SECTION 07 21 00

STRUCTURAL THERMAL BREAKS

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\*\* NOTE TO SPECIFIER \*\* Armatherm; structural thermal breaks.
This section is based on the products of Armatherm, which is located at:
1 Titleist Dr.
Acushnet, MA 02743
Tel: 844-360-1036
Email: [request info (sales@armatherm.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Armatherm&coid=51487&rep=&fax=&message=RE:%20Spec%20Question%20(07215ara):%20%20&mf=)
Web: <http://www.armatherm.com>
 [ [Click Here](https://www.arcat.com/arcatcos/cos51/arc51487.html) ] for additional information.
Armatherm thermal break solutions minimize building energy loss and improve building envelope performance. Since 2011, Armatherm has been working with architects and structural engineers to improve building design details and reduce heat loss due to thermal bridging within the building thermal envelope.
Armatherm solutions can be used anywhere a penetration or transition exists in the building envelope creating a thermal bridge. Solutions to minimize heat loss include balcony, canopy, parapet, masonry shelf angle, cladding/Z-girt connections, and wall-to-foundation transitions. Improve the effective U value of wall and roof assemblies and reduce heat loss by as much as 70 percent while contributing to LEED points.
We are a collaborative, design-build partner who can assist in determining the extent of thermal bridging heat loss on building envelope performance including thermal modeling and connection design calculations. We look forward to working with you.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Structural Thermal Breaks of the following types:
			1. Polyurethane structural thermal breaks. (Armatherm 500-150) (Armatherm 500-200) (Armatherm 500-280)
			2. Reinforced thermoset resin structural thermal breaks. (Armatherm FRR)
			3. Wall cladding support structural thermal breaks. (Armatherm Z GIRT)
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 03 30 00 - Cast-in-Place Concrete.
		2. Section 04 20 00 - Unit Masonry.
		3. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing.
		4. Section 05 40 00 - Cold-Formed Metal Framing.
		5. Section 07 21 19 - Foamed-In-Place Insulation.
		6. Section 07 40 00 - Roofing and Siding Panels.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
			1. ASTM C273 - Standard Test Method for Shear Properties of Sandwich Core Materials.
			2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
			3. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
			4. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
			5. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.
			6. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
			7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
			8. ASTM E831 - Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis.
		2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
			1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
		3. American Institute of Steel Construction (AISC):
			1. AISC 360 - Specification for Structural Steel Buildings.
		4. International Association for Cold Storage Construction (IACSC):
			1. IACSC Energy Modeling Guideline for Cold Storage and Refrigeration Warehouse Facilities, Table 4.4.1-1.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data:
			1. Manufacturer's data sheets on each product to be used.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Typical installation methods.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: Two representative units of each type, size, pattern and color.
		2. Schedule: Submit a list of locations where structural thermal breaks are to be used, and the specific product and thickness to be used at each location.
		3. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
		4. Thermal Design: Wall assembly or interface detail shall meet the ASHRAE 90.1 requirements for continuous insulation and shall not have structural connections (beams, support framing, sub girts, clips) which create thermal bridging. Effective U values of wall, roof and foundation assemblies shall meet or exceed the design requirements per code. Effective U value calculation or modeling shall be performed in accordance with ASHRAE guidelines.
		5. Structural Design: Design structural thermal break connections and/or facade attachment support framing using performance requirements and design criteria indicated. Provide comprehensive engineering analysis by a qualified professional engineer.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
		2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
		3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
			1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
			2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
			3. Retain mock-up during construction as a standard for comparison with completed work.
			4. Do not alter or remove mock-up until work is completed or removal is authorized.
	1. PRE-INSTALLATION CONFERENCE
		1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
		2. Protect from damage due to weather, excessive temperature, and construction operations.
	3. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
	4. WARRANTY
		1. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Armatherm, which is located at: 1 Titleist Dr.; Acushnet, MA 02743; Tel: 844-360-1036; Email: [request info (sales@armatherm.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Armatherm&coid=51487&rep=&fax=&message=RE:%20Spec%20Question%20(07215ara):%20%20&mf=); Web: <http://www.armatherm.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. POLYURETHANE STRUCTURAL THERMAL BREAKS
		1. Performance and Design Requirements:
			1. Structural Performance:
				1. Provide structural thermal break material and connections capable of withstanding and/or transferring shear, moment, and wind design loads.
				2. Allow for fabrication and construction tolerances, accommodate live load deflection, shrinkage, and creep of the building structure and other building movements as required by building code.
				3. Maintain structural steel deflections per AISC 360.
			2. Thermal Performance, Column Base Insulation Blocks: Effective R-Value of floor shall meet or exceed design requirements of building code. Calculate or model effective R-Value in accordance with IACSC Energy Modeling Guideline for Cold Storage and Refrigeration Warehouse Facilities, Table 4.1.1-1.

\*\* NOTE TO SPECIFIER \*\* Delete basis of design options not required.

* + 1. Basis of Design: Armatherm 500-150; as manufactured by Armatherm.
			1. Performance Requirements:
				1. Compressive Strength (ASTM D1621): 560 psi (3.9 MPa).
				2. Compressive Modulus (ASTM D1621): 18,130 psi (125 MPa).
				3. Shear Strength (ASTM C273): 167 psi (1.2 MPa).
				4. Thermal Conductivity, U-Value (ASTM C518): 0.32.
				5. Coefficient of Thermal Expansion (ASTM E831): 33 x 10e-6 in/in/degree F.
				6. Thermal Resistance, R-Value (ASTM C518): 3.3.
			2. Description: High-strength, polyurethane thermal break.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 2 inches (51 mm).
			2. Thickness: 4 inches (102 mm).
			3. Thickness: 6 inches (152 mm).
			4. Thickness: 10 inches (254 mm).
			5. Thickness: 12 inches (305 mm).
			6. Thickness: As indicated on Drawings.
			7. Locations:

\*\* NOTE TO SPECIFIER \*\* Delete location options not required.

* + - * 1. Parapets.
				2. Canopies.
				3. Cast in situ concrete balconies.
				4. Curtain wall mullions.
				5. Cladding and facade connections.
				6. Roof penetrations.
				7. Steel column base or concrete footing.
				8. \_\_\_\_\_.
				9. As indicated on Drawings.
			1. Accessories: Armatherm FRR bushings and washers as applicable to location.
				1. Thickness: Minimum 0.25 inches (6.4 mm).
				2. Provide thermal break between steel washer and bolt and internal structural steel.
		1. Basis of Design: Armatherm 500-200; as manufactured by Armatherm.
			1. Performance Requirements:
				1. Compressive Strength (ASTM D1621): 1131 psi (7.8 MPa).
				2. Compressive Modulus (ASTM D1621): 29,000 psi (200 MPa).
				3. Shear Strength (ASTM C273): 257 psi (1.77 MPa).
				4. Thermal Conductivity, U-Value (ASTM C518): 0.40.
				5. Coefficient of Thermal Expansion (ASTM E831): 25 x 10e-6 in/in/degree F.
				6. Thermal Resistance, R-Value (ASTM C518): 2.5.
			2. Description: High-strength, polyurethane thermal break.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 2 inches (51 mm).
			2. Thickness: 4 inches (102 mm).
			3. Thickness: 6 inches (152 mm).
			4. Thickness: 10 inches (254 mm).
			5. Thickness: 12 inches (305 mm).
			6. Thickness: As indicated on Drawings.
			7. Locations:

\*\* NOTE TO SPECIFIER \*\* Delete location options not required.

* + - * 1. Parapets.
				2. Canopies.
				3. Cast in situ concrete balconies.
				4. Curtain wall mullions.
				5. Cladding and facade connections.
				6. Roof penetrations.
				7. Steel column base or concrete footing.
				8. \_\_\_\_\_.
				9. As indicated on Drawings.
			1. Accessories: Armatherm FRR bushings and washers as applicable to location.
				1. Thickness: Minimum 0.25 inches (6.4 mm).
				2. Provide thermal break between steel washer and bolt and internal structural steel.
		1. Basis of Design: Armatherm 500-280; as manufactured by Armatherm.
			1. Performance Requirements:
				1. Compressive Strength (ASTM D1621): 2233 psi (15.4 MPa).
				2. Compressive Modulus (ASTM D1621): 49,312 psi (340 MPa).
				3. Shear Strength (ASTM C273): 310 psi (2.1 MPa).
				4. Thermal Conductivity, U-Value (ASTM C518): 0.45.
				5. Coefficient of Thermal Expansion (ASTM E831): 25 x 10e-6 in/in/degree F.
				6. Thermal Resistance, R-Value (ASTM C518): 2.22.
			2. Description: High-strength, polyurethane thermal break.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 2 inches (51 mm).
			2. Thickness: 4 inches (102 mm).
			3. Thickness: 6 inches (152 mm).
			4. Thickness: 10 inches (254 mm).
			5. Thickness: 12 inches (305 mm).
			6. Thickness: As indicated on Drawings.
			7. Locations:

\*\* NOTE TO SPECIFIER \*\* Delete location options not required.

* + - * 1. Parapets.
				2. Canopies.
				3. Cast in situ concrete balconies.
				4. Curtain wall mullions.
				5. Cladding and facade connections.
				6. Roof penetrations.
				7. Steel column base or concrete footing.
				8. \_\_\_\_\_.
				9. As indicated on Drawings.
			1. Accessories: Armatherm FRR bushings and washers as applicable to location.
				1. Thickness: Minimum 0.25 inches (6.4 mm).
				2. Provide thermal break between steel washer and bolt and internal structural steel.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. REINFORCED THERMOSET RESIN STRUCTURAL THERMAL BREAKS
		1. Performance and Design Requirements:
			1. Structural Performance:
				1. Provide structural thermal break material and connections capable of withstanding and/or transferring shear, moment, and wind design loads.
				2. Allow for fabrication and construction tolerances, accommodate live load deflection, shrinkage, and creep of the building structure and other building movements as required by building code.
				3. Maintain structural steel deflections per AISC 360.
				4. Submit independent test results or engineered performance analysis for structural thermal break material in bearing and/or slip critical connections where shear and moment loads are applied.
		2. Basis of Design: Armatherm FRR; as manufactured by Armatherm.
			1. Performance Requirements:
				1. Compressive Strength (ASTM D638): 40,000 psi (276 MPa).
				2. Compressive Modulus (ASTM D695): 673,400 psi (4643 MPa).
				3. Shear Strength (ASTM D732): 16,000 psi (110 MPa).
				4. Thermal Conductivity, U-Value (ASTM C518): 1.05.
				5. Coefficient of Thermal Expansion (ASTM E831): 2.2 x 10e-6 in/in/degree F.
				6. Thermal Resistance, R-Value (ASTM C518): 0.95.
				7. Surface Burning Characteristics (ASTM E84):

Flame Spread: 25, Class A.

Smoke Developed: 50, Class A.

* + - 1. Description: Reinforced thermoset resin thermal break.

\*\* NOTE TO SPECIFIER \*\* Delete thickness options not required.

* + - 1. Thickness: 1/2 inches (13 mm).
			2. Thickness: 3/4 inches (19 mm).
			3. Thickness: 1 inch (25 mm).
			4. Thickness: 2 inches (51 mm).
			5. Thickness: As indicated on Drawings.
			6. Locations:

\*\* NOTE TO SPECIFIER \*\* Delete location options not required.

* + - * 1. Steel beam connections.
				2. Masonry shelf angles.
				3. Parapets.
				4. Canopies.
				5. Balconies.
				6. Curtain wall mullions.
				7. Cladding and facade connections.
				8. Roof penetrations.
				9. \_\_\_\_\_.
				10. As indicated on Drawings.
			1. Accessories: Armatherm FRR bushings and washers as applicable to location.
				1. Thickness: Minimum 0.25 inches (6.4 mm).
				2. Provide thermal break between steel washer and bolt and internal structural steel.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. WALL CLADDING SUPPORT STRUCTURAL THERMAL BREAKS
		1. Performance and Design Requirements:
			1. Thermal Design: Wall assembly or interface detail shall meet the ASHRAE 90.1 requirements for continuous insulation.
				1. Wall assembly shall not have structural connections (beams, support framing, sub girts, clips) which create thermal bridging.
				2. Effective U values of wall assemblies shall meet or exceed the design requirements per code.
				3. Effective U value calculation or modeling shall be performed in accordance with ASHRAE guidelines.
				4. Three dimensional thermal modeling report should include the impact of the support/attachment system on the effective U value of the wall assembly.

\*\* NOTE TO SPECIFIER \*\* Delete wall assembly effective U value option not required.

* + - * 1. Wall assembly effective U value shall be as indicated on Drawings.
				2. Wall assembly effective U value shall be \_\_\_\_\_.
			1. Structural Performance: Exterior wall/cladding panel assemblies are required to demonstrate the ability to meet requirements for the following:
				1. Live loads such as wind and snow loads, dead load.
				2. Thermal movements.
				3. Temperature change.
				4. Design facade attachment support framing using performance requirements and design criteria indicated.
				5. Provide comprehensive engineering analysis by a qualified professional engineer which includes wall panel manufacturer's analysis of design loads.
		1. Basis of Design: Armatherm Z GIRT; as manufactured by Armatherm.
			1. Performance Requirements:
				1. Compressive Strength (ASTM D638): 40,000 psi (276 MPa).
				2. Compressive Modulus (ASTM D695): 673,400 psi (4643 MPa).
				3. Shear Strength (ASTM D732): 16,000 psi (110 MPa).
				4. Thermal Conductivity, U-Value (ASTM C518): 1.05.
				5. Coefficient of Thermal Expansion (ASTM E831): 2.2 x 10e-6 in/in/degree F.
				6. Thermal Resistance, R-Value (ASTM C518): 0.95.
				7. Surface Burning Characteristics (ASTM E84):

Flame Spread: 25, Class A.

Smoke Developed: 50, Class A.

* + - 1. Spacing: As recommended by Manufacturer.
			2. Connectors and Fasteners: Minimum ultimate pull-out capacity from shall be 450 pounds (204 kg).
1. EXECUTION
	1. EXAMINATION
		1. Do not begin installation until substrates have been properly constructed and prepared.
		2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
			1. Include accessory products including bushings and washers.
	4. FIELD QUALITY CONTROL
		1. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

\*\* NOTE TO SPECIFIER \*\* Include if manufacturer provides field quality control with onsite personnel for instruction or supervision of product installation, application, erection or construction. Delete if not required.

* + 1. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
	1. CLEANING AND PROTECTION
		1. Clean products in accordance with the manufacturer's recommendations.
		2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION