

SECTION 01 4519

AIR BARRIER QUALITY CONTROL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air.
 - 1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the building enclosure are called "the air barrier system". Services include coordination between the trades, the proper scheduling and sequencing of the work, preconstruction meetings, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
 - 2. The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of the conditioned and semi-conditioned space is achieved. The air barrier system shall have the following characteristics:
 - a. It must be continuous, with all joints sealed.
 - b. It must be structurally supported to withstand positive and negative air pressures applied to the building enclosure.
 - c. Connection shall be made between:
 - 1) Foundation and walls.
 - 2) Walls and windows or doors.
 - 3) Different wall systems.
 - 4) Wall and roof.
 - 5) Wall and floor over unconditioned space.
 - 6) Walls and floors between conditioned and semi-conditioned or unconditioned space

- 7) Walls, floor and roof across construction, control and expansion joints.
 - 8) Walls, floors and roof to utility, pipe and duct penetrations.
 3. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be made air-tight.
- B. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- C. Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure, customized fabrication and installation procedures, not production of standard products.
 1. Continuity of the air barrier materials and products with joints to provide assemblies. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.
 2. Specific quality-control requirements for individual construction activities are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products. It is the Contractor's responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section.
 3. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
 4. Requirements for Contractor to provide an airtight building enclosure is not limited by quality-control services required by Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.4 RELATED SECTIONS

- A. The requirements of this section apply to all materials, systems, and assemblies that integrate and make up the complete and continuous air barrier system for the building enclosure. These are specified in related sections of this manual and include but are not limited to:
 1. 07 2713 Modified Bituminous Sheet Air Barriers
 2. 07 5323 EDPM Roofing
 3. 07 6200 Sheet Metal Flashing and Trim
 4. 07 7200 Roof Accessories
 5. 07 8413 Penetration Firestopping
 6. 08 1113 Hollow Metal Doors and Frames
 7. 08 4413 Glazed Aluminum Curtain Walls
 8. 08 8000 Glazing

1.5 RESPONSIBILITIES

- A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials and assemblies of materials and products, from substructure to walls to roof. Provide quality assurance procedures, testing and verification as specified herein. Facilitate inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are included in the Contract Sum.
1. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
 2. Provide coordination drawings of all the joints and junctures between the different trades, products and systems that make up the enclosure of the conditioned or semi-conditioned and unconditioned space in the building.
 3. Build a mock-up before proceeding with the work, satisfactory to the Architect, of each air-tight joint type, juncture, and transition between products, materials and assemblies.
- B. Associated Services: Cooperate with agencies performing commissioning, required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
1. Provide access to the Work.
 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 4. Deliver samples to testing laboratories.
 5. Provide security and protection of samples and test equipment at the Project Site.
- C. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.6 PERFORMANCE REQUIREMENTS

- A. Compliance Requirements:
1. Materials: materials used for the air barrier system in the opaque envelope shall have an air permeance not to exceed 0.004 cfm/ft² under a pressure differential

of 0.3 in. water (1.57psf) (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178. And,

2. Assemblies of materials and components: shall have an air permeance not to exceed 0.04 cfm/ ft² under a pressure differential of 0.3 in. water (1.57psf) (0.15 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2357. And,
3. The entire building: The air leakage of the entire building shall not exceed 0.05 cfm/ft² under a pressure differential of 0.3 in. water (1.57psf) (0.75 L/s.m2 @ 75 Pa) when tested according to the US Army Corps of Engineers test protocol and ASTM E 779.

1.7 SUBMITTALS

- A. The Contractor shall provide evidence of meeting the material and assembly performance requirements above. The Contractor shall engage a testing agency to test the whole building with completed air barrier to meet the performance requirements specified herein, and other substantiation testing required. The independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect through the Contractor.
 1. Submit for approval the qualifications and experience of the testing entity showing the experience of the agency in performing the required tests on similar large buildings.
 2. Submit for approval a test protocol specific to the project following the US Army Corps of Engineers (USACE) test protocol for testing large buildings; the protocol shall describe the preparation of the building for testing.
 3. Submit for approval a diagram tracing continuity of the air barrier in building sections and plans, providing area calculations of the pressure boundary.
 4. Report Data: Provide test reports in accordance with the USACE test protocol requirements.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.2 TESTING AND INSPECTION

- A. The Owner will engage the services of a commissioning agency to provide occasional observation and inspection during installation of the air barrier system and to witness required testing by the Contractor. The commissioning agency will provide the following listed services:
1. Qualitative Inspection:
 - a. Reports of observations, with copies to the Owner, Contractor and Architect.
 - b. Continuity of the air barrier system throughout the building enclosure with no gaps, holes.
 - c. Structural support of the air barrier system to withstand design air pressures.
 - d. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar droppings, with mortar joints struck flush, or as required by the manufacturer of the air barrier material.
 - e. Site conditions for application temperature and dryness of substrates.
 - f. Maximum length of exposure time of materials to ultra-violet deterioration.
 - g. Surfaces are properly primed.
 - h. Laps in material are 2" minimum, shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
 - i. Mastic applied on cut edges.
 - j. Roller has been used to enhance adhesion of sheet applied air barrier membranes.
 - k. Treatment and reinforcement of joints between gypsum sheathing boards.
 - l. Measure application thickness of liquid-applied materials to manufacturer's specifications for the specific substrate.
 - m. Materials used for compatibility.
 - n. Transitions at changes in direction, and structural support at gaps.
 - o. Connections between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
 - p. All penetrations sealed.
 2. Quantitative tests provided by the contractor and witnessed by the Building Enclosure Commissioning Provider:
 - a. Whole building airtightness test in accordance with USACE test protocol and ASTM E779, Determining Airtightness of Buildings Air Leakage Rate by Single Zone Air Pressurization.
 - b. Windows, curtain wall, and polycarbonate panel connections to adjacent opaque assemblies, ASTM E783 and ASTM E 1105
 - c. Bond to substrate, ASTM D4541 adhesion testing.
 - d. Minimum dry or wet film thickness for liquid-applied materials are per the

manufacturer's requirements.

3. Required Substantiation:

- a. Demonstrate performance of the continuous air barrier for the building enclosure by the following tests:
 - a) Test the completed building and demonstrate that the air leakage rate of the building enclosure does not exceed 0.05 cfm/ft² at a pressure differential of 0.3" w.g.(75 Pa) (0.75 L/s*m2 @ 75 Pa), in accordance with ASTM's E 779 (2010) and the USACE protocol. Accomplish tests using either pressurization or depressurization or both. Divide the volume of air flow in cfm @ 0.3" w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft2 @ 0.3" w.g. (L/s*m2 @ 75 Pa). Do not test the building until verifying that the continuous air barrier system has been installed and all known deficiencies have been addressed.
 - b) Test the completed building using Infrared thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. While the building is pressurized/depressurized and non-pressurized. Identify air leakage pathways discovered during infrared thermography and insulation discontinuities. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060. Determine air leakage pathways using ASTM E 1186 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems smoke tracer, and perform corrective work as necessary to eliminate air leakage pathways, irrespective of achieving the whole building air leakage rate specified in (a) above.

END OF SECTION