

SECTION 014500 – QUALITY CONTROL

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Drawings and General Provisions of Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to Work of this Section.
- B. Section 010500 – FIELD ENGINEERING.
- C. Section 014510 – TESTING LABORATORY SERVICE.

1.02 SUMMARY

- A. This Section includes Contractor's responsibilities of quality control services and extent of quality control services to be performed.
- B. Definitions: Quality control services include inspections and tests, and actions related thereto including reports, but do not include contract enforcement activities performed directly by Architect / Engineer. Quality control services include those inspections and tests and related actions performed by independent agencies and governing actions performed by independent agencies and governing authorities, as well as directly by Contractor.
 - 1. Testing service is required to immediately notify Construction Manager of discrepancies observed in the Work performed and to be performed to the Contract Documents.
- C. Inspections, tests, and related actions specified in this Section and elsewhere in Contract Documents are not intended to limit Contractor's quality control procedures which facilitate compliance with requirements of Contract Documents.
- D. Requirements for quality control services by Contractor, as requested or to be requested by Architect / Engineer, Owner, governing authorities, or other authorized entities are not limited by provisions of this Section.
- E. Contractor shall review and become familiar with the requirements of the General and Special Conditions covering the provisions for testing of the Work.

1.03 RESPONSIBILITIES

- A. Contractor shall coordinate with independent testing agency performing inspections, tests, and quality control services.
 - 1. The Construction Manager will schedule services of independent testing agency to perform services so specified.
 - 2. Owner will pay for quality control services specified.

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- B. Retest Responsibility: Where results of required inspection, test, or similar service are unsatisfactory (i.e., do not indicate compliance of related work with requirements of Contract Documents), retests are responsibility of Contractor. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work.
- C. Responsibility for Associated Services: Contractor is required to cooperate with independent agencies performing required inspections, tests, and similar services. Provide auxiliary services as reasonably requested, including access to work, the taking of samples or assistance with the taking of samples, delivery of samples to test laboratories, and security and protection for samples and test equipment at project site.
- D. Coordination: Contractor and each engaged independent agency performing inspections, tests, and similar services for project are required to coordinate and sequence activities so as to accommodate required services with minimum delay of work and without the need for removal / replacement of work to accommodate inspections and tests. Scheduling of times for inspections, tests, taking of samples, and similar activities is Contractor's responsibility through the Construction Manager.
- E. As it applies to Work being performed as part of this Contract sampling and testing is required for the following Sections of Work and shall be performed by an independent testing lab and paid for by the Owner.
 - 1. Section 023000 – Earthwork: Soil testing and inspection service during earthwork operations for subgrades, engineered fill, and caisson bearing.
 - 2. Section 027450 – Bituminous Concrete Pavement: Quality control testing of uncompacted asphalt concrete mix and in-place compacted pavement.
 - 3. Section 033000 – Cast-In-Place Concrete: Inspection of reinforcing steel placement.
 - 4. Section 033000 – Cast-In-Place Concrete: Field quality control of concrete.
 - 5. Section 033000 – Cast-In-Place Concrete: Tests for concrete materials and mix design tests.
 - 6. Section 033000 – Cast-In-Place Concrete: Testing of FF/FL floor tolerances.
 - 7. Section 040600 – Masonry Mortar: Field quality control of mortar.
 - 8. Section 040700 – Masonry Grout: Field quality control of grout.
 - 9. Section 042000 – Masonry Units: Field quality control of unit masonry and masonry assemblies, and reinforcing placement.

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10. Section 051000 – Structural Metal Framing: Field quality control for welds.
 11. Section 051000 – Structural Metal Framing: Field quality control for high strength steel torqued bolted connections.
 12. Section 051000 – Structural Metal Framing: Field quality control for structural steel alignment.
 13. Section 078100 – Applied Fireproofing: For quality control for applied fireproofing.
 14. Section 078110 – Intumescent Fireproofing.
 15. Section 099100 – Paints: Field quality control for painting.
- F. Contractor shall submit to the Architect / Engineer for review, the names and addresses of testing laboratories to be used by Contractor in making their required inspections, sampling, and testing as outlined herein or other tests that may be required by the Contract Documents and not covered herein. Testing laboratories must have sufficient experience in making the inspections, sampling, or testing they will be required to complete. Where sufficient evidence or knowledge of the testing laboratory is not available, the Construction Manager shall have the right to require Contractor to use the same testing lab selected by the Owner or to submit names of other laboratories that will be acceptable to the Architect and the Owner at no additional cost to the Owner.
- G. Test procedures to be used shall be submitted for approval of the Architect / Engineer where other than those specified are recommended by the testing agency.
- 1.04 QUALIFICATION OF LABORATORY
- A. Refer to Section 014510 – TESTING LABORATORY SERVICE for requirements.
- 1.05 SUBMITTALS
- A. Submit 2 copies of test reports directly to the Architect from the approved testing services, with one copy each to Contractor and Construction Manager.
- 1.06 SOIL COMPACTION TESTING
- A. Contractor shall cooperate and coordinate with the soil testing and inspection service for quality control testing during earthwork operations as follows:
1. Field density test reports.
 2. One optimum moisture-maximum density curve for each type of soil encountered.

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3. Contractor shall arrange for soil testing and inspection service to be on the site for observation and testing during times when the following operations are being performed.
 - a. Proofrolling.
 - b. Compaction of subgrades and fill. During compaction operations, Contractor shall carefully monitor existing foundations to detect possible foundation movements. If movement is detected, Work shall be stopped and the Architect and the Construction Manager immediately notified.

- B. Percentage of Maximum Density Requirements: Provide not less than following percentages of maximum density of soil material compacted at optimum moisture content, for the actual density of each layer of soil material in place.
 1. Foundations: Compact top 12 inches of subgrade and each 8 inch layer of backfill or fill material to 95 percent of a modified Proctor (ASTM method D1557).
 2. Building Slabs and Steps: Compact top 12 inches of subgrade and each 8 inch layer of backfill or fill material to 95 percent of a modified Proctor (ASTM method D1557).
 3. Lawn, Unpaved Areas, and Borrow Pit: Compact top 6 inches of subgrade and each 8 inch layer of backfill or fill material to 85 percent of a modified Proctor (ASTM method D1557).
 4. Walkways: Compact top 6 inches of subgrade and each 8 inch layer of backfill or fill material to 95 percent of a modified Proctor (ASTM method D1557).
 5. Pavements: Compact top 12 inches of subgrade and each 8 inch layer of backfill or fill material to 95 percent of a modified Proctor (ASTM method D1557).
 6. Underground Utilities: Provide the preceding requirements for the respective utility location(s).
 7. Storm Piping Outside Building
 - a. Bedding shall begin by placing 4 to 6 inch bedding of the approved backfill material and compacting to 95 percent of a modified Proctor (ASTM method D1557). The width of the bedding shall be the diameter of the pipe plus 2 feet.
 - b. Haunching shall consist of placing the approved backfill material to the spring line of the pipe and compacting to 95 percent of a modified Proctor (ASTM method D1557). This lift shall not exceed 9 inches loose. The pipe bedding and flow line shall not be disturbed as a result of the haunching operation.

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- c. Initial backfill shall consist of placing the approved backfill material to the top of the pipe and compacting to 95 percent of a modified Proctor (ASTM method D1557). This lift shall not exceed 9 inches loose. Crushed or buckled pipe as a result of the backfilling operations will be removed and replaced with no additional payment.
 - d. Initial backfill shall continue in 6 inch lifts with the approval backfill material to a depth of 12 inches above the pipe.
 - e. Finish backfilling of the trench shall consist of placing the approved backfill or material from the trench excavation in 6 inch lifts to the grade of the trench. Finish backfilling within paved areas shall continue to the base of the compacted aggregate with the approved backfill material.
 8. Retaining Walls: Compact each 8 inch layer of backfill or fill material to 95 percent of a modified Proctor (ASTM method D1557).
- C. Quality Control Testing During Construction: Testing service must inspect and approve subgrades and fill layers before further construction work is performed thereon. Tests of subgrades and fill layers will be taken as follows:
 1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect / Engineer, except that a minimum of one test shall be performed for each 15,000 square feet of building area.
 2. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case less than 3 tests.
 3. Foundation and Retaining Wall Backfill: Take at least 2 field density tests, at locations and elevations as directed.
 4. Trench Backfill: For each compacted backfill layer make at least one field density test between each drainage structure if the distance between drainage structures is less than 100 feet. Make a field density test for every 100 feet between each drainage structure if the distance between drainage structures is greater than 100 feet.
- D. If, in the opinion of the Architect, based on reports of testing service and inspection, subgrade or fills which have been placed are below specified density, additional compaction work and testing shall be provided by Contractor for the Section of Work involved at no additional expense to the Owner, until subgrades or fills meet or exceed specified density.

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1.07 BITUMINOUS PAVING TESTING

- A. Contractor shall cooperate and coordinate with the testing laboratory to perform field inspection of the pavement work, unless specifically noted otherwise.
- B. Field quality control testing shall be performed during paving operations. Perform the following sampling and testing of asphalt concrete mixtures for quality control during paving operations. Record the locations where samples are taken to correlate with subsequent testing.
- C. Test uncompacted asphalt concrete mix and report the following:
 - 1. Sampling: AASHTO T168 (ASTM D979).
 - 2. Asphalt Cement Content: AASHTO T164 (ASTM D2172).
 - 3. Perform at least one initial test for paving, unless otherwise specified or directed.
- D. Test in-place, compacted pavement for density and thickness, as herein specified. For testing in-place density and thickness perform five (5) tests for each 400 tons or fraction thereof, unless otherwise specified or directed.
- E. Contractor shall pay for and perform additional Work and testing as may be required if any of the previous tests indicate insufficient values or if directed by the Architect. Continue Work and testing until specified values have been attained.
- F. Asphalt concrete material not complying with specified requirements will not be acceptable. Contractor shall repair or remove and replace defective paving as directed by the Architect, at no additional cost to the Owner.

1.08 INSPECTION OF REINFORCING STEEL PLACEMENT

- A. Contractor shall cooperate and coordinate with the testing laboratory to perform field inspection of the placement of reinforcing steel prior to, and in some specified instances during the placement of concrete in all reinforced concrete structures, unless specifically noted otherwise.
- B. Inspection shall include the following:
 - 1. All Structures:
 - a. Size of all reinforcing bars.
 - b. Measurement of bar laps.
 - c. Spacing of reinforcing bars.
 - d. Measurement of reinforcing concrete cover.

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- e. Adequacy of reinforcement ties to prevent movement during concrete placement.
 - f. Placement of reinforcing chairs, bolsters, and concrete blocks supporting reinforcement.
 - g. Condition of reinforcing free of corrosion scale, grease, oil, and other foreign materials which would reduce bond of concrete to reinforcement.
2. Slabs-on-Grade:
- a. Nominal size of welded wire fabric.
 - b. Measurement of fabric lap.
 - c. Type, size, and spacing of supports for welded wire fabric.
 - d. Adequacy of maintaining welded wire fabric in correct position during the concrete placement. If concrete workers walk on fabric during concrete placement fabric shall be lifted back in to correct position prior to set of concrete. (THE TESTING LABORATORY SHALL BE PRESENT DURING THE PLACEMENT OF SLABS-ON-GRADE WHICH USE WELDED WIRE FABRIC OR REINFORCING STEEL BARS).
 - e. Slabs-on-grade with fibrous reinforcement do not require this inspection.
- C. Report inspection results in writing to the Architect, the Construction Manager, and Contractor the same day or within a reasonable time period that tests are made. Reports shall indicate the specific structural items inspected and the location, with column grid references, where possible to clearly identify the inspected items.
- D. Additional Inspections: Where inspections indicate deficiencies and concrete placement is made prior to the correction and retesting of these deficiencies or where concrete placement of any structural item is made without this required inspection, the testing laboratory shall conduct additional tests, including concrete coring, magnetic detection devices, sonic testing devices, and other methods as required to verify the conformance of the reinforcing steel placement to the Contract Documents. Contractor shall pay for such inspections conducted and other additional inspections as may be required when unacceptable or uninspected reinforcing steel placement is verified.

1.09 CONCRETE TESTING

- A. Contractor shall cooperate and coordinate with the testing laboratory to perform field quality control testing during concrete work under Division 3.

- B. Quality Control Testing During Construction: Perform sampling and testing for field quality control during the placement of concrete, as follows:
1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 2. Slump: ASTM C143, one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens.
 3. Air Content: ASTM C231, pressure method; one for every other concrete load at point of discharge or when the indication of change requires.
 4. Compression Test Specimens: ASTM C31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.
 - a. Cast and store 4 cylinders for laboratory cured test specimens and as specified in ASTM C31.
 5. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below and when 80 degrees F. and above; and each time a set of compressive test specimens is made.
 6. Compressive Strength Tests: ASTM C39, one set for each 100 cubic yards or fraction thereof, of each mix design placed in a day or for each 5,000 square feet of surface area placed; 1 specimen (lab cured) tested at 7 days, 2 specimens (lab cured) tested at 28 days, and 1 specimen (lab cured) retained in reserve for later testing if required.
 - a. When the frequency of testing will provide less than 5 strength tests for a given mix design, conduct testing strength tests for a given mix design from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 - b. When the total quantity of a given mix design of concrete is less than 50 cubic yards, the strength tests may be waived by the local authority having jurisdiction (AHJ) if, in his judgment, adequate evidence of satisfactory strength is provided.
 - c. When the strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

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- C. Report test results in writing to the Architect, the Construction Manager, Contractor, and ready-mix supplier on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, type and amount of fibrous reinforcement, compressive breaking strength, and type of break for both 7 day tests and 28 day tests.

- D. Additional Tests: The testing service will make additional tests of in-place concrete, as directed by the Architect, when test results indicate the specified concrete strengths and other characteristics have not been attained in the structure. The testing service shall conduct tests to determine the strength and other characteristics of the in-place concrete by compression tests on cored cylinders complying with ASTM C42 or by load testing specified in ACI 318 or other acceptable nondestructive testing methods, as directed. Contractor shall pay for such tests conducted and other additional testing as may be required, when unacceptable concrete is verified.

- E. Evaluation of Quality Control Tests: Do not use concrete delivered to the final point of placement which has slump or total air content outside the specified values.
 - 1. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of 3 consecutive compressive strength tests results equal or exceed the 28 day design compressive strength of the type or class of concrete; and no individual strength test falls below the required compressive strength by more than 500 psi.

 - 2. Strength tests of specimens cured under field conditions may be required by the Architect to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded by the field quality control laboratory at the same time and from the same samples as the laboratory cured specimens.
 - a. Provide improved means and procedures for protecting concrete when the 28 day compressive strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders.

 - b. When laboratory cured cylinder strengths are appreciably higher than the minimum required compressive strength, field cured cylinder strengths need not exceed the minimum required compressive strength by more than 500 psi even though the 85 percent criterion is not met.

- c. If individual tests of laboratory cured specimen produce strengths more than 500 psi below the required minimum compressive strength or if tests of field cured cylinders indicates deficiencies in protection and curing, provide additional measures to assure that the load-bearing capacity of the structure is not jeopardized. If the likelihood of low-strength concrete is confirmed and computations indicate the load-bearing capacity may have been significantly reduced, tests of cores drilled from the area in question may be required.
 - 3. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such tests will be considered deficient in strength.
- F. Deficient concrete shall be removed and replaced by Contractor without additional cost to the Owner.

1.10 CONCRETE MATERIALS AND MIX DESIGN

- A. Concrete Materials and Mix Design: Contractor shall provide the following in conformance with the requirements of Section 033000 – CAST-IN-PLACE CONCRETE.
 - 1. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94.
 - 2. Product Data: Submit 3 copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures, bonding agents, water stops, joint systems, chemical floor hardeners, and dry shake finish materials.
 - 3. Laboratory Test Reports: Submit 2 copies of laboratory test reports for concrete materials and mix design tests. The Architect's review will be for general information only. Production of concrete to comply with specified requirements is Contractor's responsibility.
 - 4. Mix Design: Submit 3 copies of concrete mix designs for each type of mix required by the Concrete Schedule indicating the amount of each ingredient (by weight) in one cubic yard of concrete, the calculated water / cement ratio, and the slump, two weeks prior to placement of concrete.
- B. Tests for Concrete Materials
 - 1. For normal weight concrete, test aggregates by the methods of sampling and testing of ASTM C33.
 - 2. For light weight concrete, test aggregates by the methods of sampling and testing of ASTM C330.
 - a. For Portland cement, sample the cement and determine the properties by the methods of test of ASTM C33.

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3. Submit written reports for each material sampled and tested, prior to the start of Work. Provide the project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.
 - C. Submit signed statement from ready-mix plant that concrete furnished for the Project will exactly conform to the approved design mixes.
- 1.11 TESTS FOR FF/FL: Refer to Section 033000 – CAST-IN-PLACE.
- 1.12 TESTS FOR MORTAR
- A. Contractor shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work, unless specifically noted otherwise.
 - B. For colored and noncolored mortars test for compressive strength by the methods of sampling and testing of ASTM C109 and ASTM C780.
 1. Provide a minimum of one set of cubes for testing per 5,000 square feet of masonry wall construction and as directed by Architect.
 - C. Submit written reports for each material sampled and tested. Provide the project identification name and number, date of report, name of contractor, name of testing service, source of aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.
 - D. If the compressive strength tests fail to meet the minimum requirements specified, the mortar represented by such tests will be considered deficient in strength.
 - E. Deficient mortar shall be removed and replaced by Contractor without additional cost to the Owner.
- 1.13 TESTS FOR GROUT
- A. Contractor shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work, unless specifically noted otherwise.
 - B. Grout for filling reinforced or unreinforced concrete masonry cores or brick cavities test for compressive strength by methods as described in Section 042000 – UNIT MASONRY.

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1. Provide a minimum of one set of 3 test specimens for testing per 5000 square feet of masonry wall construction or for each ready mix truck load of grout and as directed by the Architect.
- C. Submit written reports for each material sampled and tested. Provide the project identification name and number, date of report, name of Contractor, name of testing service, source of aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, specific location where material represented by sample is used, slump and compression test results. Indicate whether or not material is acceptable for intended use.
- D. If the compressive strength tests fail to meet the minimum requirements specified, the grout represented by such tests shall be considered deficient in strength.
- E. Deficient grout shall be removed and replaced by Contractor without additional cost to the Owner.

1.14 TESTS OF CONCRETE MASONRY PRISMS

- A. Contractor shall cooperate with a separate testing laboratory to perform field quality control testing during the masonry work, unless specifically noted otherwise.
- B. When required by the Masonry Plan, construct a set of 3 masonry prisms using mortar and concrete masonry units to be used in the masonry work. Unless otherwise noted, construct prisms 8 inches by 8 inches by 16 inches high (nominal) in compliance with ASTM E447, Method B.
- C. When prism tests are required to establish the strength of masonry in lieu of Masonry Inspection, provide a minimum of one set of 3 masonry prisms for testing for each 5000 square feet (gross) of masonry wall construction.
- D. Submit written reports for each prism tested. Provide the project identification name and number, date of report, name of Contractor, name of testing service, name of material suppliers, specific location where masonry represented by the prism is used, compression test strength results, and specified required strength.
- E. If the compressive strength tests fail to meet the minimum strength specified in the Plans, the masonry represented by the tests shall be considered deficient.
- F. When tests indicating deficient masonry represent masonry already constructed, such masonry shall be removed and replaced by Contractor without additional cost to the Owner. In lieu of removal and replacement, additional cores may be grouted as required and directed by the Architect without additional cost to the Owner.

1.15 MASONRY INSPECTION

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- A. Provide masonry construction inspection of concrete or brick masonry walls indicated as requiring inspection on the Masonry Plans to insure that masonry construction is in conformance with the Contract Documents. Masonry inspection is required for those masonry elements which must be constructed to attain high design strengths.
- B. Qualification of Inspection Agency: Refer to Section 014510 - TESTING LABORATORY SERVICE. Individual inspector shall be certified as a masonry construction inspector by the National Concrete Masonry Association or by a qualified state Masonry Institute or Association.
- C. The individual or individuals who will perform the masonry inspection shall be present for the Premasonry Conference.
- D. The masonry inspector shall prepare a written report or reports for each day of inspection.
- E. The masonry inspector shall be present at the project site within sufficient time, in advance of grouting operations, to inspect the construction to insure its conformance to the Contract Documents and that grouting may proceed. No grouting shall be permitted unless the masonry inspector is present and has indicated that the masonry construction is properly prepared for the grouting operation.

1.16 WELDING QUALITY CONTROL

- A. Welding operators shall be qualified under the provisions of the AWS Structural Welding Code on test pieces in positions and with clearances equivalent to those actually to be encountered in construction. Welders shall make only those types of welds for which they are specifically WABO certified.
- B. All welds shall be visually inspected unless special testing is specified on the drawings.
 - 1. Welds indicated as requiring visual inspection shall be visually inspected by an independent inspector, acceptable to the Architect, prequalified to make the weld being inspected. Welders and inspectors shall be prequalified by the American Welding Society Qualification Test.
- C. Contractor performing the welding requiring visual inspection shall coordinate with an independent testing service, acceptable to the Architect to perform weld testing.
- D. Submit written reports for each weld tested. Provide project identification and number, date of report, name of Welding Contractor, name of testing service, location of weld, type of weld, and test results. Indicate whether or not weld is acceptable for intended use.
- E. If by inspection welds fail to meet minimum acceptable criteria, the welds shall be cut out and replaced at no additional cost to the Owner.

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- F. All shear stud connectors shall be inspected per AWS D1.1 prior to concrete placement.
- G. All deck welds shall be inspected prior to concrete placement.

1.17 BOLTED STRUCTURAL CONNECTIONS QUALITY CONTROL

- A. Contractor shall cooperate with an independent testing laboratory, to perform field quality control inspection of slip-critical and snug-tight bolted connections.
- B. Inspection of A325 and A490 bolted connections shall be performed in accordance with the standards set forth in AISC manual current edition. The inspector shall be present at the beginning of steel erection to insure that the erector is conforming to the Contract Documents and AISC Specifications. Compliance with requirements set forth in the Contract Documents and AISC manual must be attained. Any connections which, in the opinion of the inspector, do not meet the tightening requirements of the Contract Documents and AISC manual shall be corrected by the erector at no additional cost to the Owner.

1.18 STRUCTURAL STEEL ALIGNMENT QUALITY CONTROL

- A. Contractor shall cooperate with an independent surveying company, to perform field measurement of structural steel beams, columns, joist, and deck alignment.
- B. Alignment shall be measured and compared to AISC "Code of Standard Practice for Steel Buildings and Bridges".
- C. The Surveying Agency shall submit, to the Architect, a written report summarizing the measurements performed and the equipment used in the field work. Where alignment fails to meet AISC requirements, Contractor shall make the required corrections at no additional cost to the Owner.

1.19 APPLIED FIREPROOFING QUALITY CONTROL

- A. Contractor shall cooperate with a qualified testing laboratory to perform field quality control testing of applied fireproofing.
- B. Testing Services: Perform a substrate inspection prior to the application of sprayed fire resistive materials. Testing and inspecting of completed applications of sprayed fire resistive material shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of sprayed fire resistive material for the next area until test results for previously completed applications of sprayed fire resistive material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire resistance design.
 - 1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000 square feet area, or partial area, on each floor, from the average of 4 measurements from a 144 square inch sample area, with sample width of not less than 6 inches per ASTM E605.

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2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E605.
 3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E605 or AWCI Technical Manual 12A, Section 5.4.5, "Displacement Method."
 4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000 square feet area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E736.
 5. If testing finds applications of sprayed fire resistive material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
- C. Remove and replace applications of sprayed fire resistive material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.
- D. Apply additional sprayed fire resistive material per manufacturers written instructions where test results indicate that thickness does not comply with specified requirements.

1.20 PAINTING QUALITY CONTROL

- A. Contractor shall cooperate with a separate testing laboratory to perform field quality control testing of painted finishes.
- B. Wet Film Thickness
1. Wet film thickness shall be tested at the rate of one reading per 1000 square feet of painted surface. Ten random locations for readings will be chosen throughout building.
 2. Wet film thickness shall be as specified in Section 099100 – PAINTS and 099113 – EXTERIOR PAINTING; or if not specified, as specifically recommended by the paint manufacturer for the type of substrate, type of paint and system used, and application methods and coverage requirements.
 3. Testing Instrument
 - a. Wet Film Thickness Gage, KTA-Tator, Inc., Pittsburgh, PA.

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C. Dry Film Thickness

1. Dry film thickness shall be tested at the rate of 5 readings per 100 square feet of painted surface. Twenty random locations for readings will be chosen throughout the building.
2. Average of all readings for a given area or surface are to be within the dry film thickness range specified in 099100 – PAINTS and 099113 – EXTERIOR PAINTING; or if not specified, as specifically recommended by the paint manufacturer for the type of substrate, type of paint and system used, and application methods and coverage requirements. No individual reading should be more than 20 percent below the specified dry film thickness.
3. Testing instruments; shall be destructive or nondestructive type applicable for the type of substrate the coating is applied to. The following lists acceptable types of testing instruments:
 - a. Type I, (Magnetic Pull-Off) Dry Film Thickness Gage, KTA-Tator, Inc., Pittsburgh, PA.
 - b. Fixed Probe Dry Film Thickness Gage - Elcometer 345 Basic, KTA-Tator, Inc., Pittsburgh, PA.
 - c. Fixed Probe Dry Film Thickness Gage - Elcometer 345 Top, KTA-Tator, Inc., Pittsburgh, PA.
 - d. Fixed Probe Dry Film Thickness Gage - Elcometer 300F-P2, KTA-Tator, Inc., Pittsburgh, PA.
 - e. Type II - Fixed Probe Dry Film Thickness Gage - Minitest 200F, KTA-Tator, Inc., Pittsburgh, PA.
 - f. Fixed Probe Dry Film Thickness Gage - Positector 6000-F1, KTA-Tator, Inc., Pittsburgh, PA.
 - g. Fixed Probe Dry Film Thickness Gage - Positector 6000-F3, KTA-Tator, Inc., Pittsburgh, PA.
 - h. Fixed Probe Dry Film Thickness Gage - Quanix 2200, KTA-Tator, Inc., Pittsburgh, PA.
 - i. Fixed Probe Dry Film Thickness Gage - Quanix 2300, KTA-Tator, Inc., Pittsburgh, PA.
 - j. Destructive Dry Film Thickness - Tooke Gage, KTA-Tator, Inc., Pittsburgh, PA.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

TULALIP, WASHINGTON

3.01 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking, and similar services performed on Work, repair damaged Work and restore substrates and finishes to eliminate deficiencies including defects in visual qualities of exposed finishes. Except as otherwise indicated, comply with requirements of Contract Documents for "CUTTING AND PATCHING." Protect Work exposed by or for service activities and protect repaired Work. Repair and protection is Contractor's responsibility, regardless of assignment of responsibility for inspection, testing, or similar service.

END OF SECTION 014500