

SECTION 07200 INJECTED or CAVITY-FILL POLYURETHANE FOAM (IPF)

Specifier Note: This specification is provided as guidelines for your use. Please review before publishing.

PART 1.00 - GENERAL

1.01 DESCRIPTION:

A. Work included: Building insulation required for this Work includes, but is not necessarily limited to: Injected (or cavity-fill) polyurethane foam (IPF) installed in the exterior walls *Specifier Note: (and/or roof, floor, etc.)* as shown on the drawings or as required in the specifications, alternates and/or allowances.

B. Related work and materials described elsewhere: *Specifier Note: Delete sections not used and add any applicable sections not included below.*

1. SECTION 01000: GENERAL REQUIREMENTS
2. SECTION 01400: QUALITY CONTROL SERVICES
3. SECTION 01410: INDOOR AIR QUALITY MANAGEMENT
4. SECTION 01505: CONSTRUCTION WASTE MANAGEMENT
5. SECTION 01740: WARRANTIES AND BONDS
6. SECTION 01800: CUTTING AND PATCHING
7. SECTION 09250: GYPSUM SHEATHING
8. SECTION 06100: ROUGH CARPENTRY
9. SECTION 07102: AIR SEALING
10. SECTION 07210: BUILDING INSULATION
11. SECTION 07210: VAPOR RETARDERS / SLIP SHEETS
12. SECTION 07210: FASTENERS
13. SECTION 07210: TEMPORARY BRACING
14. SECTION 07210: WIRING IN INSULATED WALLS
15. SECTION 07220: AIR BARRIER SYSTEM
16. SECTION 07390: EXTERIOR ENVELOPE MINIMUM PERFORMANCE CRITERIA
17. SECTION 07900: SEALANTS

1.02 ALTERNATES

Specifier Note: Add any applicable alternates.

Specifier Note: Add any applicable references required for this Section and/or remove those that do not apply.

1.03 REFERENCES

A. Reference Standards:

1. American Society for Testing and Materials (ASTM)

2. US Green Building Council – LEED Green Building Rating System, Version 2.0, Minimum Energy Performance Criteria
3. 1990 National Building Code
4. ASHRAE/IESNA- Standard 90.1-1999, Energy Standard for Commercial and High-rise Residential Buildings.

1.04 SCOPE AND CONDITIONS OF THE WORK:

- A. Provide all labor, materials, accessories, services and equipment necessary to complete the work.
- B. Comply with General Conditions, Supplementary General Conditions, any addenda, Division-1 General Requirements, the Drawings, and all other Contract Documents.
- C. Coordinate with other portions of Work, and cooperate with other trades.

1.05 SPECIAL REQUIREMENTS AND REGULATIONS:

- A. Comply with all federal, state and municipal codes, laws and regulations for thermal insulation, air barriers, and vapor retarders.
- B. All materials, products and equipment shall be delivered, handled, stored, fabricated, assembled, installed and operated in accordance with the manufacturer's printed instructions. If any contradiction exists between those instructions and this SECTION of the Contract Documents, the Contractor shall obtain clarification from the Owner or his designated representative before proceeding with the Work.
- C. Contractor or owner shall clear building areas to be injected of debris and materials prior to the commencement of IPF operations.

1.06 SUBMITTALS AND TESTS:

- A. Prior to start of construction, the General Contractor or the Contractor's Agent shall submit to the Architect an IPF system sequencing plan, including quality assurance testing procedures.
- B. Submit warranties, bonds, and service and maintenance contracts as specified in the respective sections of these Specifications.
- C. Requirements: Warranties required related to this work shall include, but shall not be limited to, the following:
 1. Pipe and equipment freeze-ups: *(Five (5))* year guarantee. Thermal envelope components (insulation, vapor retarders, and air barriers systems) shall be provided and installed in such a manner as to guarantee against plumbing and equipment freeze-ups for a period of at least *(5)* years.
 2. Air Barrier: *(Five (5))* year guarantee. This is an air barrier component and shall be provided and installed in such a manner as to guarantee that the building air leakage rates though this portion of the work is less than the performance standard set in **SECTION _____** for a period of at least *(5)* years.
 - a. The Approved Installer shall provide written air-tightness warranty for a minimum of *(five (5))* years against leaks in this component of the

air barrier system, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions. The warrantee must state that all air barrier materials have been installed as specified and are free from defects in manufacturing and installation. The warranty shall commence on date of Owner acceptance.

- b. Installer's Guarantee (Project): Submit three executed copies of full *(five (5))* year "Guarantee(s)" on a form approved by Owner.
- D. Submit two (3) copies of manufacturer's product specifications, product data, and installation instructions for each type of air barrier material or system used.
- E. Submit two (2) copies of manufacturer's MSDS sheet for each type of air barrier material required.
- F. Samples:
 1. Submit samples of IPF materials for approval prior to beginning the work.
 2. Each sample shall be fabricated using the same tools and techniques as required for the actual application.
 3. Provide daily test shots of each type of two-part IPF urethane from each batch for the Architect's approval.
- G. Certified Testing: When required by the contract documents, submit copies of certified test reports showing compliance with specified fill-to-void percentages. Recordings of infrared video tests are acceptable as the basis for this report.
- H. Installer Certification:
 1. The installer shall have a minimum of three years documented experience, demonstrating previously successful work of the type specified herein.

1.07 QUALITY ASSURANCE:

Pre-Construction Conference: Prior to installation, and as soon as possible after the award of the IPF-related sub-contracts, the parties shall meet at the project site. At this meeting, the intent and goals of the IPF insulation system, representative details, and substrate conditions will be reviewed. The requirements of the contract documents, submittals, status of coordinating work, availability of materials, proposed installation sequencing, installation facilities and proposed installation schedule, requirements for inspections, testing, certifications, forecasted weather conditions (when applicable), governing regulations, insurance and warrantee requirements, and proposed installation procedures will also be reviewed. The Contractor shall schedule and attend a meeting with:

1. The IPF sub-contractor;
2. The product manufacturers' representatives (when applicable);
3. Installers of all substrate construction;
4. Architect;
5. Owner, and;
6. Representatives of other entities directly concerned with the performance of the IPF system including all other work adjoining and related to the IPF system.

Discussions will include the following design criteria:

1. Control of ambient and substrate temperatures.
2. Substrate fastening and bracing.
3. Impact of humidity and wetting on substrate material integrity and bonding.

1.08 PROTECTION:

- A. Protection of the premises from damage: Protect against ignition at all times.
- B. Thermal protection of raw materials: Protect from freezing or extreme heat. Maintain chemical components at a minimum of 60 degrees while stored on site.
- C. Fire protection: The code states that the use of completely exposed foamed plastic in interior applications presents a fire hazard unless the foam is protected by one of the code approved 15-minute fire resistive barriers (usually 1/2" sheetrock, lath and plaster, or other approved finish or coating). Code requirements, if any, for unoccupied areas should also be followed. Comply with insurance ratings indicated.
- D. Health and safety: There are odors and vapors related to injected urethanes. While there is no danger from the vapors of this product during installation with adequate ventilation, anyone with respiratory sensitivities should evacuate the premises while the work is being done. Protect areas where ventilation is inadequate with signage and require personnel in the unvented area to wear proper OSHA-approved breathing protection.

PART 2.00 - PRODUCTS

2.01 MANUFACTURER:

Injected polyurethane foam insulation system: FOAM-TECH, division of Building Envelope Solutions, Inc., N. Thetford, VT, (802-333-4333). Note that this material is different from normal spray-applied formulations and is designed to minimize pressure on the cavity walls and assure uniform bonding.

2.02 MATERIALS:

- A. SUPERGREEN FOAM™ (IPF version) as provided by FOAM-TECH or approved equal, with an in-place density of 2.1 to 2.5 lbs. per cubic foot in the exterior walls, ceilings, and floors. Foam product will be a standard polyurethane two-component mix for producing rigid, closed-cell insulation by frothing/pouring in place.
- B. Closed cell content: 90 percent minimum.
- C. Water absorption: 3.0% maximum.
- D. Blowing agent: All products to have a "Zero ozone depletion potential" (ODP) blowing agent.
- E. Surface-burning characteristics: Maximum flame-spread and smoke developed indices of 75 and 450, respectively, based on tests performed on un-faced core by ASTM E-84 test method.
- F. K-value: 0.15 minimum when aged 90 days at 140o F dry heat.

2.03 OTHER MATERIALS:

- A. Vapor retarder/slip sheet shall be 4-mil polyethylene or equal installed in a workmanlike manner. Vapor retarders are required to protect the framing even when the perm rating of the insulation material itself is less than one.
- B. Fasteners for cavity-fill insulation shall be nails or screws approved by the Owner installed at adequate frequency to assure support of the sheathing against pressure generated by the introduction of this material into a closed space.
- C. Temporary bracing shall be required for cavity-fill areas with inadequate fastening or when sheathing materials are damp or wet.
- D. Non-metallic electrical wiring in foamed-in-place sections shall be Type NMB or NMC-B located a minimum of 1" from surface to be drilled.

PART 3.00 EXECUTION

3.01 GENERAL:

- A. Installation shall conform to Approved Manufacturer's printed recommendations and instructions, except as otherwise specified herein or as shown on the drawings.
- B. Cooperate with inspection and quality assurance test procedures.

3.02 EXAMINATION:

- A. Examine substrates and conditions for compliance with requirements of Sections in which substrates and related work are specified and to determine if conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Report in writing, any defects in surfaces or conditions that may adversely affect the performance of products installed under this section to the Architect prior to commencement of work.
- C. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

3.03 PREPARATION:

- A. Clear building cavities to be filled of debris and other materials prior to the commencement of cavity-fill operations. Clean substrates of substances harmful to the insulation, including moisture, dirt, or un-bonded coatings which will effect the insulation or prevent an airtight seal.
- B. Complete all sheathing on both sides of the cavities to be filled. Seal all joints and close off openings to prevent unintended foam leakage. Small penetrations through the building envelope shall be sealed with a low-expansion polyurethane sealant, caulking compound, or other sealant.
- C. Check to insure that both surfaces are securely anchored to all framing members. Gypsum board shall, to the maximum extent feasible, be installed horizontally.
- D. Unless otherwise specified, a vapor retarder/slip sheet is required and shall be a minimum of 4 mil polyethylene or equal installed in a workmanlike manner.

- E. Wiring, conduit, boxes, etc. shall be braced or fastened securely so that expansion of foam sealant shall not cause wiring to "float" or be dislocated by the expansion of the foam.
- F. All window and door jambs and window weight pockets and doors shall be adequately braced, if necessary, to prevent the expanding foam sealant from bowing or springing the jamb or jamb extension.
- G. Fasteners for injected foam insulation shall be securely set with maximum spacing at studs and all sheet edges as follows or as required to avoid unacceptable sheathing distortion:
 - 1. For gypsum board, 8 inches O.C.
 - 2. For plywood or OSB, 12 inches O.C.
 - 3. Temporary bracing shall be required for areas with inadequate fastening or where sheathing is weaker.
- H. Mask areas to be protected from spatter or top-off spillage.

3.04 INSTALLATION:

A. Cavity-fill instructions:

1. Process a two-component urethane foam system with 1:1 ratio by volume, positive-displacement, industry-standard pumping equipment.
2. Monitor and maintain the component ratio and mix the components of the urethane chemicals in accordance with the manufacturer's product specifications and processing instructions to achieve the desired density and physical properties.
3. Chemical components are to be maintained at a minimum of 65 degrees while stored on site.
4. Monitor and maintain the component temperatures in accordance with the manufacturer's product specifications and processing instructions to achieve the desired density and physical properties.
5. The temperature on both sides of the wall must be a minimum of 45 degrees during foaming and for a forty eight (48) hour period after foam has been placed in the wall cavity. If the exterior temperatures are below 45 degrees, the interior temperature must be 70 degrees for a minimum of eight (8) hours prior to injection and forty-eight (48) hours after completion. The outside temperature should not be less than 20 degrees unless the outside is protected by thermal insulation. These temperature protocols apply to SUPERGREEN FOAM™ and will be different for other polyurethane foam injection molding products.
6. During foam operations, the above temperature requirements must be met while providing two (2) air changes per hour for ventilation for installation personnel and other workers in the building. Heat during foaming operations shall be provided by vented or non-open flame sources.
7. Inject the mixed foam through the holes and fill the walls in multiple rises or increments to prevent excess pressure from causing the sheathing to bulge. Sheathing flatness tolerance to be *Specifier Note: insert maximum allowable deviation in the surface. For example + or - 1/8". Note that this tolerance should allow for normal framing tolerances _____* in a nine (3' X 3') square foot area.

8. Trim foam flush with sheathing the surfaces. Remove foam from finished surfaces.

3.05 QUALITY ASSURANCE:

- A. The foam will expand and give off heat when processed. During the installation the installer shall perform and record in-process infrared thermographic quality assurance testing of all wall cavities to locate areas where there are significant voids. Fill all voids to assure a material fill equivalent to at least 99% of the available volume. Submit one VHS copy of the scanning process with a written summary of the QA results.
- B. IPF insulation system shall be installed so that the air leakage across the areas insulated with IPF will not exceed the air barrier compliance limit specified ([Section _____](#)).
- C. Quality assurance testing by prescribed or approved alternate test methods in no way relieves the Contractor of responsibility for any work required to meet the compliance test standard or for compliance with any other Contract Document requirements.

3.05 CLEANING:

- A. Upon completion of the work of this Section, remove tools, equipment, and all rubbish and debris from the work area; leave area in broom-clean condition.
- B. Dispose of debris and scraps in a location designated by the Contractor or Owner.

END OF SECTION 07200 INJECTED URETHANE FOAM INSULATION