SECTION 072700 - AIR BARRIERS

This Section includes various materials and methods used to create building enclosure air seal and to seal spaces between adjacent materials or components forming wall or roof openings. This section is intended to complement other air seal materials or component sections such as concrete, windows, gypsum board, and other sections.

Certain air seal materials can also be used for vapor retarder purposes in high vapor pressure environment when material has acceptable vapor permeance resistance properties.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes air leakage criteria for primary air seal building enclosure materials and assemblies; materials and installation methods supplementing **[other] [primary]** air seal materials and assemblies; and air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.
				2. Related Sections:

Section 072600 - Vapor Retarders: Vapor retarders.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. American Society of Civil Engineers:

ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

* + - * 1. ASTM International:

ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.

* + - * 1. Sealant, Waterproofing and Restoration Institute:

SWRI - Sealant Specification.

* + - 1. DEFINITIONS
				1. Air Barrier: Continuous network of materials and joints providing air tightness, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of single material or combination of materials to achieve performance requirements.
			2. DESIGN REQUIREMENTS

Use this article carefully; restrict statements to identify system design requirements only.

The following standard may be used to assist in determining design wind loads and imposed air pressure loads on building surfaces. Refer to applicable code requirements and coordinate.

* + - * 1. Perform design work in accordance with ASCE 7.
			1. PERFORMANCE REQUIREMENTS

Use this article carefully; restrict statements to identify system performance requirements or function criteria only.

Performance specifying permits air seal product manufacturers latitude to adjust or redesign proprietary systems to achieve specified requirements. Rely on this article for fundamental statements for enclosure air seal system; minimize material and component statements so as not to conflict with performance criteria.

Performance specifying can imply air seal materials will be selected by Contractor (and appropriate Subcontractors). Compatibility with adjacent materials, longevity of performance, degradation caused by elements and ability to perform in conjunction with adjacent materials is concern that must be addressed by designer and contractor.

The following paragraph presents suggested air seal performance criteria. When testing is being considered, refer to AAMA and ASTM test methods, and associated documents for guidance.

The following paragraphs list several ASTM and AAMA test methods which may or may not be appropriate for random testing of air seal; edit for Project requirements.

First paragraph following is for static air pressure testing. Second paragraph following is for dynamic air pressure testing; be cautious with dynamic air testing so not to cause damage to building seals.

* + - * 1. Static Test: Resist air leakage caused by static air pressure across exterior wall assemblies and other interruptions to integrity of building enclosure systems; to maximum air leakage rate of <\_\_\_\_\_\_\_\_> cfm/sq ft when subjected to pressure differential of **[1.57] [6.24]** lb/sq ft when tested in accordance with **[ASTM E283.] [ASTM E330.]** <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>
				2. Dynamic Test: Resist air leakage caused by dynamic air pressure across exterior wall assemblies and other interruptions to integrity of wall and roof systems; to maximum air leakage rate of <\_\_\_\_\_\_\_\_> cfm/sq ft when subjected to pressure differential of **[1.57] [6.24]** lb/sq ft when tested in accordance with **[ASTM E283.] [ASTM E330.]** <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.

In the following paragraph, list sections having direct influence on continuity of building enclosure air seal.

* + - * 1. Provide continuity of air seal materials and assemblies in conjunction with materials described in Section **[033000,] [085113,] [and] <\_\_\_\_\_\_\_\_>.**
			1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Section 013300 - Submittal Procedures: Submittal procedures.
				5. Shop Drawings: Indicate special <\_\_\_\_\_\_\_\_> joint conditions [**and**] <\_\_\_\_\_\_\_\_>.
				6. Design Data: Submit design calculations.
				7. Product Data: Submit data on material characteristics, performance criteria, limitations, [**and**] <\_\_\_\_\_\_\_\_>.
				8. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.
			1. SUSTAINABLE DESIGN SUBMITTALS
				1. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design submittals.
				2. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

Edit material certifications list to suit products specified in this section and Project sustainable design requirements. Specific certificate submittal and supporting data requirements are specified in Section 018113.

Materials Resources Certificates:

Certify recycled material content for recycled content products.

Certify source for regional materials and distance from Project site.

* + - * 1. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

Provide cost data for the following products:

Edit list of material cost data to suit products specified in this section and Project sustainable design requirements. Specific cost data requirements are specified in Section 018113.

Products with recycled material content.

Regional products.

<\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>

* + - 1. QUALITY ASSURANCE

Use this article to specify compliance with overall reference standards affecting all products and installation included in this section.

Identify reference document recognizable to industry, appropriate to materials specified.

* + - * 1. Perform Work in accordance with **[SWRI - Sealant and Caulking Guide Specification] <\_\_\_\_\_\_\_\_>** requirements for **[materials] [and] [installation].**
				2. Perform Work in accordance with **[[State] [Municipality] of <\_\_\_\_\_\_\_\_> [Highways] [Public Work's] standard.]**

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain **[one copy] [<\_\_\_\_\_\_\_\_> copies]** of **[each]** document on site.
			1. BENCHMARK

Use this article for full sized erected assemblies required for review of construction, coordination of work of several sections, testing, or observation of operation.

* + - * 1. Construct benchmark of air barrier system, which is comprised of variety of materials.
				2. Construct typical **[exterior wall] <\_\_\_\_\_\_\_\_>** panel, <\_\_\_\_\_\_\_\_> ft long by <\_\_\_\_\_\_\_\_> ft wide, incorporating **[window] [and] <\_\_\_\_\_\_\_\_>** frame **[and sill],** insulation**, [building corner condition,] [junction with roof membrane air seal] [vapor retarder,] [and] <\_\_\_\_\_\_\_\_>**; illustrating materials interface and seals.
				3. Refer to Section **<\_\_\_\_\_\_\_\_>** for testing and verification requirements.
				4. Locate **[where directed by Director’s Representative.] [where indicated on Drawings.]**
				5. Incorporate accepted benchmark as part of Work.

\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Remove benchmark [**when directed by Director’s Representative.] <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>**
			1. PRE-INSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Pre-installation meeting.
				2. Convene minimum **[one] <\_\_\_\_\_\_\_\_>** week prior to commencing work of this section.
			2. ENVIRONMENTAL REQUIREMENTS
				1. Section 016000 - Product Requirements.
				2. Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.
			3. SEQUENCING
				1. Section 011000 - Summary: Work sequence.
				2. Sequence Work to permit installation of materials in conjunction with related materials and seals.
			4. COORDINATION
				1. Section 013000 - Administrative Requirements: Coordination and project conditions.
				2. Coordinate the Work of this section with sections referencing this section.
1. PRODUCTS
	* + 1. AIR BARRIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers:

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Furnish materials in accordance with **[[State] [Municipality] of <\_\_\_\_\_\_\_\_> [Highways] [Public Work's] standards.]**
			1. SUSTAINABILITY CHARACTERISTICS

Edit sustainable design requirements to suit content of this section and Project sustainable design requirements specified in Section 018113.

* + - * 1. Section 018113 - Sustainable Design Requirements: Requirements for sustainable design compliance.
				2. Materials and Resources Characteristics:

Recycled Content Materials: Furnish materials with maximum available recycled content [**including:] [.]**

List materials specified in this section required to have recycled content.

<\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>

Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site [**including:] [.]**

List materials specified in this section required to be regional materials.

<\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>

* + - 1. COMPONENTS

Select sheet seal materials carefully; consider compatibility with adjacent materials, longevity of performance, degradation caused by the elements, the requirement for structural support, and their ability to perform in conjunction with adjacent materials.

When more than one seal material is used, specify by "Type" and indicate that "Type" in schedule at end of this section or on in schedule on drawings.

* + - * 1. Sheet Seal **[Type [1] <\_\_\_\_\_\_\_\_>]: [Butyl] [Neoprene] [EPDM] <\_\_\_\_\_\_\_\_>, [black]** <\_\_\_\_\_\_\_\_> color, <**\_\_\_\_\_\_\_\_**> mil thick; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.
				2. Sheet Seal [**Type [2] <\_\_\_\_\_\_\_\_>]: [Rubberized asphalt bonded to sheet polyethylene] [modified bitumen]** <\_\_\_\_\_\_\_\_>, nominal total thickness of <\_\_\_\_\_\_\_\_> mil; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.
				3. Liquid Seal [**Type [3] <\_\_\_\_\_\_\_\_>]: [Elastomeric bitumen] [Synthetic rubber] <\_\_\_\_\_\_\_\_>, [roller] [trowel]** applied, nominal total thickness of <\_\_\_\_\_\_\_\_> mil; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.

Insert required coating designation when specifying galvanized steel. Use G (Z) coating classes for zinc coatings and A (ZF) coating classes for zinc-iron alloy coatings for reduced spangle.

* + - * 1. Sheet Seal **[Type [4]** <\_\_\_\_\_\_\_\_>]: Galvanized steel, ASTM A653 **[G60] [G90]** zinc coating; **[24] [26]** <\_\_\_\_\_\_\_\_> gage thick core steel.

Materials can be specified by proprietary name, by detailed description of sealant characteristics, by reference standard, or combination of three methods. When specifying in combination, ensure accurate coordination of text without contradiction.

When referencing to ASTM C920 in the following paragraphs, identify desired classifications. Type, Grade, Class, and Use classifications are fairly general and should not be relied upon for explicit quality or performance requirements.

Do not use polysulfide, polyurethane or silicone sealants in conjunction with bitumen sheet materials or when adjacent surfaces are bitumen based.

When more than one sealant material is used, specify by "Type" and indicate that "Type" in schedule at end of this section or on in schedule on drawings.

* + - * 1. **[Butyl**] Sealant [**Type [A**] <\_\_\_\_\_\_\_\_>]: [**ASTM C920, Grade <\_\_\_\_\_\_\_\_>, Class <\_\_\_\_\_\_\_\_>, Use** <\_\_\_\_\_\_\_\_>;] butyl rubber base, single component, solvent release, non-skinning,; [**black**] <**\_\_\_\_\_\_\_\_**> color; <**\_\_\_\_\_\_\_\_**> manufactured by <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>:

Elongation Capability: [**5**] <\_\_\_\_\_\_\_\_> percent.

Service Temperature Range: **[-40 to 180**] <\_\_\_\_\_\_\_\_> degrees F.

Shore A Hardness Range: [**10 to 30**] <\_\_\_\_\_\_\_\_>.

* + - * 1. Polysulfide Sealant **[Type [B]** <\_\_\_\_\_\_\_\_>]: **[ASTM C920, Grade** <\_\_\_\_\_\_\_\_>, Class <\_\_\_\_\_\_\_\_>, **Use** <\_\_\_\_\_\_\_\_>;] single component, chemical curing, capable of continuous water immersion, non-sagging type; **[black]** <\_\_\_\_\_\_\_\_> color, <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>:

Elongation Capability: [**25**] <**\_\_\_\_\_\_\_\_**> percent.

Service Temperature Range: [**-40 to 180**] <**\_\_\_\_\_\_\_\_**> degrees F.

Shore A Hardness Range: [**20 to 35**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. [**Polyurethane] Sealant [Type [C**] <\_\_\_\_\_\_\_\_>]: [**ASTM C920, Grade <\_\_\_\_\_\_\_\_>,** Class <\_\_\_\_\_\_\_\_>, **Use** <\_\_\_\_\_\_\_\_>;] single component, chemical curing, non-sagging; [black] <\_\_\_\_\_\_\_\_> **color**; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>:

Elongation Capability: [**25**] <**\_\_\_\_\_\_\_\_**> percent.

Service Temperature Range: [**-40 to 180**] <**\_\_\_\_\_\_\_\_**> degrees F.

Shore A Hardness Range: [**20 to 35**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. [**Silicone] Sealant [Type [D**] <\_\_\_\_\_\_\_\_>]: [**ASTM C920, Grade** <\_\_\_\_\_\_\_\_>, Class <\_\_\_\_\_\_\_\_>, **Use** <\_\_\_\_\_\_\_\_>;] single component, **[solvent] [chemical] [acidic]** curing, non-sagging; [**black**] <\_\_\_\_\_\_\_\_> color; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>:

Elongation Capability: [**25**] <**\_\_\_\_\_\_\_\_**> percent.

Service Temperature Range: [**-40 to 180**] <**\_\_\_\_\_\_\_\_**> degrees F.

Shore A Hardness Range [**35 to 45**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Primer: [**Recommended by sealant manufacturer's] [Appropriate to application] <\_\_\_\_\_\_\_\_>.**
				2. Substrate Cleaner: Non-corrosive **[, type recommended by sealant manufacturer] [, compatible with adjacent materials**].

Use generic adhesive by name or when more than one adhesive material is used, specify by "Type" and indicate that "Type" in schedule at end of this section or on in schedule on drawings.

* + - * 1. Mastic Adhesive **[Type [1]** <\_\_\_\_\_\_\_\_>]: Compatible with sheet seal and substrate, thick mastic of uniform **[knife grade]** <\_\_\_\_\_\_\_\_> consistency; <\_\_\_\_\_\_\_\_> manufactured by <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.
				2. Adhesive **[Type [2]** <\_\_\_\_\_\_\_\_>]: Compatible with sheet seal and substrate, permanently non-curing.
			1. ACCESSORIES
				1. Thinner and Cleaner for **[Butyl] [Neoprene]** <\_\_\_\_\_\_\_\_> Sheet: [**As recommended by sheet material manufacturer]** <\_\_\_\_\_\_\_\_>.
				2. Tape: [**Bright aluminum**] [**Polyethylene] [Polyester**] <\_\_\_\_\_\_\_\_> self adhering type, [**mesh reinforced,] [50]** <\_\_\_\_\_\_\_\_> mm wide, compatible with sheet material.
				3. Attachments: **[Galvanized steel]** <\_\_\_\_\_\_\_\_> bars and anchors, <\_\_\_\_\_\_\_\_> inch.
1. EXECUTION
	* + 1. PREPARATION
				1. Clean and prime substrate surfaces to receive [**adhesive**] [**and**] [**sealants**].
			2. INSTALLATION

Modify the following paragraphs to coordinate with drawing details. Ensure drawings utilize same terminology used in this section. Alternately, schedule specific applications at the end of this section.

Flexible sheet or liquid seal materials should be placed over firm backup to achieve structural support in order to accomplish effective and permanent air seal. Placing these sheet materials over intermittent supports such as wall studding is a poor practice and does not function effectively. Air pressure differential imposed on sheet material will physically distort and damage or displace material and quickly render air barrier ineffective.

In the following paragraphs, "adhesive" is usually utilized with sheet butyl, neoprene, or sheet steel materials; "tape" is sometimes utilized with flexible sheet materials. Consider life span of required air seal utilizing "tape."

* + - * 1. Sheet Seal Over Solid Substrate: Secure flexible sheet seal [**Type <\_\_\_\_\_\_\_\_>]** to [**masonry**] [**gypsum board**] <\_\_\_\_\_\_\_\_> materials with [**adhesive**] [**heat bonding tape**] [**continuous metal bar with anchors**]. [**Caulk with [Type <\_\_\_\_\_\_\_\_>]** **sealant to ensure complete seal.] [Position lap seal over firm bearing.]**
				2. Liquid Seal Over Solid Substrate: Place liquid seal [**Type <\_\_\_\_\_\_\_\_>]** to [**masonry**] [**gypsum board**] <\_\_\_\_\_\_\_\_> materials by [**roller] [troweling**]. [**Caulk with [Type <\_\_\_\_\_\_\_\_>]** sealant to ensure complete seal.]
				3. Air Seal For Wall/Roof Junction: [**Lap sheet] [Place liquid**] seal [**Type <\_\_\_\_\_\_\_\_>]** onto roof [**vapor retarder] [air barrier] material [and seal**] with [**sealant Type <\_\_\_\_\_\_\_\_>]** [**adhesive Type <\_\_\_\_\_\_\_\_>]. [Caulk to ensure complete air seal.] [Position lap seal over firm bearing.]**
				4. Install sheet seal [**Type <\_\_\_\_\_\_\_\_>]** between [**window] [and] [door**] frames and adjacent wall seal materials with [**sealant Type <\_\_\_\_\_\_\_\_>] [adhesive Type <\_\_\_\_\_\_\_\_>].** [**Caulk to ensure complete seal.] [Position lap seal over firm bearing.]**
				5. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
				6. Install air barrier to maintain continuity across different substrates **[and interface with existing construction]**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install Work in accordance with **[[State] [Municipality]** of <\_\_\_\_\_\_\_\_> **[Highways] [Public Work's]** standards.]
			1. PROTECTION OF INSTALLED CONSTRUCTION
				1. Do not permit adjacent work to damage work of this section.
			2. SCHEDULES

Include schedule when several different material types and locations require specific identification.

Consider the following examples when developing Project schedule.

"Types" noted in examples below are hypothetical; Project Schedule will use "Types" identified Part 2 of specification section and similar "Types" identified on drawings.

* + - * 1. Wall Air Seal Over Outer Surface of Inner Wythe of Masonry: Trowel seal Type F over masonry unit surface to thickness of 6 mm, seal masonry anchor penetrations air tight.
				2. Wall Air Seal Over Exterior Surface of Gypsum Sheathing: Place sheet seal Type G over sheathing surfaces with Adhesive Type E. Seal with Type Y sealant.
				3. Window Frame Perimeter: Lap sheet seal Type H from wall air seal surface with 75 mm of full contact over firm bearing to window frame with 25 mm of full contact. Edge seal with Type Z sealant.
				4. Wall and Roof Junction: Lap sheet seal Type J from wall seal material with 150 mm of contact over firm bearing to roof air seal membrane with 100 mm of full contact. Seal with Type X sealant.
				5. Roof System Air Seal Over Steel Deck: Gypsum sheathing, taped joints, apply membrane air seal Type K over sheathing surfaces with Adhesive Type D; edge seal membrane with Type Y sealant.

END OF SECTION 072700