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 (Owner).

B. Definition: Contractor also means Construction Manager or his designated Trade Contractor.

1.2 TESTING AND COST RESPONSIBILITIES

A. Third Party Inspection and Testing Agency Responsibility:
   1. Owner will provide and pay for initial services for testing and inspection required by this Section; see Section 01 00 00, General Requirements, Article “GENERAL INTENTION”, Paragraph beginning “Before placement and…”
      a. Initial services for testing and inspection is defined as the first test, test groups, and test series for each type of test required.
      b. See Article “FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR EXCLOSURE COMMISSIONING” in PART 3 below for exterior closure testing related to commissioning.
   2. Laboratory shall test and/or obtain certificates for tests of materials and methods of construction as described hereinafter:
      a. Reports: Furnish laboratory test reports of materials and construction; include description of method of test, identification of sample and portion of the work tested, description of location in the work of the sample, time and date of test of sample, weather and climatic conditions, and evaluation of results of tests, including recommendations for action.
   3. Inspection services: The inspection agency will have full authority to see that the work is performed in accordance with requirements of the Contract Documents and the directions of the Architect and Resident Engineer. The Inspector shall cooperate with the Construction Manager so as to cause no delay in the progress of the Work, but shall be directly responsible to the Owner for his actions.
      a. Furnish "Inspection at Site" reports for each visit to the site.
   4. Equipment: Furnish all necessary testing equipment; see “Construction Manager Responsibility” below for access.
   5. Test Standards: Include a lump sum allowance of $5,000 for furnishing published standards (AAMA, ASTM, AASHTO, ACI, ANSI, AWS, ASHRAE, UL, etc.) referred to or specifically referenced which are pertinent to any Sections of these specifications. Furnish one set of standards in single copies or bound volumes to the Resident Engineer within 60 days. Photocopies are not acceptable. Billings for the standards furnished shall be at the net cost to Construction Manager. Prior to ordering test standards, submit to Resident Engineer a preliminary list of the test standards, with estimated costs of both electronic and hard copy formats. Obtain Resident Engineer’s approval prior to ordering test standards. Provide these documents once.

B. Construction Manager Responsibility:
   1. Non-Compliance: When initial testing services indicate noncompliance with the Contract Documents, any subsequent retesting required by noncompliance and as directed by Resident Engineer shall be performed by either the same testing agency or an

independent laboratory, as directed by Resident Engineer, and paid for by the Construction Manager.

2. Other Testing:
   a. Any additional testing required by the Construction Manager to facilitate or expedite construction, the Construction Manager's information or convenience, or for otherwise, such as concrete strength tests required for early removal of forms, etc., shall be paid for by the Construction Manager.
   b. Construction Manager shall provide all other testing not assigned to Owner in "Third Party Inspection and Testing Agency Responsibility" paragraph above including testing required under Sections in Divisions 2 and higher. Such testing shall be performed by the subcontractor and/or manufacturer to meet certification requirements, Field Quality Control, adhesion testing, daily inspection, etc., and shall be paid for by the subcontractor as part of their work scope.
3. Schedule portions of the work requiring inspection and testing so that the time of the agency on the project is as continuous and brief as possible.
4. Regulatory Requirements: Inspections and tests required by codes and ordinances, or by plan approval authorities, and made by a legally constituted authority shall be the responsibility of, and paid for by, the Construction Manager, unless otherwise provided by the Contract Documents.
5. Access: Provide free, ready access to various parts of the work and assist testing and inspection personnel in the performance of their duties at no additional cost to the Owner.
   a. For Testing and Inspection of Exterior Closure Commissioning, and similar activities, provide scaffolding, lifts, electric swing stages, potable water, electrical power, and all other staging areas, devices, equipment, utilities, services, and conditions necessary for Third Party Testing Agency to access and perform all inspection and testing required of them.
6. Data: Furnish records, drawings, certificates, and similar data as may be required by the testing and inspection personnel to ensure compliance with the Contract Documents.
7. Notice: Furnish notice to Resident Engineer and testing and inspection personnel not less than 24 hours prior to any time required for such services; see Section 01 00 00, General Requirements, Article "GENERAL INTENTION", Paragraph D.
8. Defective work: The Contractor shall bear all costs of correcting rejected work, including the cost of the Architect's and his consultants' additional services thereby made necessary.
9. Mock-Ups: All costs associated with construction, inspecting, and performance testing of mock-ups to be paid for by Construction Manager.

1.3 APPLICABLE PUBLICATIONS (latest version unless otherwise indicated)

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 Architectural Manufacturers Association (AAMA):

501.1	Standard Test Method for Water Penetration of Windows, Curtain Walls, Doors Using Dynamic Pressure
501.4	Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts
501.5	Test Method for Thermal Cycling Exterior Walls
503	Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazed Systems

C. American Association of State Highway and Transportation Officials (AASHTO):

T27-06	Sieve Analysis of Fine and Coarse Aggregates
T96-02(R2006)	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
T99-01(R2004)	The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
T104-99(R2003)	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
T180-01(R2004)	Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
T191-02(R2006)	Density of Soil In-Place by the Sand-Cone Method

D. American Society for Testing and Materials (ASTM):

A325-06	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A370-07	Definitions for Mechanical Testing of Steel Products
A416/A416M-06	Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
A490-06	Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
C31/C31M-06	Making and Curing Concrete Test Specimens in the Field
C33-03	Concrete Aggregates
C39/C39M-05	Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-05	Compressive Strength of Hydraulic Cement Mortars
C138-07	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C140-07	Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-05	Slump of Hydraulic Cement Concrete
C172-07	Sampling Freshly Mixed Concrete
C173-07	Air Content of freshly Mixed Concrete by the Volumetric Method
C330-05	Lightweight Aggregates for Structural Concrete
C567-05	Density Structural Lightweight Concrete
C780-07	Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-08	Sampling and Testing Grout
C1064/C1064M-05	Freshly Mixed Portland Cement Concrete
C1077-06	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314-07	Compressive Strength of Masonry Prisms
D698-07	Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143-07	Piles Under Static Axial Compressive Load
D1188-07	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-07	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-07	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166-06	Unconfined Compressive Strength of Cohesive Soil
D2167-94(R2001)	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-05	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2922-05	Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974-07	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-(2002)	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-07	Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
E164-03	Ultrasonic Contact Examination of Weldments
E329-07	Agencies Engaged in Construction Inspection and/or Testing
E543-06	Agencies Performing Non-Destructive Testing

E605-93(R2006)	Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
E709-(2001)	Guide for Magnetic Particle Examination
E1155-96(R2008)	Determining FF Floor Flatness and FL Floor Levelness Numbers

E. American Welding Society (AWS):

D1.1-07	Structural Welding Code-Steel

1.4 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 Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.

C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

PART 2 - PRODUCTS (Not Used)

2.1 CONSTRUCTION MANAGER'S RESPONSIBILITY

A. See "TESTING AND COST RESPONSIBILITIES" in PART 1 above.

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 Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
   2. Provide full timeobservation of fill placement and compaction and field density testing in building areas and provide full timeobservation 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 D2922 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 Resident Engineer before the tests are conducted.
    a. Building Slab Subgrade: At least one test of subgrade for every 6000 square feet of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 6000 square feet of overlaying building slab, but in no case fewer than three tests.
    b. Foundation Wall Backfill: One test per 100 feet of each layer of compacted fill but in no case fewer than two tests.
    c. Pavement Subgrade: One test for each 2000 square feet, but in no case fewer than two tests.
    d. Curb, Gutter, and Sidewalk: One test for each 300 feet, but in no case fewer than two tests.
    e. Trenches: One test at maximum 100 foot intervals for first and every other 8-inch lift of compacted trench backfill.
    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 Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 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 Resident Engineer.

3.2 FOUNDATION PILES

A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.

B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.

C. All piles are subject to re-inspection at any time, and any pile which fails to conform to Specifications or which have may have been damaged in handling shall be rejected after having Pile Driving Analyzer (PDA) test performed on piles in question.

D. Clarification of Assignment of Certain Responsibilities:
1. Verification of Driven Pile locations: Contractor shall lay out pile locations according to the Drawings. Testing Laboratory will verify that piles are driven. Contractor shall provide as-built survey documenting elevation of top of each pile and that piles are within specified tolerance including plumbness and exact location.
2. Testing Laboratory shall witness pile driving and report shall include the following:
   a. Appearance of plumbness.
   b. Blow counts.
   c. PDA tests.

E. Treated Timber Piles:
Inspection: Perform inspection at point of treatment and at project site. Mark conforming piles for identification.
1. Logging: Log the driving of all piling and record the following:
   a. Date driven, type of hammer, pile description including tip, length and butt dimensions measured just prior to driving, pre-drilling size and depth, and any unusual driving conditions.
   b. Location of pile.
   c. Number of blows per foot for full length of pile.
   d. Tip and butt elevation
   e. Record control elevations provided by Contractor.
   f. Heaved piles.
   g. Reporting: Submit driving records daily to Resident Engineer.
   h. Pile numbering plan as submitted by the Contractor prior to beginning the work.

F. Steel Pipe Piles:
1. Inspections to certify materials' conformity to details and requirements.
2. Witnessing and logging all driving operations.
3. Visually inspect all welding.
4. Verify that welders are certified for the type of welding being performed.
5. Steel Piles: Testing agency shall inspect all steel piles prior to installation.
6. Driving Record: Record all driving of piles. Include date driven, pile location and number, type and size of hammer used, type of driving cushion used, rate of operation of driving equipment, pile description including tip, pile dimensions, elevation of tip, continuous record of number of blows for each foot of penetration, pile deviation and any unusual occurrences during pile driving.
7. Condition of driving end and installation of anchorage to cap, if required.
8. Reporting: Submit driving records daily to Resident Engineer.
9. For concrete fill testing, see 3.7.B herein under "Field Inspection and Material Testing" under "CONCRETE" below.
10. All Steel Pipe Battered Piles will be PDA Tested.

G. Prestressed Concrete Piles:
1. Inspection at Plant: Inspect forms, placement of reinforcing steel and strands, placement and finishing of concrete, and tensioning of strands.
2. Concrete Testing: Test concrete including materials for concrete as required in Article, CONCRETE of this section, except make a minimum of two sets of four (4) cylinders two test cylinders for each day's production of each strength of concrete produced.
3. Test strand for conformance with ASTM A416/A416M and furnish report to Resident Engineer.
4. Inspect piles to ensure specification requirements for curing and finishes have been met.
5. Reports: Submit a report in quadruplicate to Resident Engineer, for each pile, detailing diameter or cross section, length, predrilling depth, size of drilling bit, make and model of hammer, driving time, blows per minute, number of blows per foot in last 5 feet of

penetration, number of blows for each inch during final 6 inches of penetration, and any other pertinent information.

6. High-strain dynamic monitoring shall be performed and reported according to ASTM D4945 during initial driving and during restriking on 12 percent of single piles.

3.3 MONITOR EXISTING STRUCTURE

A. During Surcharge work monitor the Pan American Building, place monuments on the building and install a Sondex probe and inclinometer to verify that building is not moving, settling, or tilting. Take measurements every 7 days after surcharging of soil is started and continue taking measurements at this interval until the surcharge material is removed. Monument Rulers will be installed by the Earthwork Contractor on the Pan Am Building and will be monitored under this scope of work. See Section 31 20 00 - Earth Moving for description of surcharging.

B. Monument Rulers: When piles are being driven within 200 feet of the Pan American Building monitor Monument Rulers on the Pan American Building daily and report any changes to Resident Engineer immediately.

1. Monument Rulers will be installed by others.

3.4 LANDSCAPING

A. Topsoil testing specified under Section 32 91 18 – Imported Topsoil.

3.5 SITE WORK CONCRETE

A. Test site work concrete, including materials for concrete, as required in Article CONCRETE of this section.

3.6 POST-TENSIONING OF CONCRETE

A. Inspection Prior to Concreting: Inspect tendons and/or threadbars, drape of tendons and/or threadbar geometry, sheaths and/or ducts for in-place condition, count, and anchorage components and back-up reinforcement for compliance prior to concreting. See Section 03 38 00 for additional requirements.

B. Concrete Testing: As required in Article CONCRETE of this Section except make three test cylinders representing each area to be tensioned and cylinders shall be cured in same manner as concrete they represent. Make compression test prior to determining minimum specified strength required for post-tensioning.

1. Alternatively, other methods approved by Resident Engineer may be used to determine concrete early strength prior to stressing.
    a. When maturity metering is approved by Resident Engineer, examine system information, and documentation necessary for specific mix, to be able to confirm interpretation of concrete strength based on in-situ temperature measurements.

C. Post-tensioning: Witness post-tensioning operation and record actual gauge pressures and elongations applied to each tendon and threadbar.

D. Submit reports in quadruplicate of the following:

1. Inspection of placement and post-tensioning of all tendons.
2. Size, type, number, location, and drape of tendons.
3. Calculated elongations, based upon the length, modulus of elasticity, and cross-sectional area of the tendons used, per the system manufacturer.

4. Actual field elongations. Check elongation of tendons within ranges established by manufacturer.
5. Jack-pump system identifier for each stressing operation.
6. Calculated gauge pressure and jacking force applied to each tendon.
7. Actual gauge pressures and jacking force applied to each tendon.
8. Required concrete strength at time of jacking.
9. Actual concrete strength at time of jacking.
10. Do not cut or cover the tendon ends until the Contractor receives the Resident Engineer's written approval of the post-tensioning records.
11. Stressing Operator's and Inspector's names and initials, and date stressing was conducted.

3.7 CONCRETE

A. Batch Plant Inspection and Materials Testing:
1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Resident Engineer with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Resident Engineer.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least four cylinders for each 50 cubic yards or less of each concrete type, and at least four cylinders for any one day's pour for each concrete type. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions. Each set of four cylinders shall be known as a "sample".
   a. Special Requirements: Specimens shall be:
      1) Taken after any addition of water to the concrete mix on the job.
      2) Stored while on the job in a moist box as specified under Section 01 52 00 - Construction Facilities & Temporary Controls.
      3) Placed in moist box within 10 minutes of molding.
      4) Not transported to testing laboratory until initial cure is obtained, nor sooner than 16 hours after molding.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. 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.

5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test every truck. For concrete not required to be air-entrained, test once every 100 cubic yards at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Record batch and discharge time for every truckload and report this information to Resident Engineer on the same form as entrained air content. Notify Resident Engineer and Construction Manager immediately if concrete time in transit does not conform to ASTM C94.
8. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
9. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
10. Verify that specified mixing has been accomplished.
11. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
    a. When ambient air temperature falls below 40 degrees F, record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
    b. When ambient air temperature rises above 85 degrees F, record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
12. Inspect forms for clean lines just prior to concrete placement and notify Resident Engineer and Construction Manager of unsatisfactory condition. Submit report if unsatisfactory condition has not been corrected.
13. Inspect the reinforcing steel placement, including bar size, bar spacing, top, bottom, and side concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
14. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
15. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
16. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
17. Observe preparations for placement of concrete:
    b. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
    c. Inspect preparation of construction, expansion, and isolation joints.
18. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
19. Observe concrete mixing:
    a. Monitor and record amount of water added at project site.
    b. Observe minimum and maximum mixing times.
    c. Adding water at site may not be permitted. Refer to specification for the work being installed to verify if permitted.
20. Measure concrete flatwork for levelness and flatness as follows:
    a. Perform Floor Tolerance Measurements FF and FL in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.

b. Perform all floor tolerance measurements within 24 hours after slab installation and prior to removal of shoring and formwork. At areas cured with plastic sheets or paper membrane, floor tolerance tests shall be performed immediately following its removal.
c. Provide the Resident Engineer with the results of all profile tests, including a running tabulation of the overall FF and FL values for all slabs installed to date, within 72 hours after each slab installation.

21. Inspect anchor bolts cast into concrete.
22. Inspect concrete formwork for shape, location and dimensions of members.
23. Other inspections:
    a. Grouting under base plates.
    b. Grouting anchor bolts and reinforcing steel in hardened concrete.
    c. Expansion and adhesive anchor installation.

C. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each sample, test one cylinder at 7 days for information and one cylinder at 28 days for acceptance. Use remaining cylinder as a spare tested as directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be an average of the compressive strength of two cylinders in the same sample tested at 28 days, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
    a. Cylinder identification number and date cast.
    b. Specific location at which test samples were taken and where the concrete represented by this test, was deposited.
    c. Type of concrete, slump, and percent air or entrained air content.
        1) Percent Air or Entrained Air Content: Match units in specification section applicable to the concrete being installed.
        2) If specification for concrete being installed is specified or entrained air content.
    d. Compressive strength of concrete in psi.
    e. Weight of lightweight structural concrete in pounds per cubic feet.
    f. Weather conditions during placing.
    g. Temperature of concrete in each test cylinder when test cylinder was molded.
    h. Maximum and minimum ambient temperature during placing.
    i. Ambient temperature when concrete sample in test cylinder was taken.
    j. Date delivered to laboratory and date tested.

3.8 REINFORCEMENT

A. Mill Test Reports: Furnish to, and obtain from, testing agency.

B. Perform sampling at fabricating plant. Take two samples from each 25 tons or fraction thereof of each size of reinforcing steel No. 3 thru No. 18.

C. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.

D. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.

E. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

F. For welded reinforcement, review and approve welder qualifications and welding procedures in accordance with applicable sections of AWS D1.4.

3.9 PRESTRESSED CONCRETE PILES

A. Inspection at Plant: Forms, placement and concrete cover of reinforcing steel and tendons, placement and finishing of concrete, and tensioning of tendons.

B. Concrete Testing: Test concrete including materials for concrete required in Article, CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.

C. Test tendons for conformance with ASTM A416 and furnish report to Resident Engineer.

D. Inspect members to insure that specification requirements for curing and finishes have been met.

3.10 PRECAST CONCRETE

A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.

B. Concrete Testing: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.

C. Inspect members to insure specification requirements for curing and finishes have been met.

D. Inspect all connections for compliance with approved shop drawings.

E. Inspect all field welds in accordance with “Weld Inspection” under “Fabrication and Erection” under “STRUCTURAL STEEL” below.

3.11 MASONRY

A. Perform the following services as required to ensure compliance with requirements of Division 4 of the Specifications and Chapter 17 of the IBC.

B. Inspect and evaluate masonry construction in compliance with 1704.5 and Table 1704.5.3 (Level 2) of the International Building Code.

C. If testing specified above for masonry stated conflicts with requirements specified below the more stringent requirement shall apply.

D. Mortar Tests:
1. Laboratory compressive strength test:
   a. Comply with ASTM C780. All samples shall consist of a set of four cubes.
   b. Obtain samples during or immediately after discharge from batch mixer.
   c. Furnish molds with 2 inch, 3 compartment gang cube.
   d. Test one cube at 7 days and 2 cubes at 28 days.
2. Frequency: Take two samples during first week of operation; one sample per week after initial test until masonry completion.

E. Grout Tests:
1. Laboratory compressive strength test:
a. Comply with ASTM C1019. All samples shall consist of four grout prisms 3" x 3" x 6" or taller.
b. Test one prism at 7 days and 2 prisms at 28 days.
c. Frequency: Take sample for each 2500 square feet of masonry.

F. Masonry Unit Tests:
1. Laboratory Compressive Strength Test:
a. Comply with ASTM C140.
b. Test 3 samples for each 5000 square feet of wall area.

G. Prism Tests: For each type of bearing wall construction indicated, test masonry prisms per ASTM C1314 for each 5000 square feet of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.12 STRUCTURAL STEEL

A. General: See Section 05 12 00. 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.

B. Prefabrication Inspection:
1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
3. Approve welder qualifications by certification or retesting.
4. Approve procedure for control of distortion and shrinkage stresses.
5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
6. Review materials' proofs of compliance. Identify markings of structural steel shapes to conform to ASTM standards specified. Review structural steel shapes certificates of compliance.

C. Fabrication and Erection:
1. Weld Inspection:
b. Inspect welding equipment for capacity, maintenance and working condition.
c. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
d. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
e. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
f. Visually inspect and Measure 25 percent of fillet welds.
g. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
1) 20 percent of all shear plate fillet welds at random, final pass only.
2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.

h. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
k. Owner may perform non-destructive testing, in addition to visual, on any shop or field welds. Owner shall be responsible for all associated costs including handling, surface preparation, and non-destructive testing if the welds are acceptable per AWS D1.1, Section 6, Part C. If the welds are not found to be acceptable, Contractor shall be responsible for repair of discontinuities and all associated costs including those described above.

2. Bolt Inspection:
a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.

3. Inspect the application of joint details at each connection for compliance with the construction documents.

D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.13 STEEL DECKING

A. Provide field inspection of welds and ballistic fasteners of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."

C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.14 SHEAR CONNECTOR STUDS

A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.

B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.

C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.15 SPECIAL INSPECTION FOR WIND RESISTANCE

A. Perform special inspection services as required to ensure compliance with requirements of drawings, specifications, and IBC Sections 1705.4, 1705.4.1, and 1705.4.2.
   1. The main wind-force resisting system is the moment frame building structure and does not require additional special inspection for high winds.
   2. The special inspections shall include periodic inspection of the following:
      a. Roof cladding and roof framing connections.
      b. Connection of Glazed Aluminum Curtain Walls and Aluminum-Framed Entrances and Storefronts to building structure and Cold-Formed Metal Framing.
      c. Connections of Cold-Formed Metal Framing to structure.
      d. Connection of Exterior Stone Cladding to support structure.
      e. Connection of Louvers to support structure.
      f. Connection of Cementitious Sheathing to Cold-Formed Metal Framing at exterior wall locations receiving Ceramic/Porcelain Tiling system.
      g. Connection of Metal Clad Fins to support structure.
      h. Connection of Portland cement plaster furring, including metal lath, to structural support.

B. Construction Manager, and contractors designated by the Construction Manager, shall comply with IBC Section 1706.

3.16 APPLIED FIREPROOFING

A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents; see Section 07 81 00, Applied Fireproofing.

B. Obtain a copy of approved submittals from Resident Engineer.

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 and bond in accordance with ASTM E 736; ascertain that required resistances have been attained in accordance with IBC including Chapter 17 and Sections 1704.10 and 1704.11. Inspect steel before installation of fireproofing as required by IBC.
   1. Bond Strength: The bond strength value shall meet or exceed 100% of the value indicated in manufacturer's product literature approved in accordance with Section 01 33 23, Shop Drawings, Product Data, and Samples.
   2. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.

E. Test Intervals: Provide testing at not less than the following intervals:
   1. Mock-up.
   2. Each floor as completed and prior to installation of mechanical/electrical work which may interfere with testing and/or replacement of fireproofing.
   3. ASTM E 605 unless more frequent testing required by governing Code.

F. Test Frequency:

1. Thickness: Select one bay per floor, or one bay for each 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 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. Bond: Same as “Thickness” above.

G. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.17 INTUMESCENT FIREPROOFING

A. Provide field inspection and testing services to certify fireproofing specified in Section 07 81 23 - Intumescent Fireproofing, has been applied in accordance with contract documents.

B. Obtain a copy of approved submittals from Resident Engineer.

C. Use approved installation in test areas as criteria for inspection of work.

D. Test and inspect in accordance with IBC including Chapter 17 and Section 1704.11. Inspect steel before installation of fireproofing as required by Building Code , and in accordance with TECHNICAL MANUAL 12-B (SECOND EDITION) – Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide, The Association of the Wall and Ceiling Industries – International (AWCI).
1. Frequency of Tests: Not less than one bay per floor, or one bay for each 10,000 square feet of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Beam, column, and metal deck (at least 5 feet from beams).

F. Perform the tests and inspections of completed Work in successive stages, including MockUp. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

G. Tensile Bond: Select one bay per floor, or one bay for each 10,000 square feet of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Beam, column, and metal deck (at least 5 feet from beam). Test in accordance with ASTM E760.

3.19 GALVANIZED TESTING

A. Perform the following services as required to ensure compliance with requirements of the following Sections of the Specifications:
1. 03 45 00 Series – Precast Architectural Concrete
2. 05 40 00 – Cold-Formed Metal Framing.
3. 05 12 00 – Structural Steel.

B. Cold-Formed Galvanized Metal Framing:
1. Perform testing of framing members obtained from field samples.
2. Test for coating weight in accordance with ASTM A90.
3. Should any member test below minimum specification with permissible variations, entire lot shall be rejected; advise Resident Engineer immediately.
4. Test Variability and Retests: In accordance with ASTM A924.

C. Galvanized Steel Field Welds: Furnish inspection during installation of all welds involving structural galvanized steel members.
   1. Procedures for all precast connections between galvanized materials must be tested and pre-qualified for the required design carrying capacity.
   2. Welding personnel must be pre-qualified in the same welding procedures. A minimum of three tests per connection is required.
   3. Check and verify that damaged galvanizing has been repaired as Specified in Section 05 05 15, Hot Dip Galvanizing, prior to being concealed.

3.20 THERMAL AND MOISTURE PROTECTION WORK TESTING AND INSPECTION

A. Perform the following services as required to ensure compliance with requirements of Division 7 of the Specifications.

B. Waterproof membrane work: Check surfaces before application of membrane materials and verify that substrate surfaces are in satisfactory condition to receive membrane materials. Furnish continuous inspection during application of membrane and verify that required thicknesses are provided upon completion

C. Roofing: Check deck surfaces before application of roofing materials and verify that substrate is in satisfactory condition to receive roofing. Verify nailers adequately anchored to structure. Furnish continuous inspection during application of roofing, including application of vapor barriers, insulation and roofing. Inspect all sheet metal flashings, counterflashings and reglets for satisfactory and waterproof installation.

D. Building Envelope: Insulation at wall and roof plus air barrier. Provide thermographic building survey (thermal imaging) of completed wall and roofing systems following ASTM C1060, C1153, and E1186. Survey to evaluate locations, consistency, and relative state of dryness of insulation, missing insulation, and potential leak sources for water and air, if any. Furnish report of survey which includes photographs, data, and analysis of each area of survey. Verify minimum temperature differential required (normally 40 degrees F).

E. Intervals as follows plus other times when directed by Resident Engineer:
   1. Exterior Walls: Prior to Substantial Completion and after building enclosure with exterior walls completed and permanent HVAC system operating.
   2. Roof:
      a. Within 2 months of completion of roof including after building enclosure with exterior walls completed.
      b. 9 to 11 months and 21 to 23 months after Substantial Completion.
      c. 4th, 6th, and 9th year after Substantial Completion.

F. Firestopping: Provide inspection of firestopping for joints and penetrations of rated assemblies in accordance with ASTM E2174; ascertain that required resistances have been attained in accordance with Code requirements. Provide “Destructive inspections as described below.
   1. Destructive Inspection After Installation: Inspect a minimum of 2 percent, but not less than one, of each type of fire stop on each floor or for each area of a floor when a floor is larger than 10,000 sq. ft. An area consists of 10,000 sq. ft. or less.
      a. Remove sufficient amount of firestopping to verify firestopping system complies with designated UL System No.
      b. Accepted Fire Stops: Installer shall repair accepted fire stops damaged by inspection in accordance with ASTM E2174 at no increased cost to Owner.
   2. Document all observed deficiencies on inspection form. Physically identify locations where required fire stop has been omitted or where inspection results indicate the installed fire stop does not comply with the “Inspection Documents” as defined by ASTM

E2174; or identification tag is not provide in compliance with Section 07 84 00 – Firestopping.

3. Non-Compliance: Provide the following procedures for non-complying fire stops:
   a. Destructive Inspection after Installation: Repair or replacement by installer and re-inspection of that fire stop plus one additional inspection of that type fire stop.
   b. Destructive or Non-Destructive Inspections: If non-compliance occurs on 10% or more of the quantity of like fire stops, then:
      1) Inspection of those particular type fire stops shall cease.
      2) The installer shall inspect his own work, repair or replace those like fire stops within the area.
      3) After corrections have been completed by installer within the area, inspections by the inspector will re-commence.

3.21 FUNGI (MOLD/MILDEW) WORK TESTING AND INSPECTION

A. Submit unit cost to Resident Engineer for work described in this Article titled “FUNGI (MOLD/MILDEW) WORK TESTING AND INSPECTION”.

B. Perform the following services as directed by the Resident Engineer to ensure interior building materials suspected of becoming wet are free from fungi (mold and mildew). Include gypsum board, paneling, and other designated finish materials.
   1. Cellulosic materials which become food sources for fungi are prime types of materials; however, non-cellulosic materials may harbor active fungi due to dirt including ventilation systems and filters.
   2. Inspection/testing into concealed from view spaces may not be conducted until building is fully enclosed and permanent HVAC system operating.
   3. Testing: Perform laboratory analysis for fungi known to be toxic agents including, but not limited to, Stachybotrys Chartarum, Aspergillus, Penicillium, Fusarium, Trichoderma, and Memnoniella.

C. Gypsum Board: Inspection openings are required to be cut by the Construction Manager where directed by the Resident Engineer as specified under Section 09 29 00 – Gypsum Board.

D. Equipment and Other Materials: Use of boroscopes to view concealed spaces in ductwork, walls, partitions, ceilings may be used. Moisture meters may also be used to detect moisture in materials to identify potential sources of fungal growth.

E. Remediation: Recommend remediation measures in written report to Resident Engineer and Architect. Refer to Section 09 29 00, Gypsum Board, for removal of contaminated board and application of fungicide to interior wall spaces.

3.22 CURTAIN WALL EMBED TESTING

A. Perform the following services as required to ensure compliance with requirements of the following:
   1. Section 08 44 13 – Glazed Aluminum Curtain Walls.

B. Required Witnesses (besides testing service and installing trade contractor):
   1. Curtain Wall Consultant, Architect, Resident Engineer, and Construction Manager.

C. Field Test: Perform the following field tests of embeds used for support of curtain wall; include welded and cast-in devices. Test in accordance with the cited Standards except as modified, and in accordance with the performance criteria specified under Section 08 44 13 – Glazed Aluminum Curtain Walls. See "Required Witnesses" above.

1. Loads: 1.5 design loads. Dead load applied simultaneously with other loads.
2. Test: With dead load applied, apply live loads perpendicular to slab edge, positive and negative.
3. Standards:
   a. Application Rate And Time Periods: In accordance with of ASTM E330.
   b. Load Application: As approved by curtain wall consultant.

D. Quantity: Perform 5 separate tests as directed by Resident Engineer.

3.23 FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR EXCLOSURE COMMISSIONING

A. General: Comply with Sections 01 91 00, General Commissioning Requirements, and 07 08 00, Facility Exterior Closure Commissioning, including related Enclosure Testing Matrix.

B. Wall Systems: During construction, provide field tests of permanent in-place wall systems as described below.

C. Curtain Wall, Metal Panels, Precast Concrete Wall Panels, and Windows: Perform Water Penetration and Air Leakage Field Testing; coordinate with work of Section 08 44 13, Glazed Aluminum Curtain Wall.
1. Notify Resident Engineer, in writing, a minimum of 14 days prior to conducting the field-testing.
2. Testing Methodology:
   a. Water Penetration Resistance Testing shall be conducted in accordance with ASTM E1105, Procedure A, consisting of 15 minutes induced air pressure difference.
      1) Field Test pressure shall be same test pressure specified in the Performance and Testing Requirements section.
      2) Water penetration shall be as specified in the in PERFORMANCE REQUIREMENTS and Section 01 45 29, Mockups.
   b. Air Leakage Testing shall be conducted in accordance with ASTM E783
      1) Test pressure shall be 6.24 psf.
      2) Maximum air leakage rate shall be as specified in PERFORMANCE REQUIREMENTS and Section 01 45 29, Mockups.
3. Testing Procedure and Extent:
   a. Conduct initial field test at designated completed curtain wall area selected by Contracting Officer's as soon as is practical after installation of curtain wall has started. Test early during installation so that errors in fabrication or installation can be found and corrections made before remainder of curtain wall assemblies are installed.
      1) As applicable, test area shall include interface with adjacent building envelope systems, as well as typical sill, vertical and horizontal mullions. Test shall include both vision and opaque panels.
      2) Test Procedure:
         a) Initial field test shall include air leakage testing followed by Water Penetration Resistance Testing.
   b. After initial testing of earliest installation, test one area selected by Contracting Officer prior to completing 10 percent of curtain wall installation, two additional tests prior to completing 30 percent of the glazed wall area and two additional tests prior to completing 50 percent of the glazed wall areas.
      1) As applicable, test areas shall include interface with adjacent building envelope systems, as well as typical vertical and horizontal mullions, corner

mullions, and typical penetrations through curtain wall. Tests shall include both vision and opaque panels.
2) All tests following initial field test shall be for water penetration resistance only.

4. Unless otherwise directed by Contracting Officer, each test area shall extend at least 15 feet wide by one story height.
5. Submit test reports and photographs indicating the procedures and results of all field tests.

D. Exterior Stone Cladding:
1. Water Hose Tests: Minimum 3 series, AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing for Water Leakage.
a. Test Intervals: Test at the approximate intervals of work completions:
1) 5%.
2) 20%.
3) 50%.
b. Test Areas: Each test shall include, but not limited to, the following:
1) One area with vertical and horizontal joint.
2) One area at glazed head.
2. Air Pressure Tests: Not required unless cause of leak cannot be determined from “Water Hose Tests” above. AAMA 501.3 – Field Check of Water and Air Leakage through Installed Exterior Windows, Curtain Walls and Doors by Uniform Air Pressure Difference.

E. Air and Water Leakage Testing: Coordinate with work of Section 07 27 30, Air Weather Barrier (AWB).
1. Perform quantitative air leakage testing for the building assemblies per ASTM E 779 and the following:
a. Test air barrier/vapor retarder assemblies for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
b. Testing results not to exceed test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to ASTM E 783.
2. Water Leakage Testing: Quantitative.
3. Perform Air and Water Leakage Testing on two (2) floors in each Building A, B, C, D, E, F, G, H, J, M, N, and P.

F. Water Ponding/Run-Off Test: Coordinate with work of Section 07 52 16, Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing.
1. Apply water to fully cover surface to which roofing has been applied to evaluate drainage.

G. Envelope and Room Leakage Test.

H. Exterior Vertical Surfaces:
1. Curtain Wall: Tests shall be at least 15 feet wide by one story tall area; test in accordance with ASTM E1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.
2. Metal Panel. Tests shall be at least 15 feet wide by one story tall; test in accordance with ASTM E1105.
3. Windows: Test in accordance with ASTM E 1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.
4. System Interfaces: Test curtain wall interfaces in accordance with AAMA 501.2.
5. Precast Architectural Concrete: Tests shall be at least 15 feet wide by one story tall area; test in accordance with ASTM E1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.

6. Envelope and Room Leakage: Test in accordance with ASTM E779; test 20 percent of floors in each building.

SURFACE	AREA	TEST PANEL AREA	TEST QUANTITY
Curtain Wall	280,000 SF	285 SF / Test Area	10% of area = 96 Tests
Metal Panel	490,000 SF	285 SF / Test Area	5% of area = 86 Tests
Windows	90,000 SF	30 SF / Test Area	5% of area = 150 Tests
Precast Concrete	140,000 SF	285 SF / Test Area	5% of area = 26 Tests
Flashing/End Dams	2860 units	2860 units	2% of units = 80 Tests
Sealant Joints	300,000 LF	5 tests of first 300 LF plus 1 test per 600 LF	= 500 Tests
Air & Water Leakage	12 Buildings @ 2 Floors / Building		= 24 Tests

3.24 CONVEYING SYSTEMS INSPECTION

A. Perform the following services as required to ensure compliance with requirements of Division 14 of the Specifications.

B. Elevators:
1. Test for performance requirements.
   a. “Performance Standards Matrix New Elevator Installation” with modifications as listed below; NEII-1.
2. Inspect materials and products supplied.
   a. Standard Items:
      1) Traction: “Checklist for Electric Elevators”, ASME A17.2.1a, Appendix A.
      2) Hydraulic: “Checklist for Electric Elevators”, ASME A17.2.2, Appendix A.

3.25 FIRE PROTECTION INSPECTION AND TESTING

A. Perform the services required to ensure compliance with requirements of Division 21 of the Specifications.

B. Other: As specified elsewhere or required by Authorities Having Jurisdiction; see Section 01 00 00, General Requirements, Article “TESTS”.

3.26 PLUMBING INSPECTION

A. Observe and document sterilization of water piping and Storage Tank by Division 22.

B. Observe and document purging of gas piping.

3.27 OTHERS

A. Other: As specified elsewhere or required by Authorities Having Jurisdiction; see Section 01 00 00, General Requirements, Article “TESTS”.

3.28 TEST QUANTITIES

A. For quantities of individual tests required to be performed other that the Exterior Closure Tests identified in subparagraph 3.23.H.6 under FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR EXCLOSURE COMMISSIONING article above, is identified in the Veterans Administration “Solicitation/Contract/Order for Commercial Items” documents.

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