SECTION 01 4529

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Provide inspections, tests, and other services specified in individual specification sections and building code, including testing required by code.
- B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Where terms "Laboratory", "Inspector", "Inspection", "Inspection Laboratory", "Laboratory" or "Testing Laboratory" are used, they mean and refer to officially designated and accredited testing laboratory.
- D. Provide testing laboratory with one set of Contract Documents and relevant approved submittals.

1.2 REQUIREMENTS

- A. The Owner reserves the right, at his sole discretion, to select and pay for the services of an Independent Testing Laboratory (ITL) to perform specified services and testing as may be in the Owner's best interest.
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its services.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- B. Contractor shall be responsible for paying for costs of Owner's ITL if its testing determines that the Contractor's Work does not comply with design or code requirements. Contractor shall also be responsible for costs to replace Work that is not in compliance.

1.3 QUALITY ASSURANCE

- A. Laboratory shall be prequalified complying with applicable provisions of ACIL Ref. 1 and requirements of local, state, and federal authorities having jurisdiction. Qualifications of laboratories shall be based on industry standards established for the particular work and materials requiring testing or inspection, including but not limited to the following:
 - 1. ASTM C 1077.
 - 2. ASTM D 3666.
 - 3. ASTM D 3740.
 - 4. ASTM E 329.
 - 5. ASTM E 543.

1.4 LABORATORY DUTIES

- A. Cooperate with Contractor; provide qualified personnel promptly on notice.
- B. Acquaint Owner, Contractor, Architect, and Contractor's superintendent with testing procedures and with all special conditions encountered at the site.
- C. Inspections, sampling, and testing of materials and construction methods shall be as specified in

individual technical specification sections.

- 1. Comply with specified standards, ASTM, ANSI, and other recognized authorities.
- 2. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations therefrom.
- 3. Obtain Contractor's written acknowledgment of each inspection, sampling, and test made.
- D. Promptly notify Contractor, Architect and Contractor of irregularities or deficiencies of Work or Products which are observed during performance of services.
- E. After each inspection and test, ITL shall promptly submit ITL Reports as follows:
 - 1. To Owner: 1 copy.
 - 2. To Contractor: 2 copies.
 - 3. To Architect: 1 copy.
 - 4. To Structural Engineer: 1 copy.
 - 5. To General Contractor: 2 copies.
 - 6. To Contractor: 1 copy.
 - 7. To Reviewing Engineer: 1 copy.
- F. ITL reports shall indicate by notation (★) alongside each inspection and test which do not comply with Contract Documents.
- G. Each ITL report shall include but not be limited to the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Testing laboratory name, address, and telephone number.
 - 4. Name and signature of laboratory inspector.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of test.
 - 8. Identification of Product and Specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test.
 - 11. Results of tests and compliance with Contract Documents.
 - 12. Interpretation of test results, when requested by Contractor and Architect.
 - 13. Observations regarding compliance with Contract Documents.
- H. Perform properly authorized additional services as required by the Contractor and Architect.

1.5 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work, except as specifically authorized by the specifications.
 - 3. Perform any duties of the Contractor.
- 1.6 CONTRACTOR'S RESPONSIBILITIES
 - A. Cooperate with laboratory personnel, provide access to Work, and to Manufacturer's operations.
 - 1. Monitor each inspection, sampling, and test.
 - 2. Provide Laboratory or Agency with written acknowledgment of each inspection, sampling,

and test.

- 3. Within 24 hours notify Contractor in writing of reasons for not acknowledging Laboratory results.
- B. Secure and deliver to the Laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the Laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Furnish copies of Product test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the Product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- F. Furnish verification of materials and equipment compliance with Contract Documents.
- G. Identify materials to be tested or inspected by Testing Laboratory or Agency.
- H. After determination of need for testing or inspecting by Owner, notify Laboratory sufficiently in advance, minimum five days, of operations to allow for its assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- I. Make arrangements with laboratory and pay for additional samples and tests required:
 - 1. For the Contractor's convenience; or
 - 2. When initial tests indicate Work does not comply with Contract Documents.

1.7 CONDUCT OF INSPECTIONS AND TESTS

- A. The Contractor shall notify the Contractor and Testing Laboratory in sufficient time before the performance of work to permit the proper conduct of Owner-authorized inspections and tests.
- B. Representatives of Testing Laboratory shall inspect the manufacture, assembly, and placement of materials as required and as authorized by the Owner, and shall report their findings to the Contractor, and Contractor.
- C. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection when such defect is discovered nor shall it obligate the Contractor to accept such work.

1.8 TESTING EQUIPMENT

- A. All testing machines and measuring devices which require calibration shall be calibrated initially and at intervals not exceeding six months (except as authorized in writing); using reference standards readily traceable to the National Bureau of Standards or other standards specifically approved in writing; to accuracy limits and criteria approved by the Architect or Contractor.
- B. Calibration:

- 1. All calibration shall be performed by or under the direct supervision of the ITL manager, using in-house Qualified or Certified Metrology Personnel; in strict accordance with established Quality Assurance Procedures.
- 2. All required calibration equipment and reference standards shall be the property of the Home Office of the ITL and shall be verified for accuracy and traceability prior to and subsequent to calibration service period.
- 3. Should any calibration equipment experience damage in transit, or for any reason fail to conform to specified accuracy requirements during verification of accuracy checks subsequent to on-site testing, any and all such equipment shall be repaired or replaced, as necessary so as to comply with effective Quality Assurance requirements and all affected on-site equipment shall be recalibrated immediately.
- C. Failure of Equipment:
 - 1. If on-site testing apparatus fails to reflect compliance with acceptable limits of accuracy during any calibration period, equipment shall be repaired or replaced.
 - 2. Equipment failure shall be brought to the immediate attention of Architect, in writing.

1.9 SCOPE OF TESTING

- A. General: The following is a general listing of testing which may be required, and represents the minimum testing required. Refer to technical sections for particular testing required for different portions of the Work.
- B. Earthwork And Backfilling:
 - 1. General: ITL shall perform inspections and testing of earthwork in accordance with this Section and as required to certify that materials and installation are in compliance with Contract Documents.
 - 2. Reference Standards:
 - a. ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - b. ASTM D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - c. ASTM D2167 Test Method for Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
 - d. ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - e. ASTM D2937 Test Method for Density of Soil in Place by the Drive-Cylinder Method.
 - f. ASTM D3017 Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - g. ASTM D4253 Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - h. ASTM D4254 Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - i. ASTM D4564 Test Method for Density of Soil in Place by the Sleeve Method.
 - 3. Samples: Secure 60-lbs. of each type of fill material for ITL to perform compaction testing in laboratory.
 - 4. Backfilling and Compaction:
 - a. Before placement, type and quality of fill material shall be selected and tested for compliance with requirements of Soils Report.
 - b. Compaction Testing: Prior to placement of fill, perform one compaction test of each type of fill material in accordance with ASTM D698.
 - 5. Density Testing:

- Perform density testing of in-place fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, ASTM D2937, ASTM D3017, ASTM D4253, ASTM D4254, or ASTM D4564.
- b. General Fill Areas Below Footing Bearing: One density test per lift per 2,500 sq. ft., if required by not less than three tests at each footing location.
- c. Trench Excavations for Foundations: One density test per lift at 50 feet on center maximum, but not less than three tests.
- d. Under Paved Areas and Building Slab: In each compacted fill layer, one field density test required for every 100 c.y., but not less than three tests.
- e. Foundation Wall Backfill: One field density test per lift at 50 feet on center, but not less than two tests per lift in any one area.
- 6. Retesting: Test failures shall be retested at Contractor's expense.
- 7. ITL Reports: Shall be complete as specified elsewhere in this section and include the following information:
 - a. Exact location and elevation of test.
 - b. Type of backfill.
 - c. Reference compaction curve.
 - d. Type of compaction equipment used.
 - e. When compaction was performed.
 - f. Moisture content, dry density, percent of maximum dry density.
 - g. Weather conditions, number of passes required by compaction equipment.
 - h. Statement certifying that materials and installation comply with Soils Report, Contract Documents and applicable specification sections.
- C. Concrete Work:
 - 1. The ITL shall test the concrete and reinforcement rebar in accordance with the procedures indicated in this section and specific code requirements and regulations as needed for it to certify to the Owner that the materials meet the requirements of Contract Documents.
 - 2. In a similar way, the ITL shall issue the rules and requirements and procedures for the inspection of the handling and pouring of the concrete and rebar, in a manner that the Contractor will be able to verify that those rules and requirements are being met and that the placement of the materials meet the Contract Documents.
 - 3. Reference Standards:
 - a. ACI 318 Building Code Requirements for Reinforced Concrete.
 - b. ASTM C31 Practice for Making and Curing Concrete Test Specimens in the Field.
 - c. ASTM C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - d. ASTM C42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - e. ASTM C143 Test Method for Slump of Hydraulic Cement Concrete.
 - f. ASTM C172 Practice for Sampling Freshly Mixed Concrete.
 - g. ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 4. Mix Design:
 - a. Check Contractor's mix design and maintain control of concrete mix designs in accordance with the "Design and Control of Concrete Mixtures" engineering bulletin published by Portland Cement Association for each strength of concrete required for this Project.
 - b. Contractor shall immediately notify the ITL, Owner's Representative, Contractor and Architect if, at any time during construction the concrete resulting from the approved mix design proves to be unsatisfactory for any reason, such as, too much water, lack of sufficient plasticity to prevent segregation, honeycomb, or other defects; or insufficient strength.
 - c. Contractor shall modify the design, subject to approval, until a satisfactory concrete is

obtained.

- 5. Batch Weights:
 - a. Check batch weights of cement, and coarse and fine aggregates.
 - b. Inspect the batch plant including inspection of the batching, mixing and the discharge facilities.
 - c. Inspect the batching operations as required to verify uniformity and quality in the production of concrete.
 - 1). Sample the materials batched and check mix proportions.
- 6. Admixtures:
 - a. Check quantity and type of admixture used for compliance with design requirements.
 - b. Architect shall approve the use of all admixtures proposed for concrete which will remain exposed to weather, and remain exposed to view in the completed building.
- 7. Scales:
 - a. Check at intervals necessary to ensure accurate weighing of materials used in concrete work.
- 8. Sampling and Testing:
 - a. Sample and test all structural concrete and floor slab concrete in accordance with ASTM C172.
 - b. Samples shall consist of four cylinders; one for 7-day test; two for 28-day test; one to hold on reserve for later testing.
 - 1). Compression testing shall conform to ASTM C39.
 - c. Take samples from first two placements of each class or type of concrete regardless of amount placed.
 - d. Take at least one sample of each class or type of concrete from each concrete placement each day in accordance with ASTM C31, Section 7.3e.
 - e. Take at least one sample from each 75 cubic yards placed in continuous placement.
 - 1). Conform to ASTM C31.
 - f. Samples shall be taken at point of concrete placement and prepared at Project Site.
 - g. Water Content: Check surface and absorption water content of aggregate and the amount of water added to each batch.
 - h. Slump Tests: Take at same frequency as sampling, and more often as necessary to control the consistency of concrete, in accordance with ASTM C143.
 - i. Air Content Tests: Take at least once a day in accordance with ASTM C231.
 - j. Placement: Verify that concrete is discharged from mixers before mix begins to set and within limit of 1-1/2 hours maximum from time of mixing.
 - k. Concrete Temperature: Shall not exceed 85°F at time of placement.
 - I. Test Cylinders: Obtain cement mill reports for each test cylinder and indicate mill test on compression test reports.
 - 1). Test Cylinders shall remain on Project Site no longer than 24 hours.
 - m. Sample and test all concrete pavement in accordance with ASTM C31 and ASTM C39.
 - n. Samples for concrete pavement shall consist of at least 3 cylinders for each day for each 100 c.y. of concrete or fraction thereof.
 - o. Slump range for concrete pavement shall be 1-1/2" to 3".
- 9. Additional Testing:
 - a. ITL shall make additional tests of in-place concrete when test results indicate the specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect.
 - b. ITL shall conduct tests to determine strength and other characteristics of in-place concrete by compression tests on cored cylinders complying with ASTM C42 or by load testing specified in ACI 318 or other acceptable non-destructive testing methods, as directed.
- 10. Survey of Floor Slab Elevations:
 - a. During construction, survey the top of completed concrete floor slabs to determine that

floor elevations are within tolerances required by Contract Documents.

- b. Complete the surveys of top of poured-in-place concrete floor slabs at each column and at the center of each bay for a minimum of 25% of all concrete floor slabs as follows:
 - 1). After concrete has been poured and with forms in place.
 - 2). After forms have been removed and the concrete slab has been reshored.
- c. Any deviations observed which exceed the acceptable tolerances shall be reported immediately to the Architect, Owner and structural engineer and shall be documented in the required inspection reports by ITL. See Section 03 3000/"Cast-in-Place Concrete" – 3.6 for acceptable tolerances.
- d. Verify that concrete floor slabs are not being poured if vertical plumbness of columns is not within specified tolerances.
- 11. Static Load Testing:
 - a. Perform static load test and evaluations complying with ACI 318 if results of core testing are unsatisfactory or if core testing is not practical to obtain, as directed by the Architect.
- 12. Concrete Formwork:
 - a. Inspect forms for location, configuration, block outs, camber, shoring ties, seal of form joints and compliance with Contract Documents.
 - b. Verify condition of bond surfaces, locations and sizes of all accessories, embedment items, and anchorage for prevention of displacement may be checked.
 - c. Verify proper use/application of form release agents.
 - d. Inspect form stripping for conformance with requirements of Section 03 3000 CAST-IN-PLACE CONCRETE.
- 13. Concrete Reinforcement:
 - a. Placement of reinforcing steel shall be observed by Contractor before concrete placement.
 - b. Concrete placement shall not proceed until all inspections are complete and approved.
 - c. If reinforcing steel is purchased directly from a United States mill, manufacturer's approved test sheets will suffice.
 - d. If steel is from dealer's stock, perform tension and bending tests on 3 separate samples for each size of bar in every 5 tons of each type of reinforcing steel as specified in the appropriate ASTM Specification.
 - 1). Contractor shall furnish without any cost all material for testing.
 - e. Steel supplier shall certify mill certificate reports.
 - f. Contractor shall submit mill test reports to ITL.
- 14. Core Testing:
 - a. When there is evidence that the strength of the concrete structure in-place does not meet specification requirements, the ITL shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C42 and as follows:
 - 1). Take at least 3 representative cores from each member or area of suspect strength from locations directed by the Architect.
 - 2). Test cores in a saturated-surface-dry condition per ACI 318 if the concrete will be wet during the use of the completed structure.
 - 3). Test cores in an air-dry condition per ACI 318 if the concrete will be dry at all times during the use of the completed structure.
 - 4). Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85% and no single core is less than 75% of the 28-day required compressive strength.
 - b. Core holes shall be filled solid with non-shrinking mortar and finished to match adjacent concrete surfaces.
- 15. ITL Reports: Shall be complete as specified elsewhere in this section and include the following information:
 - a. Results of slump testing.
 - b. Quality and strength of all concrete.

- c. Location and results of core testing.
- d. Results of all requirements specified in this section.
- e. Report exact mix tested, minimum size aggregate, location of pour in the Project, cylinder identification, date of receipt of cylinder in laboratory, slump data, cement brand and type, admixtures used, dates and records of test cylinders, air content, names of inspectors and laboratory personnel, and evaluation of analysis of cause, in case of test failure and recommendations for remedial action.
- D. Non-Shrink Grout:
 - 1. General: ITL shall test the compressive strength of non-shrink grout to certify compliance with the Contract Documents"
 - a. Test in accordance with CRD-C621-81, Corp of Engineers "Specification for Non-Shrink Grout".
- E. Structural Steel:
 - 1. General:
 - a. The Contractor shall perform inspections and the ITL shall perform testing of structural steel work in accordance with this section and as required to certify materials and installation are in compliance with Contract Documents.
 - b. Contractor shall notify the ITL at least two weeks in advance of the mill and shop schedules before the start of any qualification testing or welding.
 - c. Corrective measures, including additional and more complete testing, which may result from these tests, shall be by the Contractor, at Contractor's expense.
 - d. Contractor shall furnish the ITL with the following:
 - 1). Complete set of approved shop, erection drawings and modifications.
 - 2). Mill test reports.
 - 3). Information as to time and place of all rollings and shipment of materials to shop.
 - 4). Proper facilities, including scaffolding, temporary work platforms, adequate access to all structural members, etc. for inspection and testing of the work in the shop and field.
 - 5). Representative sample pieces requested for testing.
 - 6). Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector may refer back to the person making the connection.
 - e. Review reports of inspections performed by Contractor's Testing Agency.
 - f. Testing of Structural Steel: Shall be performed in United States.
 - 2. Reference Standards:
 - a. ASTM A325 High-Strength Bolts for Structural Steel Joints.
 - b. ASTM A490 Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
 - c. ASTM E94 Guide for Radiographic Testing.
 - d. ASTM E142 Method for Controlling Quality of Radiographic Testing.
 - e. ASTM E164 Practice for Ultrasonic Contact Examination of Weldments.
 - f. ASTM E165 Test Method for Liquid Penetrant Examination.
 - g. ASTM E709 Guide for Magnetic Particle Examination.
 - h. ASTM F959 Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 - i. AWS D1.1 Structural Welding Code Steel.
 - 3. Unidentified Steel:
 - a. Structural steel which is not clearly identified by mill shipping statements and certified mill reports shall be tested.
 - b. Contractor shall furnish samples for testing 5% of the unidentified steel.
 - c. Cost of testing materials and cost of testing shall be paid by Contractor.

- d. Contractor shall certify that all bolts are manufactured in the United States.
- 4. Plant Inspection:
 - a. ITL shall inspect structural steel at the plant before shipment as well as during erection.
 - b. Architect reserves the right to reject any material at any time before final acceptance which does not conform to all of the requirements of the Contract Documents.
- 5. Structural Steel Shop Inspection:
 - a. Visually inspect all structural steel elements and components during fabrication.
 - b. Inspect and test shop welds in accordance with requirements for welding specified in this section.
 - c. Check shapes, sizes, classes, and types of steel, high strength and unfinished threaded fasteners and testing and welding materials.
 - d. Verify and report all special corrections performed by the fabricator on fabricator's own initiative.
 - e. Inspect bolted connections in accordance with Division 5 Sections.
 - f. Review reports of inspections performed by the Contractor's testing agency.
 - g. Measure beam cambers at random on 10% of beams; compare design camber.
- 6. Structural Steel Field Inspection and Testing:
 - a. Verify locations and anchorages, inserts and adjustments.
 - b. Visually inspect erection of all structural steel components.
 - c. Inspect and test all field welding including welded studs in accordance with requirements specified in this section.
 - d. Inspect and test all field-bolted connections in accordance with Division 5 Sections and the following:
 - 1). Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."
 - e. Inspect and verify plumbness and tolerances of structural frame for compliance with AISC "Code of Standard Practice".
 - f. Verify and report all special corrections performed by the fabricator on fabricator's own initiative.
 - g. Measure beam cambers at random on 5% of beams; compare design camber.
- 7. Welding Requirements:
 - a. Review all field and shop welding procedures for compliance with AWS specifications.
 - b. Review all shop and field welder certifications.
 - c. Visually inspect all welded connections.
 - d. In addition to visual inspection, shop-welded connections shall be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1). Liquid Penetrant Inspection: ASTM E165.
 - 2). Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld.
 - a). Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3). Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."
 - 4). Ultrasonic Inspection: ASTM E164.
 - e. Perform magnetic particle testing in accordance with ASTM E709 and at the discretion of Testing Agency for all questionable welds.
 - f. Ultrasonically test 100% of all complete penetration welds in accordance with AWS D1.1 Section 6 by ANST Level II technicians (American Society of Non-Destructive Testing).
 - g. Ultrasonically test 100% of all partial-penetration column splice welds.
 1). Ultrasonic test may ignore defects in first 1/8" of root pass.
 - Review field plug weld certification procedure and welders for this procedure.
- 8. Bolting Requirements: Refer to Division 5 Sections.
- 9. ITL Reports: Shall be complete as specified elsewhere in this section and include the

following information:

- a. Adequate description of each weld tested, the identifying mark of the welder responsible for the weld, a critique of any defects noted by visual inspection or testing and a statement regarding the acceptability of the weld tested, as judged by current AWS standards.
- b. Survey readings of all columns.
- c. Statement indicating final approval of welded and bolted connections.
- d. Statement indicting that materials and installation comply with Contract Documents and specifications applicable to this work.
- F. Steel Decking:

5.

- 1. General: The Contractor shall perform continuous inspections of metal deck work in accordance with this section and as required to certify materials and installation are in compliance with the Contract Document.
- 2. Provide visual inspection of 100% of welding of the metal deck in accordance with AWS D1.1.
- 3. Closures and Accessories: Verify attachment and location.
- 4. Welding Inspection: In addition to the required welder qualifications, prior to each welder starting work on the job and periodically as the Inspector determines, each welder shall perform a weld test to demonstrate to the Inspector the welder's ability to produce a satisfactory weld. The weld test shall be as follows:
 - a. Weld at least two samples of deck material to a base steel section simulating the framing with one weld each sample.
 - 1). Twist the deck sample with respect to the base until failure occurs.
 - 2). If the decking tears or if the weld on shearing in torsion show the proper fusion area, the welds are satisfactory.
 - b. Questionable welding of the permanent decking may be checked by the Inspector by suitable means including ultrasonic methods if applicable.
 - Stud Connectors: Inspect headed stud connectors as follows:
 - a. Inspect all studs visually.
 - 1). Studs which do not show full fusion or studs which do not show full 360° fillet shall be bent 15°.
 - 2). If no fracture occurs, stud is considered acceptable and left bent.
 - 3). If fracture occurs, stud shall be replaced.
 - b. In addition to the above, test not less than one of each 20 studs by bending 15°.
 - 1). If no fracture occurs, stud is considered acceptable and left bent.
 - 2). If fracture occurs, stud shall be replaced and adjacent studs tested.
- 6. ITL Reports: Shall be complete as specified in this section and include the following information:
 - a. Types and locations of defects found during inspections.
 - b. Recommendations for correcting the defective work.
 - c. Statement indicating final approval of all welded connections.
 - d. Statement certifying that materials and installation comply with Contract Documents and specification sections for this work.
- G. Miscellaneous Metals And Stairs:
 - 1. General: The Contractor shall perform inspections of miscellaneous metal and stairs work in accordance with this section and as required to certify materials and installation are in compliance with Contract Documents.
 - 2. Miscellaneous Welding:
 - a. Visually inspect welding of miscellaneous steel members, angles and attachments including the work for steel stairs.
 - b. Verify that fit-up, joint preparation, length and location of welds conform to requirements

of the Technical Specifications and that welds are not omitted.

- c. Check all welds of support members, angles and other steel attachments or anchors for work which requires welded connections.
- 3. ITL Reports: Shall be complete as specified elsewhere in this section and include the following information:
 - a. Adequate description of each weld tested, the identifying mark of the welder responsible for the weld, a critique of any defects noted by visual inspection or testing and a statement regarding the acceptability of the weld tested, as judged by current AWS standards.
 - b. Survey readings of all columns.
 - c. Statement indicating final approval of welded and bolted connections.
 - d. Statement indicating that materials and installation comply with Contract Documents and specifications applicable to this work.'
- H. Powder-Driven Anchors:
 - 1. The Contractor shall verify procedures used for installation of all concrete anchors and monitor installation for compliance with manufacturer's recommendations.
- I. Roofing:
 - 1. General: The Contractor shall perform continuous inspection of roofing work in accordance with this section and as required to certify materials and installation are in compliance with Contract Documents.
 - 2. During Installation of Roofing System: Verify the following:
 - a. Preparation of the roof substrate.
 - b. Application of the roofing membrane.
 - c. Installation of protection board.
 - d. Installation of insulation.
 - e. Flashing and counterflashing.
 - f. Scuppers and roof drains.
 - g. Installation of interlocking pavers.
 - h. Cant strips and blocking.
 - i. Curbs and flashing at all roof penetrations, including skylights.
 - j. Thru-wall flashing at parapets.
 - k. Installation of retaining bars.
 - I. Sealants.
 - 3. ITL Reports: Shall be complete as specified elsewhere in this section and include the following:
 - a. Date and time of sampling or inspection.
 - b. Record of temperature and weather conditions.
 - c. Identification of material or product and specification section.
 - d. Location of inspection or testing in the project.
 - e. Type of inspection or test.
 - f. Deviations from manufacturer's recommendations and Contract Documents.
 - g. Problems encountered and corrective measures to be taken.
 - h. Progress of the work.
 - i. Diagrams or sketches which may better explain the conditions observed or problems encountered than narratives.
- J. Glazed Curtain Wall:
 - 1. General: The Contractor shall perform inspections and the ITL shall perform testing of curtain wall work in accordance with this section and as required to certify materials and installation

are in compliance with Contract Documents.

- 2. The step by step procedures required for ITL services shall be coordinated with Curtain Wall Consultant.
- 3. Attachment to the Building: Verify the following:
 - a. Inserts, anchors, welds, clip angles, bolts, nuts, washers, lock washers, shims and slip shims.
 - b. Fixed dead load anchors, expansion wind load anchors.
 - c. Protective coating, separators or tape between dissimilar metals or materials.
- 4. Fabrication of Metal Curtain Wall Components: Verify the following:
 - a. Proper length, size, thickness, notching and spacing of prefabricated pieces.
 - b. Baffles, filters and weep size and location.
 - c. Splice plates and joints including provision for horizontal and vertical expansion.
 - d. Color and match of various extrusions.
- 5. Assembly, Sealing and Erection of Components: Verify the following:
 - a. End dam seals at end of horizontals and verticals.
 - b. Head and sill castings or extrusions, including attachment of horizontals to verticals.
 - c. Weather strips and weather seals.
 - d. Proper cleaning solvents and primers for sealants as required by sealant manufacturer.
 - e. Seal fasteners.
 - f. Backer rod and bond breaker tape in places where required.
 - g. Alignment and squareness.
 - h. Proper installation of fire safing.
- 6. Glass and Glazing: Verify the following:
 - a. All glazing pockets which must be free of dust, dirt and construction debris prior to glazing.
 - b. Size, thickness, bite and edge clearance of glass.
 - c. Setting blocks, glass supports, chairs and gaskets.
 - d. Insulation and tape vapor barrier seals at spandrel glass.
 - e. Glass edges and surfaces for damage.
- 7. Final Inspection and Report:
 - a. When the installation of the glazed curtain wall is completed, perform a final inspection to verify that all components have been properly installed and that all punch list items have been properly installed and corrected.
 - b. Submit a final report to the Owner summarizing the conformance to Contract Documents, the general quality of the completed work and note any potential maintenance problems.
- K. Acoustical Ceilings:
 - 1. General: The Contractor shall perform inspections and the ITL shall perform testing of acoustical ceiling suspension system in accordance with this section and as required to certify materials and installation are in compliance with Contract Documents.
 - 2. Inspections shall include, but not be limited to, the following:
 - a. Extent and Testing Frequency: Testing shall take place in successive stages in areas of extent described below.
 - b. Do not proceed with installation of acoustical panel ceilings until test results for previously installed hangers show compliance with requirements.
 - c. Extent of Each Test Area: When the installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - d. Within each test area, ITL shall select 1 of every 10 powder-actuated fasteners and postinstalled anchors used to attach hangers to concrete and shall test them for 200 lbf of tension.
 - 1). ITL shall also select 1 of every 2 postinstalled anchors used to attach bracing wires to concrete and shall test them for 440 lbf of tension.

- e. When testing discovers fasteners and anchors that do not comply with requirements, ITL shall test those anchors not previously tested until 20 consecutively pass, and then shall resume initial testing frequency.
- f. ITL shall report test results promptly and in writing to Contractor and Architect.
- g. Remove and replace those fasteners and anchors that test results indicate do not comply with requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.1 REPAIR AND PROTECTION
 - A. Protect construction exposed by testing service activities.
 - B. Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction.

END OF SECTION

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