
Field Density, Soils (AASHTO T191, T205, or T238)	_____
Penetration Test, Soils	_____
B. Landscaping:	
Topsoil Test	_____
C. Aggregate Base:	
Laboratory Compaction, (ASTM D1557)/	_____
Field Density, (ASTM D1556)	_____
Aggregate, Base Course	_____
Gradation (AASHTO T27)	_____
Wear (AASHTO T96)	_____
Soundness (AASHTO T104)	_____
D. Asphalt Concrete:	
Field Density, (AASHTO T230)	_____
Aggregate, Asphalt Concrete	_____
Gradation (AASHTO T27)	_____
Wear (AASHTO T96)	_____
Soundness (AASHTO T104)	_____
E. Concrete:	
Making and Curing Concrete Test Cylinders (ASTM C31)	_____
Compressive Strength, Test Cylinders (ASTM C39)	_____
Concrete Slump Test (ASTM C143)	_____
Concrete Air Content Test (ASTM C173)	_____
Unit Weight, Lightweight Concrete (ASTM C567)	_____
Aggregate, Normal Weight:	
Gradation (ASTM C33)	_____
Deleterious Substances (ASTM C33)	_____
Soundness (ASTM C33)	_____
Abrasion (ASTM C33)	_____
Aggregate, Lightweight	
Gradation (ASTM C330)	_____
Deleterious Substances (ASTM C330)	_____
Unit Weight (ASTM C330)	_____
Flatness and Levelness Readings (ASTM E1155) (number of days)	_____
F. Reinforcing Steel:	
Tensile Test (ASTM A370)	_____
Bend Test (ASTM A370)	_____
Mechanical Splice (ASTM A370)	_____
Welded Splice Test (ASTM A370)	_____
G. Masonry:	
Making and Curing Test Cubes (ASTM C109)	_____
Compressive Strength, Test Cubes (ASTM C109)	_____

Sampling and Testing Mortar, Comp. Strength (ASTM C780)	_____
Sampling and Testing Grout, Comp. Strength (ASTM C1019)	_____
Masonry Unit, Compressive Strength (ASTM C140)	_____
Prism Tests (ASTM C1314)	_____

H. Structural Steel:	
Ultrasonic Testing of Welds (ASTM E164)	_____
Magnetic Particle Testing of Welds (ASTM E709)	_____
Radiographic Testing of Welds (ASTM E94)	_____

I. Sprayed-On Fireproofing:	
Thickness and Density Tests (ASTM E605)	_____

J. Inspection:	
Technical Personnel (Man-days)	_____

3.14. Technical Personnel:

A. Technicians to perform tests and inspection listed above. Laboratory will be equipped with concrete cylinder storage facilities, compression machine, cube molds, proctor molds, balances, scales, moisture ovens, slump cones, air meter, and all necessary equipment for compaction control.

END OF SECTION

Section 01 45 33
STRUCTURAL SPECIAL INSPECTIONS AND PROCEDURES

Statement of Special Inspections

Project: *VA Medical Center Providence – Building 35 Addition for Research*

Location: *830 Chalkstone Avenue, Providence, RI 02908-4799*

Owner: *Department of Veterans Affairs*

Design Professional in Responsible Charge: *John H. Thomsen, P.E.*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the International Building Code 2012 (IBC). It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. The inspections listed in this schedule are in addition to inspections identified in the administrative provisions of the IBC and the contractor's own quality assurance requirements. This *Statement of Special Inspections* encompasses the following disciplines:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Structural | <input type="checkbox"/> Mechanical/Electrical/Plumbing |
| <input type="checkbox"/> Architectural | <input type="checkbox"/> Other: _____ |

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Project Engineer/VA-COR's duly authorized representative and Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Project Engineer/VA-COR's duly authorized representative and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities for quality control.

Interim reports shall be submitted to the Project Engineer/VA-COR's duly authorized representative and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing, and correction of any discrepancies noted in the inspections shall be submitted by the Special Inspection Coordinator prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports shall be submitted bi-weekly.

Prepared by the Structural Engineer of Record:

John H. Thomsen, P.E.
(type or print name)

Signature

Date

Design Professional's Seal

Owner's Authorization:

Project Engineer/VA-COR's duly authorized
representative Acceptance:

Signature

Date

Signature

Date

Schedule of Inspection and Testing Agencies

This Schedule of Special Inspections includes the following building systems:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Soils and Foundations | <input checked="" type="checkbox"/> Spray Fire Resistant Material |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete | <input type="checkbox"/> Wood Construction |
| <input type="checkbox"/> Precast Concrete | <input type="checkbox"/> Exterior Insulation and Finish System |
| <input type="checkbox"/> Masonry | <input type="checkbox"/> Mechanical & Electrical Systems |
| <input checked="" type="checkbox"/> Structural Steel | <input type="checkbox"/> Architectural Systems |
| <input type="checkbox"/> Cold-Formed Steel Framing | <input type="checkbox"/> Special Cases |
| <input type="checkbox"/> Curtain Wall Systems | |

The design of structural steel connections is specified in the contract documents on a performance basis. The structural design of these connections will be reviewed by the Structural Engineer of Record (SER). Inspection requirements for the connections are listed in this schedule.

The curtain wall systems, cold-formed steel framing systems, and precast concrete components are specified in the contract documents on a performance basis and are excluded from this schedule because they are designed by other engineers not under the aegis of the SER. These other structural engineers shall prepare a statement and schedule of special inspections for their respective designs

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. Special Inspection Coordinator	<i>To be determined</i>	
2. Inspector	<i>To be determined</i>	
3. Inspector	<i>To be determined</i>	
4. Testing Agency	<i>To be determined</i>	
5. Other	<i>To be determined</i>	

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner’s Agent in accordance with IBC and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Project Engineer/VA-COR’s duly authorized representative prior to commencing work.

Statement of Contractor’s Responsibility

In accordance with IBC Section 1704.4, each contractor responsible for the construction or fabrication of a main wind-force resisting system or a seismic-force-resisting system or a wind- or seismic-resisting component listed in the statement of special inspections above must submit a Statement of Responsibility to the Structural Engineer of Record and the Project Engineer/VA-COR’s duly authorized representative prior to commencement of work on the system. The contractor’s statement of responsibility shall contain acknowledgement of awareness of the special requirements contained in the statement of special inspections.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Project Engineer/VA-COR's duly authorized representative. The credentials of all Inspectors and testing technicians shall be provided.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE Structural Engineer – a licensed PE specializing in the design of building structures
PE/GE Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations

American Concrete Institute (ACI) Certification

ACI-CFTT Concrete Field Testing Technician – Grade 1
ACI-CCSI Concrete Construction Special Inspector
ACI-LTT Laboratory Testing Technician – Grade 1&2
ACI-STT Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI Certified Welding Inspector
AWS/AISC-SSI Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI Structural Masonry Special Inspector
ICC-SWSI Structural Steel and Welding Special Inspector
ICC-SFSI Spray-Applied Fireproofing Special Inspector
ICC-RCSI Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT Concrete Technician – Levels I, II, III & IV
NICET-ST Soils Technician - Levels I, II, III & IV
NICET-GET Geotechnical Engineering Technician - Levels I, II, III & IV

Soils and Foundations – IBC 2012 Section 1705.6

Item	Agency Qual.	Inspection Frequency	Scope
1. Bearing Strata for Foundations	PE/GE	Periodic	Inspect soils bearing strata for adequate bearing capacity and consistency with geotechnical report, structural drawings, and specifications.
		Periodic	Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill.
2. Bearing Surface Elevations	PE/GE	Periodic	Verify that excavations are extended to the proper depth and have reached proper material.
3. Controlled Structural Fill Materials	PE/GE	Periodic	Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.
		Continuous	Perform sieve tests (ASTM D422 and D1140) and modified Proctor tests (ASTM D1557) of each source of select fill material for conformance to the geotechnical report. Perform at least one test at each footing to bear on compacted select fill (one test per lift) and one test per each 2,000 sq ft of building slab.
		Continuous	Inspect placement, lift thickness, and compaction of controlled fill.
		Continuous	Test density of each lift of fill by nuclear methods (ASTM D2922).
		Continuous	Verify extent and slope of fill placement.

Cast-in-Place Concrete – IBC 2012 Section 1705.3

Item	Agency Qual.	Inspection Frequency	Scope
1. Formwork Geometry	ACI-CCSI ICC-RCSI	Periodic Periodic	Inspect formwork for shape, location, dimensions, and finishes of the concrete member being formed and for conformance to the Contract Documents and ACI 301 Section 2 and ACI 318 Sections 6.1, 6.3, and 6.4. Inspect all formwork size, geometry, and finishes for conformance with Contract Documents
2. Mix Design	ACI-CCSI ICC-RCSI	Continuous	Review concrete-batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.
3. Material Certification	ACI-CCSI	Periodic Periodic	Review in-field all materials, manufacturer's certifications, and mill reports for conformance to Contract Documents. Maintain records of all material certificates, mill reports of all concrete-mix-constituent materials, and steel reinforcement.
4. Reinforcement Installation	ACI-CCSI ICC-RCSI	Periodic Periodic	Inspect placement of all reinforcement for compliance with ACI 318 Sections 7.3, 7.4, 7.5, 7.6, and 7.7 and ACI 301 Section 3.3. Inspect size, spacing, cover, positioning, and grade of reinforcing steel for compliance with the Contract Documents. Verify that bars are adequately tied and supported on chairs or bolsters. Inspect bar laps and mechanical splices. Verify that reinforcing bars are free of form oil or other deleterious materials. Submit detailed report of observations. Inspect inserts and accessories.

Item	Agency Qual.	Inspection Frequency	Scope
5. Batching Plant	ACI-CCSI ICC-RCSI	Periodic	Review plant quality control procedures for material storage and handling comply with ACI 301 Sections 4.1.3, 7.1, and 7.2.
		Periodic	Review that plant procedures for establishing mix design strength comply with ACI 301 Sections 4.1 and 4.2 and with ACI 318 Sections 5.1, 5.2, 5.3, 5.4, and 5.8.
		Periodic	Inspect plant to ensure compliance of mix constituents with the requirements of ACI 318 Chapter 3 and ACI 301 Sections 4.2 and 7.2.
		Periodic	Inspect that mixing and ready-mix equipment and vehicles comply with ACI 318 Section 5.7 and 5.8 and with ASTM C94.
		Periodic	Maintain records of all ready-mix truck contents and dispatch times. Verify that concrete delivered to the site conforms to approved trial mixes including proportions of aggregate, water-cement ratio, and admixtures.
6. Anchor Rods	ACI-CCSI ICC-RCSI	Continuous	Inspect size, grade, positioning, and embedment of anchor rods for conformance to Contract Documents prior to concrete placement.
		Periodic	Inspect concrete placement and consolidation around anchors.
7. Sampling and Testing of Concrete	ACI-CFTT ACI-STT	Continuous	Collect and test concrete samples per ACI 318 Section 5.6 (minimum of four cylinders for each 50 cu yd of concrete or 2,000 sq ft of slab or wall area placed), but not fewer than four cylinders for each day's pour. Project Engineer/VA-COR may require additional cylinders to be molded and cured under job conditions.
		Continuous	For each sample, measure slump (ASTM C143), temperature (ASTM C1064), weight (ASTM C138), and air content (ASTM C173) for all concrete sampled for strength. For pumped concrete, measure at point of deposit. In addition to the above, report specific locations where each cylinder was produced, date of sample, and weather conditions at time of placement. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch

Item	Agency Qual.	Inspection Frequency	Scope
8. Concrete Placement	ACI-CCSI ICC-RCSI	Continuous Continuous Continuous Continuous	<p>Prior to allowing ready-mix trucks to deposit concrete, review batch-plant ticket to verify concrete-mix compliance with project specifications, temperature, batching time, and number of mixing drum revolutions. Reject concrete that has been mixed for more than 90 min. or 300 drum revolutions.</p> <p>Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.</p> <p>Maintain records correlating concrete batching information with location of placement in the finished work. Inspect all concrete placements for compliance with ACI 318 Section 5.9 and 5.10; and ACI 301 Sections 5 and 7.3.</p> <p>Inspect for conformance to all approved hot and cold weather concrete placement procedures.</p>
9. Curing and Protection	ACI-CCSI ICC-RCSI	Periodic	<p>Inspect all placements for conformance to Contract Documents, ACI 318 Sections 5.11, 5.12, and 5.13, and with curing and protection procedures approved by SER. Observe preparations for protection from hot weather, cold weather, sun, wind, rain, and preparations for curing. Record time and date of start of curing, final curing, and curing duration.</p>
101. In Situ Concrete Strength	ACI-CCSI ICC-RCSI	Periodic	<p>Verify in situ concrete strength prior to removal of shores and forms from beams and structural slabs in accordance with ACI 318 Section 6.2.</p>
11. Laboratory Evaluation of Concrete Strength	ACI-LTT	Continuous	<p>Test for conformance to specifications in accordance with ACI 318 Section 5.6 and IBC Section 1905.6. As a minimum, perform compression tests on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. Submit certified compression test reports to Project Engineer/VA-COR.</p>

Item	Agency Qual.	Inspection Frequency	Scope
12. Adhesive Dowels	ACI-CCSI ICC-RCSI	Continuous	Verify that existing reinforcing steel is not cut when drilling holes for dowels or anchors.
		Continuous	Inspect holes prior to installation of adhesive to verify that holes are free of dust and prepared in accordance with the manufacturer's instructions and have the embedment depth indicated on the Contract Documents.
		Continuous	Verify that adhesive material is in accordance with the Contract Documents. Verify that the material is stored, mixed, and injected in accordance with the manufacturer's instructions.
		Continuous	Verify that the dowel or anchor materials, lengths, diameters, embedments, and finishes are in accordance with the Contract Documents.
13. Expansion Anchors	ACI-CCSI ICC-RCSI	Continuous	Inspect installation of each anchor.
		Periodic	Verify that existing reinforcing steel is not cut when drilling holes for anchors.
		Periodic	Verify anchor diameter, markings, seating of washer, embedment, and torque of anchors
14. Vapor Barrier	ACI-CCSI ICC-RCSI	Periodic	Inspect installation of subgrade vapor retarder for compliance with manufacturer's approved installation procedures and with Contract Documents.
15. Flatness and Levelness	ACI-CCSI ICC-RCSI	Periodic	Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method. Perform all floor tolerance measurements within forty-eight (48) hours after slab installation. Provide the Contractor and the Project Engineer/VA-COR with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.

Structural Steel – IBC 2012 Section 1705.2

Item	Agency Qual.	Inspection Frequency	Scope
1. Fabricator Certification/ Quality Control Procedures	AWS/AISC-SSI ICC-SWSI	Periodic	Inspect fabrication and fabricated steel during two separate plant visits scheduled at beginning of fabrication and at approximately 80% complete, or as directed by the SER
		Periodic	Review plant quality control procedures.
		Periodic	Inspect plant storage and handling procedures.
		Periodic	Confirm that approved submittals are in the plant and are being used for fabrication. Review welders' certifications.
		Periodic	File welder certifications and any other quality assurance documentation as required by building department.
		Periodic	Review prequalification test report for the shop coat of paint applied to slip critical connections to comply with Class A or B per RCSC Specification as required.
		Periodic	<i>Note: The foregoing certification requirements will be waived if the structural steel fabricator is certified by the American Institute of Steel Construction's Quality Certification Program for Structural Steel Fabricators and the fabricator submits evidence of this certification.</i>
2. Material Certification	AWS/AISC-SSI ICC-SWSI	Periodic	Review mill test reports, certificates, and identification markings of all structural steel, bolts, nuts, and washers for compliance with the ASTM Specifications required by the Contract Documents and by AISC Specification Section A3.
		Periodic	Inspect certificates of weld-filler material for compliance with the AWS Specifications required by the Contract Documents and by AISC Specification Section A3.
		Periodic	Inspect surface finish of steel members for conformance with SSPC standards, approved shop drawings, and contract documents

Item	Agency Qual.	Inspection Frequency	Scope
3. Bolting	AWS/AISC-SSI ICC-SWSI	Periodic	Prior to releasing containers of fastener assembly components for incorporation into the work, verify bolt, nut, and washer diameters and material grades for compliance with the Contract Documents requirements.
		Periodic	Inspect a random sample of at least 25% of all bolts in bearing-type, snug-tightened connections. Verify that the plies of the connection are in firm contact.
		As noted	Observe and report the method used to achieve bolt tension. Inspect a random sample of at least 25% of all bolts in pretensioned connections. All inspections shall be made per the RCSC Specification. The required quantities of bolts to be inspected may be modified at the discretion of the SER. Inspection of pretensioning using twist-off-type bolts or turn-of-the-nut method with match-marking shall be <u>periodic</u> . Inspection of pretensioning using the calibrated wrench method or turn-of-the-nut method without match marking shall be <u>continuous</u> .
		Periodic	For all connections using A490 bolts, verify that the grade marks on the nuts are visible on the exterior sides of the connections. Verify that only grade DH or DH3 nuts are used with A490 bolts.
		Periodic	For bolts to be pretensioned, prior to the start of work field test no fewer than three complete fastener assemblies of each combination of diameter, length, grade, and lot with a tension calibrator. Testing shall follow the procedure to be used in the work. Verify that the pretensioning method develops a pretension that is equal to or greater than 1.05 times the pretension specified in Table 8.1 of the RCSC bolt specification. The number of tests required may be increased at the discretion of the SER or inspector.
		Continuous	Inspect wrench calibration procedures on daily basis (if applicable).

Item	Agency Qual.	Inspection Frequency	Scope
4. Welding	AWS-CWI	Periodic	Perform weld inspections and tests per Chapter 6 of AWS D1.1.
	ASNT	Periodic	Verify all field welder certifications
		Periodic	Inspect procedures for control of distortion and shrinkage stresses
		Periodic	Inspect welding equipment for capacity, maintenance, and working condition.
		Periodic	Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
		Periodic	Perform visual inspections of all welds for conformance to the Contract Documents and erection drawings with the applicable visual inspection requirements of AWS D1.1. Verify size and length of fillet welds. Inspect pre-heat, post-heat and surface preparation between passes. Review with SER scope of visual inspection as work progresses.
		Periodic	Frequency of testing by ultrasonic or magnetic particle testing methods of other welds as follows:
		Periodic	1. 20% of partial penetration groove welds
		Continuous	2. 100% of welds subject to tension (hangers, etc.)
		Continuous	3. 100% of all complete joint penetration welds, multi-pass fillet welds, and single-pass fillet welds greater than 5/16 in.
Periodic	4. 10% of all other welds including deck and floor plate welds		
Periodic	5. 20% of all shear plate fillet welds		
Periodic	6. 20% of all gusset plate welds at braced frames		
Continuous	7. 100% of all remade welds		
TBD	8. Additional inspection as determined by inspector and/or SER if defects are revealed		
Periodic	Submit inspection reports, certification, and instances of noncompliance to Project Engineer/VA-COR		

Item	Agency Qual.	Inspection Frequency	Scope
5. Base-Plate Grouting and Anchor Rods	AWS/AISC-SSI ICC-SWSI	Periodic	Observe grouting operations to verify that grout is of flowable consistency and is consolidated beneath column base plates without air voids.
		Periodic	Test column base plate non-shrink grout cubes restrained from all sides per ASTM C109, and for shrinkage/ expansion properties per ASTM C1090. Prepare and test three cubes per day during grouting operations. Observe and report the quantity of mixing water; the temperatures of the mixing water, grout, and substrate; preparation of the substrate; and curing method.
		Periodic	Verify that washer plates on anchor rods are welded to column base plates.
6. Structural Framing, Details, and Assemblies	AWS/AISC-SSI ICC-SWSI	Periodic	Inspect member sizes, milled surfaces, and installation and connection details for compliance with approved shop drawings and with Contract Documents.
		Periodic	Verify columns are plumb within AISC tolerances.
		Periodic	Verify columns and beams have correct piece marks and located and oriented per appropriate drawings.
7. Metal Deck	AWS/AISC-SSI ICC-SWSI	Periodic	Review mill reports for all deck material delivered to the site.
		Periodic	Verify gauge, width, and type (profile) of deck for conformance to approved shop drawings and with Contract Documents.
		Periodic	Verify welder certifications.
		Periodic	Inspect placement for proper installation of approved screws, puddle welds, other mechanical fasteners (if any), and accessories for compliance with SDI, AWS D1.3, and the Contract Documents.
		Periodic	Inspect placement of deck reinforcement at openings and other discontinuities for compliance with approved shop drawings and with Contract Documents.
		Periodic	Inspect repair of damaged galvanized finish for compliance with Contract Documents.
		Periodic	Submit inspection reports, certification, and instances of noncompliance to Project Engineer/VA-COR.

Item	Agency Qual.	Inspection Frequency	Scope
8. Shear Connector Studs	AWS/AISC-SSI ICC-SWSI	Periodic	Perform field inspection of stud installation to verify location, diameter, quantity, installation of studs, and ferrule removal is in accordance with the Contract Documents and that the installation is in compliance with AWS D1.1 Chapter 7.
		Periodic	Daily preproduction testing: per AWS D1.1 Section 7.7 except that five studs are to be tested and that the studs are to be capable of bending 45 degrees from vertical without weld failure.
		Continuous	Visual inspection of production stud installation per AWS D1.1 Section 7.8.
		Continuous	Testing during installation (in addition to the testing required by studs that do not pass the visual inspection): A minimum of two hammer stud bend tests on each structural member at 1/3 points on the span. If a failure occurs, every stud on the structural member is to be tested. Retest all studs that are replaced.
		Periodic	Submit inspection reports, certification, and instances of noncompliance to Project Engineer/VA-COR

Spray-Applied Fire Resistant Material

Item	Agency Qual.	Inspection Frequency	Scope
1. Material Specifications	ICC-SFSI	Periodic	Review material product data for conformance to the Project Specifications.
2. Laboratory Tested Fire Resistance Design	ICC-SFSI	Periodic	Review UL fire resistive design for each rated beam, column, or assembly.
3. Schedule of Thickness	ICC-SFSI	Periodic	Review approved thickness schedule.
4. Surface Preparation	ICC-SFSI	Periodic	Inspect surface preparation of steel prior to application of fireproofing
5. Application	ICC-SFSI	Periodic	Inspect application of fireproofing.
6. Curing and Ambient Condition	ICC-SFSI	Periodic	Verify ambient air temperature and ventilation is suitable for application and curing of fireproofing.
7. Thickness	ICC-SFSI	Periodic	Test thickness of fireproofing (ASTM E605). Perform a set of thickness measurements for every 1,000 SF of floor and roof assemblies and on not less than 25% of rated beams and columns.
8. Density	ICC-SFSI	Periodic	Test the density of fireproofing material (ASTM E605).
9. Bond Strength	ICC-SFSI	Periodic	Test the cohesive/adhesive bond strength of fireproofing (ASTM E736). Perform not less than one test for each 10,000 SF.

References

1. ACI 301-10 – Standard Specifications for Structural Concrete.
2. ACI 318-11 – Building Code Requirements for Structural Concrete.
3. AISC 303-10 – Code of Standard Practice for Structural Steel Buildings
4. AISC 360-10 – Specification for Structural Steel Buildings.
5. ASTM A6-12a – Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.
6. ASTM A568-11 – Specification for Steel Sheet, Carbon and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled, General Requirements For.
7. ASTM C31-12 – Practice for Making and Curing Concrete Test Specimens in the Field.
8. ASTM C94-13 – Specification for Ready-Mixed Concrete.
9. ASTM C109-12 – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
10. ASTM C138-12 – Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.
11. ASTM C143-12 – Test Method for Slump of Hydraulic Cement Concrete.
12. ASTM C172-10 – Practice for Sampling Freshly Mixed Concrete.
13. ASTM C173-12 – Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
14. ASTM C231-10 – Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C567-11 – Test Method for Unit Weight of Structural Lightweight Concrete
16. ASTM C1064-12 – Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
17. ASTM C1090-10 – Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout.
18. ASTM C1314-12 – Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
19. AWS D1.1-2010 – Structural Welding Code – Steel.
20. International Building Code, 2012
21. RCSC-2009 – Specification for Structural Joints Using High Strength Bolts.

END OF SECTION 01 45 33