

City of Bentonville, Arkansas
 Bentonville WRRF Improvements

B&V Project 417296
 B&V File 80.0930.01
 September 25, 2025

Crossland Heavy Contractors
 Attention: Mr. Matt Hardin

Reference is made to your Submittal 15251-02-A Mechanical Insulation for Plumbing dated September 3, 2025. The following data pertains to Section(s) 15251 of the Specifications.

			Review Status					
Identification	Manufacturer	Description	CODE 1 - NO EXCEPTIONS NOTED	CODE 2 - COMMENTS NOTED	CODE 3 - COMMENTS NOTED / CONFIRM	CODE 4 - COMMENTS NOTED / RESUBMIT	CODE 5 - REJECTED / RESUBMIT	CODE 6 - RECEIPT ACKNOWLEDGED
Data	Knauf Insulation	Mechanical Insulation for Plumbing				X		

Engineer’s review of drawings and data submitted by Contractor covers only general conformity to the Drawings and Specifications, external connections and dimensions which affect the layout. Engineer’s review does not indicate a thorough review of all dimensions, quantities, and details of the material equipment, devices, or item shown. Engineer’s review shall not relieve Contractor of Contractor’s responsibility for errors, omissions, or deviations in the drawings and data, nor of the Contractor’s sole responsibility for compliance with the Contract Documents.

Remarks:

1. Include the insulation type the submitted product is intended for in the project, i.e., “PFC1”, per Specification section 15251 – 2.02.A.2.
2. Condensate drain piping outdoors does not require insulation. Condensate drain piping indoors does not require aluminum jacketing. See Note 3 in the Specification section 15251 – 3.01 Insulation schedule. Confirm intended use of this product in the project.

BLACK & VEATCH CORPORATION


 Amanda Johnson
 Project Manager

By: Michele Roth

24A03SP - Bentonville WRRF Improvements



1901 N.E. A Street
Bentonville, Arkansas 72712
United States

Crossland Heavy Contractors, Inc.
1800 S 52nd St, Ste 410
Rogers, Arkansas 72758
United States
(479) 464-7077

Title
15251 - Mechanical Insulation for Building
Mechanical : Product Information : HVAC

Submittal Manager
Adrian Ensaldo

Spec Section
15251 - Mechanical Insulation for Building
Mechanical

Type
Product Information

Number	Rev
15251-1	0

Description

A complete list of materials and catalog cuts, together with detailed specifications, materials performance data, installation instructions, parts, devices, and accessories furnished, shall be submitted in accordance with the Submittals Procedures section. Information shall include certified test results to show compliance with UL, NFPA, and ASTM safety requirements.

Quality People. Building Solutions.

Comfort Systems USA (Arkansas), Inc.
P.O. Box 16620
Little Rock, AR 72231
Phone 501-834-3320
Fax 501-834-5416

Date: 9/5/25

Return Request: 9/26/25

Project: Bentonville WRRF

Supplier: Various

Manufacturer: Various

Submittal: Mech Insulation

Submittal Number: 15251-01

Spec Section: 15251

Drawing #: Mechanical

ENGINEER

Hawkins Weir

GENERAL CONTRACTOR

Crossland Heavy Contractors

ENGINEER

Black and Veatch

MECHANICAL

SUBCONTRACTOR

Comfort Systems USA
(Arkansas), Inc.
116 Commercial Ave
Lowell, AR 72745
479-770-8992

Notes:

Condensate Drain Piping Insulation

CSUSA PROJECT NO.

25-5027

jzuber@comfortar.com

4806 Rixey Road
No. Little Rock, AR 72117

Pro Insulation

4414 South 16th Street
Ft. Smith, AR 72901
Ph. 479-646-5644
Fax 479-646-5654

September 2, 2025

Comfort Systems USA, Inc.
P.O. Box 16620
Little Rock, AR 72231

Mr. Josh Zuber

Re: Mechanical Insulation Submittals for Bentonville WWRF, Bentonville, Arkansas.

Spec Section 230719 HVAC Insulation.

The following items will be insulated with Armacell Armaflex black lap seal pipe cover.
All joints and seams will be sealed with 520 adhesive.

Item #1 Condensate Drains----- 1" Thick

- Will receive an additional .016 Embossed Aluminum jacket.

Thank You,

Scott Fairclough

SOLUTIONS FOR ENERGY SAVINGS

AP ArmaFlex®

Black Lap Seal

The original flexible elastomeric pipe insulation with a lap seal for greater seam security and increased protection against condensation, mold and energy loss.

- // Durable, low-profile lap seal with wider release tab, stays closed and looks neat
- // Easy to install – an excellent choice for retrofit applications
- // 25/50 rated for use in air plenums
- // Fiber-free, formaldehyde-free, low VOC and non-particulating

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ArmaFlex®

TECHNICAL DATA – AP ArmaFlex® BLACK LAPSEAL TUBE INSULATION

Description

Black flexible closed-cell elastomeric thermal insulation in tubular form with a self-seal system reinforced with lap seal tape

Applications

Insulation for piping associated with HVAC, VRV and VRF systems, chillers, hot and cold water, refrigeration. For use in commercial, industrial, and residential applications.

Specification Compliance

ASTM C 534, Type I – Grade 1	UL 723	UL 181	ASTM D 1056, 2C1
ASTM E 84	NFPA 90A, 90B	ASTM G21/C1338	

Approvals, Certifications, Compliances

- 3rd party certified by FM Approvals through 1-1/2" wall thickness per FM 4924
- GREENGUARD® Gold Certified.
- Manufactured without CFCs, HFCs, HCFCs, PBDEs, or Formaldehyde.
- Made with EPA registered Microban® antimicrobial product protection.
- All Armacell facilities in North America are ISO 9001 certified.
- Plenum Rated
- Conforms to ASHRAE 90.1 Energy Standards
- Conforms to building codes: International Mechanical Code, IMC, International Energy Conservation Code, IECC, International Residential Code, IRC, Title 24 California Building Energy Efficiency Standards.

Typical Properties

Specifications	Values		Test Method
	3/8" through 1" Wall (NBR/PVC based)	1-1/2" and 2" Walls (EPDM based)	
Thermal Conductivity: Btu • in/h • ft2 • °F (W/mK)			
50°F Mean Temperature (10°C)	0.235 [0.034]	0.278 (0.040)	ASTM C 177 or C 518
75°F Mean Temperature (24°C)	0.245 [0.0353]	0.28 (0.040)	
100°F Mean Temperature (38°C)	0.257 [0.037]	0.289 [0.041]	
125°F Mean Temperature (52°C)	0.268 [0.039]	0.300 [0.043]	
Water Vapor Permeability: Perm-in. [Kg/l.s • m • Pa]]	0.05 [0.725 x 10 ⁻¹³]	0.08 [1.16 x 10 ⁻¹³]	ASTM E 96, Procedure A
Flame Spread and Smoke Developed Index:	25/50 rated	25/50 rated	ASTM E 84, UL 723
Water Absorption, % by Volume:	0.2 %	0.2 %	ASTM C 209 or ASTM C1763
Mold Growth:	Passed	Passed	UL181
Fungi Resistance:			ASTM G21/C1338
Maximum Service Temperature	220°F (105°C) ①	300°F (149°C) ②	ASTM C534
Minimum Service Temperature ③	-297°F [-183°C] ④	-297°F [-183°C] ④	ASTM C534

Sizes

Wall Thickness (nominal) Form	3/8", 1/2", 3/4" 1", 1-1/2", 2" [10, 13, 19, 25, 38, 50 mm]
Inside Diameter, Tubular Form	3/8" ID to 6" ID [10 mm to 153 mm] [3/8" and 1/2" IDs not offered in 3/8" wall thickness]
Length of Sections, Tubular Form	6' [1.8 m]

Outdoor Use

Painting with WB Finish or other protective jacketing is required to prevent damage to the insulation in exterior applications and to comply with the insulation protection sections of the International Energy Conservation Code (IECC) and ASHRAE 90.1.

- ① AP ArmaFlex BST Pipe Insulation can withstand temperatures as high as 250°F for 96 hour time periods when tested according to ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- ② 1-1/2" and 2" AP ArmaFlex tubes are formulated with EPDM rubber giving them a higher upper use temperature than AP ArmaFlex tubes less than 1-1/2" wall thickness.
- ③ At temperatures below -20°F (-29°C), elastomeric insulation starts to become less flexible. However, this characteristic does not affect thermal efficiency and resistance to water vapor permeability of ArmaFlex insulation.
- ④ For applications of -40°F to -297°F (-40°C to -183°C), contact Armacell



GREENGUARD Certified products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage. For more information, visit ul.com/gg.

Microban antimicrobial product protection is limited to the product itself and is not designed to protect the users of these products from disease causing microorganisms, or as a substitute for normal cleaning and hygiene practices. Microban International, Ltd. makes neither direct nor implied health claims for the products containing Microban® antimicrobial product protection. Data, photomicrographs and information presented are based on standard laboratory tests and are provided for comparative purposes to substantiate antimicrobial activity for non-public health uses. Microban is a registered trademark of Microban International, Ltd.

AP ArmaFlex BLACK LAPSEAL TUBE INSULATION - R VALUES

3/8 " Walls

IPBST05838	1/2" Copper	2.6
IPBST03438	5/8" Copper	2.4
IPBST07838	3/4" Copper	2.4
IPBST11838	1" Copper	2.3
IPBST13838	1-1/4" Copper	2.2
IPBST15838	1-1/2" Copper	2.5
IPBST11038	1-1/2" IPS	2.4
IPBST21838	2" Copper	2.4

1/2 " WALLS

IPBST03812	1/4" Copper	3.3
IPBST01212	3/8" Copper	3.3
IPBST05812	1/2" Copper	3.4
IPBST03412	5/8" Copper	3.3
IPBST07812	3/4" Copper	3.3
IPBST11812	1" Copper	3.3
IPBST13812	1-1/4" Copper	3.2
IPBST15812	1-1/2" Copper	3.2
IPBST11012	1-1/2" IPS	3.1
IPBST21812	2" Copper	3.2
IPBST20012	2" IPS	3.2
IPBST25812	2-1/2" Copper	3.2
IPBST21012	2-1/2" IPS	3.2
IPBST31812	3" Copper	3.2
IPBST30012	3" IPS	3.1
IPBST35812	3-1/2" Copper	3.1
IPBST41812	4" Copper	3.1
IPBST40012	4" IPS	3.0

3/4 " WALLS

IPBST03834	1/4" Copper	5.9
IPBST01234	3/8" Copper	5.5
IPBST05834	1/2" Copper	5.6
IPBST03434	5/8" Copper	5.5
IPBST07834	3/4" Copper	5.4
IPBST11834	1" Copper	5.4
IPBST13834	1-1/4" Copper	5.3
IPBST15834	1-1/2" Copper	5.1
IPBST11034	1 1/2" IPS	4.9
IPBST21834	2" Copper	4.8
IPBST20034	2" IPS	5.2
IPBST25834	2-1/2" Copper	4.7
IPBST21034	2-1/2" IPS	5.0
IPBST31834	3 " Copper	4.6
IPBST30034	3" IPS	4.9
IPBST35834	3-1/2" Copper	4.5
IPBST41834	4" Copper	4.5
IPBST40034	4" IPS	4.8

1" WALLS

IPBST03810	1/4" Copper	7.3
IPBST01210	3/8" Copper	7.2
IPBST05810	1/2" Copper	7.2
IPBST03410	5/8" Copper	7.0
IPBST07810	3/4" Copper	7.0
IPBST11810	1" Copper	7.2
IPBST13810	1-1/4" Copper	7.2
IPBST15810	1-1/2" Copper	7.2
IPBST11010	1-1/2" IPS	6.9
IPBST21810	2" Copper	6.8
IPBST20010	2" IPS	7.1
IPBST25810	2-1/2" Copper	6.5
IPBST21010	2-1/2" IPS	6.8
IPBST31810	3" Copper	6.3
IPBST30010	3" IPS	6.6
IPBST35810	3-1/2" Copper	6.2
IPBST41810	4" Copper	6.1
IPBST40010	4" IPS	6.4
IPBST50010	5 " IPS	6.2
IPBST60010	6 " IPS	6.1

1-1/2" WALLS

IPBST03815	1/4" Copper	13.7
IPBST01215	3/8" Copper	12.7
IPBST05815	1/2" Copper	12.0
IPBST03415	5/8" Copper	11.3
IPBST07815	3/4" Copper	10.8
IPBST11815	1" Copper	10.1
IPBST13815	1-1/4" Copper	9.6
IPBST15815	1-1/2" Copper	9.2
IPBST11015	1-1/2" IPS	8.7
IPBST21815	2" Copper	8.6
IPBST20015	2" IPS	8.8
IPBST25815	2-1/2" Copper	8.2
IPBST21015	2-1/2" IPS	8.4
IPBST31815	3" Copper	7.9
IPBST30015	3" IPS	8.1
IPBST35815	3-1/2" Copper	7.7
IPBST41815	4" Copper	7.5
IPBST40015	4" IPS	7.8
IPBST50015	5" IPS	7.5
IPBST60015	6" IPS	7.3

2" WALLS

IPBST03820	1/4" Copper	19.7
IPBST01220	3/8" Copper	18.2
IPBST05820	1/2" Copper	17.2
IPBST03420	5/8" Copper	16.2
IPBST07820	3/4" Copper	15.5
IPBST11820	1" Copper	14.5
IPBST13820	1-1/4" Copper	13.7
IPBST15820	1-1/2" Copper	13.1
IPBST11020	1-1/2" IPS	12.4
IPBST21820	2" Copper	12.2
IPBST20020	2" IPS	12.3
IPBST25820	2-1/2" Copper	11.6
IPBST21020	2-1/2" IPS	11.7
IPBST31820	3" Copper	11.1
IPBST30020	3" IPS	11.2
IPBST35820	3-1/2" Copper	10.7
IPBST41820	4" Copper	10.5
IPBST40020	4" IPS	10.7
IPBST50020	5" IPS	10.2
IPBST60020	6" IPS	9.9

* These specifications are based on the measurement methods employed by Armacell. Other methods may not result in the same values and cannot be used to determine if the product is within the given tolerance.

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AP ArmaFlex | Black LapSeal Tube TDS | 112021 | NA | EN-A | 020

ABOUT ARMACELL

As the inventors of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal, acoustic and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With 3,000 employees and 23 production plants in 15 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for high-tech and lightweight applications and next generation aerogel blanket technology.

For more information, please visit:
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ArmaFlex 520 Adhesive

An air-drying contact adhesive specifically designed for use with ArmaFlex insulation products.

- // The original contact adhesive for ArmaFlex insulation
- // Years of on-the-job performance
- // Meets MIL-A-24179A and Amend-2



 **armacell**[®]
ArmaFlex[®]

TECHNICAL DATA - ARMAFLEX 520 ADHESIVE

Brief description	A special air-drying contact adhesive that is required for joining the seams and butt joints of ArmaFlex Pipe and Sheet Insulations as well as adhering ArmaFlex to ducts, tanks, chillers and other equipment / vessels.			
Material type	Synthetic rubber base with synthetic resins and fillers added; hydrocarbon- and ketone-type solvents.			
Product color range	Greenish yellow			
Product range	Half-pint and pint brush-top cans and pint, quart, and gallon containers.			
Approvals and compliance				
Specification compliance	All Armacell facilities in North America are ISO 9001 certified.	ASTM G21/C1338	MIL-A-24179A Type II, Class 1	
Property	Value / Assessment			Standard / Test method
Temperature range				
Service temperature	Min. °C	Min. °F	Max. °C	Max. °F
	-50	-58	120	250
	Remarks	120 °C (250 °F) — ArmaFlex pipe insulation seams and joints 82 °C (180 °F) — Full bonding sheet insulation For applications below -50°C (-58°F), contact Armacell technical team.		
Fire Performance and Approvals				
Surface burning characteristics ¹	Flame spread and smoke development index: 25/50 rated			ASTM E84
Health and environment				
Volatile organic compounds (VOC) content	615 g/l			
Other technical features				
Bond time	Immediate after allowing for tack time.			
Cure time	36 hours			
Shelf life	1-1/2 years in original sealed container.			
Solids content	Approximately 19% by weight.			
Storage	Store in a well ventilated area with storage temperature 60° F to 80° F (16° C to 27° C).			
Tack time	1–5 minutes depending on ambient conditions.			
Wet flash point	-15°F (-26°C) (TOC).			
Yield	200 sq ft per gallon (18.5 m²/gallon or 5 m²/l) max, single coat (depending upon porosity of materials bonded and air temperature).			

¹ASTM E84 performance is for adhesive in the dry state.

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ABOUT ARMACELL

As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With more than 3,300 employees and 25 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.



For more information, please visit:
www.armacell.com

DESCRIPTION

ITW Pabco/Childers Aluminum Jacketing is the premier protective outer surface for mechanical insulation systems including pipe, vessels, and equipment. It protects the insulation and underlying pipe/vessel from physical damage, UV exposure, corrosive atmospheres, and water.

ITW Aluminum jacketing (also called cladding) is available in smooth, stucco embossed, and 3/16 corrugated (cross-crimped) finishes. For larger surfaces, box-rib and deep corrugated sheets are also available.

ITW Aluminum Jacketing has a bare outer surface and comes standard with a 3-mil thick polyfilm moisture barrier heat-laminated to the interior surface to help prevent corrosion of the jacketing and the underlying metal pipe, vessel, or equipment.

COMPOSITION

Commercially pure aluminum is relatively soft and less suited for use in this application. Its strength can be greatly improved by alloying with small percentages of one or more other elements such as manganese, silicon, copper, zinc, and magnesium. Additional strength can be achieved by cold working. ITW Insulation Systems carefully screens all potential aluminum coil suppliers to assure our products have the highest quality, are corrosion resistant, and comply with all relevant standards.

ITW Aluminum Jacketing is typically manufactured using alloys 3105 or 3003 which have very similar composition and performance and are considered interchangeable for use as insulation jacketing. ITW reserves the right to ship whichever alloy is in stock at the time of order placement. One of these two specific alloys or an alternative alloy can be specified by purchaser at time of order placement but this may affect minimum quantity, lead-time, and price.

Composition Differences in Aluminum Alloys (%)

Alloy	Cu	Mn	Mg	Zn
3105	≤ 0.3	0.3-0.8	0.2-0.8	≤ 0.4
3003	0.05-0.2	1-1.5	---	≤ 0.1

COMPLIANCE TO STANDARDS

All bare and polyfilm lined Aluminum Jacketing from ITW Insulation Systems complies with the requirements of ASTM C1729 (Aluminum Jacketing

Material Standard) which includes the strength and chemical composition requirements for compliance to ASTM B209 (Aluminum Alloy Standard).

RECOMMENDED USES

Aluminum Jacketing is recommended for use in all of the following insulation system applications:

- Standard outdoor use on all pipe, vertical tank insulation systems up to 8 ft outer diameter, and all horizontal tanks
- Indoor insulation system applications up to 8 ft outer diameter where increased damage resistance is desired

LIMITATIONS ON USE

Aluminum Jacketing is not appropriate for the following applications:

- For vertical tank insulation system applications where the outer diameter is larger than 8 ft, ITW deep corrugated aluminum sheets should be used
- Where increased emissivity is desired, painted aluminum jacketing should be considered
- For applications where a maximum resistance to fire is required, stainless steel jacketing should be used
- For applications where additional resistance to corrosion from the external environment is required, ITW painted aluminum jacketing may be used. Where maximum resistance to corrosion is required, ITW stainless steel jacketing (T304 or T316) should be used.

POLYFILM MOISTURE BARRIER

Polyfilm Moisture Barrier (PFMB) is an engineered three layer coextruded film of polyethylene and Surlyn* polymers with a total film thickness of 3 mils (76 µm) that is heat laminated in the factory to the interior surface of aluminum jacketing. ITW recommends the use of PFMB on all aluminum jacketing to help prevent pitting, crevice, and galvanic corrosion of the interior surface of the metal jacketing and the insulated pipe, tank, or equipment.

Due to its superior performance characteristics, PFMB replaces the old moisture barrier technology of 1 to 3 mil thick polykraft

RECOMMENDED THICKNESS

ITW recommends that the thickness of aluminum jacketing used vary based on the outer diameter of the insulation system per the requirements of ASTM C1729. This recommended thickness is shown in the table below.

EMITTANCE

ITW Aluminum Jacketing has an outer surface emittance per ASTM C1371 and specified by ASTM C1729 of:

- Bare aluminum (oxidized in service) = 0.1

SURFACE FINISHES

Each of the three surface finishes available for ITW Aluminum Jacketing (smooth, stucco embossed, and 3/16" corrugated) has applications where it is recommended. All of these can be supplied with a painted exterior. For more information on this, consult the ITW data sheet on painted aluminum jacketing.

Smooth (Plain Mill) Finish

This is a very popular finish and is the "default" for the many end-users/specifiers who prefer the clean look of this finish. This finish sheds rain water the best. However, this smooth surface readily shows damage such as from hail or other physical abuse. It also shows the dirt more than the other finishes due to its smoothness. Lastly, it is highly reflective of sunlight and when located near roadways, some specifiers see this reflection as a possible safety hazard.

Stucco Embossed Finish

This is another popular finish used for aluminum jacketing. The stucco-like surface texture hides small imperfections and scratches caused by physical damage during or after installation. This finish also reduces reflectivity while still looking very professional. Lastly, the use of stucco embossed finish provides a small increase to the rigidity and strength of the aluminum jacketing.

3/16" Corrugated (Cross-Crimped) Finish

This finish consists of parallel grooves or crimps about 3/16" apart running in the length direction of the pipe. This finish also hides small damage and scratches to the jacketing and reduces sunlight reflection. In addition, the nature of this finish gives the aluminum jacket more ability to expand and contract to adapt to insulation movement caused by pipe or ambient temperature changes. Lastly, the rigidity and strength of 3/16" corrugated finish is substantially increased making it ideal for use as jacketing on large diameter pipe and vessels up to 8 ft diameter. This finish is available in a maximum thickness of 0.024 inches.

FLAMMABILITY

ITW Aluminum Jacketing with a 3 mil polysurlyn moisture barrier has been tested for flammability using the industry standard ASTM E84 test method. The results were:

ASTM E84 Flame Spread Index = 0

ASTM E84 Smoke Developed Index = 5

(Tested with exterior metal surface exposed to the flame)

Outer Insulation Diameter (in)	Minimum Aluminum Jacket Thickness, inches (mm)	
	Rigid Insulation	Non-Rigid Insulation
≤ 8	0.016 (0.41)	0.016 (0.41)
Over 8 thru 11	0.016 (0.41)	0.020 (0.51)
Over 11 thru 24	0.016 (0.41)	0.024 (0.61)
Over 24 thru 36	0.020 (0.51)	0.032 (0.81)
>36	0.024 (0.61)	0.040 (1.01)

DESCRIPTION

ITW Insulation Systems' Polyfilm lined Aluminum Elbow Covers are made in two precision formed matching halves to cover and weatherproof insulated 45° and 90° pipe elbows. These elbow covers are called Ell-Jacs™ Plus by ITW Insulation Systems.

Like ITW Aluminum Jacketing, Ell-Jacs™ Plus are a premier protective outer surface for insulation systems on pipe and are an excellent performing and critical accessory to complement the aluminum jacketing. Ell-Jacs™ Plus protect the insulation and underlying pipe from physical damage, UV exposure, corrosive atmospheres, and water. They also reduce the time and labor needed to install the metal jacketing system.

Ell-Jacs™ Plus have a 3 mil (76 micron) three-layer Polyfilm Moisture Barrier (PFMB) that is factory heat laminated to the interior surface. When coupled with the ultrapure 1100 alloy used in these elbows, this moisture barrier reduces pitting/crevice and galvanic corrosion potential of the interior surface of the elbow cover and the underlying pipe.

Ell-Jacs™ Plus have a factory applied and baked on finish of highly durable hard film clear acrylic or polyester paint on the exterior surface to help resist external corrosion and to raise the emittance. The special paint used on the exterior surface of Ell-Jacs™ Plus is chalk and fade resistant. It exhibits better resistance to oxidation and to the effects of various corrosive environments than bare aluminum jacketing. This painted surface also resists water, scratching, and fingerprint staining.

See the [ITW Polyfilm Technical Data Sheet](#) for more information on this material.

ADVANTAGES

Ell-Jacs™ Plus provide key advantages over aluminum elbows with a painted moisture barrier:

- PFMB on the interior surface reduces corrosion propensity – three layers of film in the PFMB eliminate pinholes
- Allows for the presence of PFMB on all parts of the metal jacketing system
- Increased spacing between fingers/ribs, for easier banding in the middle of the elbow
- PFMB has a very low water vapor transmission rate, further reducing corrosion potential
- Tough and strong PFMB film to resist damage during handling and installation. Painted moisture barrier is more easily scratched
- Clear exterior coating helps resist unsightly metal scratches



INNOVATIVE PRODUCT

Using ITW's innovation process, our team has developed an improved product that will enhance the performance of the overall insulation system.

Ell-Jacs™ Plus will benefit the facility owner and specifier, as the optimum performing PFMB is now available for the first time as a complete system without having to utilize gore sections on the elbows.

COMPOSITION

Ell-Jacs™ Plus are made from the commercially pure (>99% aluminum) and highly corrosion resistant 1100 aluminum alloy.

The performance of even commercially pure aluminum can be improved by alloying with small percentages of one or more other elements such as silicon, iron, copper, manganese, and zinc. ITW Insulation Systems carefully screens all potential aluminum coil suppliers to assure our products have the highest quality, are corrosion resistant, and comply with all relevant standards.

Composition of Aluminum 1100 Alloy (max %)

Alloy	Si + Fe	Cu	Mn	Zn
1100	0.95	0.05-0.20	0.05	0.1

See the [ITW PFMB vs. Polykraft or Paint Data Sheet](#) for more detailed information regarding key benefits of PFMB compared to painted moisture barrier.

SIZE SELECTION AND INSTALLATION

For details on Ell-Jacs™ Plus sizes, their fit on insulation, and installation, see the ITW data sheet on Aluminum Elbow Sizes and Installation.

FIT

Ell-Jacs™ Plus are available to fit:

- 45° and 90° pipe elbows
- Long and short radius pipe elbows
- Butt weld, socket weld, and screwed elbows
- Insulated pipe from ½" to 12" NPS¹

¹Ell-Jacs™ Plus are available as quad sections for some insulation thicknesses at NPS > 12". Not all combinations of NPS and insulation thickness are available. See your ITW sales representative for details.

THICKNESS

Ell-Jacs™ Plus are 0.024" (0.6 mm) in thickness to allow the elbows to be formed in the press. This thickness has proven acceptable in a vast number of installations and is adequate since elbows do not get the same abuse as straight jacketing and do not get walked on or ladders leaned on them.

RECOMMENDED USES

Ell-Jacs™ Plus are recommended for use anywhere aluminum jacketing is used on the associated straight sections of pipe but are especially critical when the straight pipe aluminum jacketing uses PFMB.



LIMITATIONS ON USE

Ell-Jacs™ Plus are not appropriate for the following applications:

- For applications where a maximum resistance to fire is required, ITW stainless steel elbow covers should be used
- Where maximum resistance to exterior surface corrosion is required, ITW stainless steel elbow covers should be used

EMITTANCE OF ALUMINUM ELBOWS

Ell-Jacs™ Plus have an outer surface emittance as measured by ASTM C1371 and specified by ASTM C1729 of:

- Standard clear coated = 0.5
- Bare aluminum (oxidized in service) for comparison = 0.1

FLAMMABILITY

Ell-Jacs™ Plus have been tested for flammability via the commonly used ASTM E84 test method. The results are shown below.

ASTM E84 Flame Spread Index = 0

ASTM E84 Smoke Developed Index = 5

(Tested with exterior metal surface exposed to the flame)

SURFACE FINISHES

Due to the pressing process during elbow formation, Ell-Jacs™ Plus have a smooth (mill) finish.

COMPLIANCE TO STANDARDS

Ell-Jacs™ Plus from ITW Insulation Systems comply with the applicable requirements of ASTM C1729 (Aluminum Jacketing Material Standard), Type III, Grade 3, Class A, which includes the strength and chemical composition requirements for compliance to ASTM B209 (Aluminum Alloy Standard).

SEALING OF JOINTS

For best insulation system performance and resistance to water infiltration, ITW recommends that all joints in Ell-Jacs™ Plus be sealed with an appropriate joint sealant. This should be applied between the overlapping pieces of metal in the joint and not as a caulking bead on the exterior lip of the joint.

Pro Insulation

4414 South 16th Street

Ft. Smith, AR 72901

Ph. 479-646-5644

Fax 479-646-5654

September 2, 2025

Comfort Systems USA, Inc.

P.O. Box 16620

Little Rock, AR 72231

Mr. Josh Zuber

Re: Mechanical Insulation Submittals for Bentonville WWRF, Bentonville, Arkansas.

Spec Section 230713 Duct Insulation.

The following items will be insulated with Knauf 1 lb fiberglass duct wrap with a foil skim kraft vapor barrier jacket. All joints and seams will be sealed with 3" wide FSK tape.

Item #1 Concealed Round Supply Duct----- 2 Inches Thick

Item #2 Concealed Round Return Duct----- 2 Inches Thick

Thank You,

Scott Fairclough

DATA SHEET

Atmosphere® Duct Wrap

with ECOSE® Technology



DESCRIPTION

Atmosphere Duct Wrap is a thermal and acoustical insulation blanket made from highly resilient, inorganic fiberglass bonded by ECOSE Technology. It is available unfaced, with a foil-scrim-kraft (FSK) jacket and with a white metalized polypropylene-scrim-kraft (PSK) jacket. Vapor retarders provide a 2" (51 mm) staple flange on one edge, and the factory-applied facing assures uniform quality.

APPLICATION

- External insulation on commercial or residential heating or air conditioning ducts
- Suitable for the exterior of rectangular or round sheet metal ducts and spaces or surfaces where temperature and condensation must be controlled

SPECIFICATION COMPLIANCE

U.S.

- ASTM C1290
- ASTM C553
 - Type I, Type II - 0.75 PCF (12 kg/m³)
 - Type I, Type II - 1.0 PCF (16 kg/m³)
 - Type I, II, III - 1.5 PCF (24 kg/m³)
- ASTM C1136; Type II
- NFPA 90A and 90B
- California Title 24 (installed at 25% compression)
- UL/ULC Classified

Canada

- CAN/ULC S102

INDOOR AIR QUALITY

- UL Environment
 - GREENGUARD Certified
 - GREENGUARD Gold Certified
 - Validated to be Formaldehyde-Free
- Does not contain polybrominated diphenyl ethers (PBDE) such as: Penta-BDE, Octa-BDE or Deca-BDE
- EUCEB Certified

CONTRACTOR: _____

JOB: _____

DATE: _____

DOING MORE FOR THE WORLD WE LIVE IN.

Knauf Insulation products with ECOSE® Technology are made using our patented, bio-based binder - a smarter alternative to the phenol/formaldehyde (PF) binder traditionally used in fiberglass products. The bio-based binder holds our product together, gives the product its unique appearance and makes it formaldehyde-free.

All of our products are made from sustainable resources, such as recycled glass and sand. And we're proud to be putting glass bottles back to work rather than into landfills. Our products are made with a minimum of 50% recycled glass—totaling an average of 26 million bottles each month.



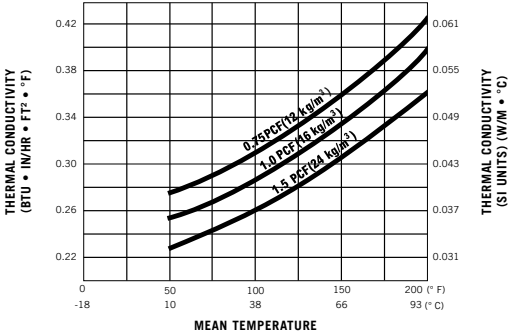
FIBERGLASS AND MOLD

Fiberglass insulation will not sustain mold growth. However, mold can grow on almost any material when it becomes wet and contaminated. Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold, it must be discarded. If the material is wet but shows no evidence of mold, it should be dried rapidly and thoroughly. If it shows signs of facing degradation from wetting, it should be replaced.

Insulation used in direct contact with air streams that provide conditioning to occupied spaces must be discarded if exposed to water.

TECHNICAL DATA		
Property (Unit)	Test	Performance
Corrosiveness	ASTM C665	Does not accelerate corrosion of steel
Corrosion	ASTM C1617	Pass
Maximum Service Temperature	ASTM C411	Faced: 250° F (121° C), Unfaced: 350° F (177° C)
Water Vapor Permeance	ASTM E96, Procedure A	0.02 perms or less (FSK and PSK facings)
Water Vapor Sorption (by weight)	ASTM C1104	Less than 5%
Mold Growth	ASTM C1338	Pass
Surface Burning Characteristics (flame spread/smoke developed)	ASTM E84, UL 723, CAN/ULC S102	UL/ULC Classified FHC 25/50 (Unfaced and FSK facing)
	ASTM E84	25/50 (PSK facing)

FORMS AVAILABLE						
Density	Thickness	Width	Length	Facing	R-Value (K Value) @ 75°F Mean Temperature	
					Out-Of Package	Installed [at 25% Compression]
0.75 PCF (12 kg/m³)	1½" (38 mm)	48" (1,219 mm)	100' (30.48 m)	FSK, PSK, Unfaced	R-5.1 (0.29)	R-4.2 (0.27)
	2" (51 mm)		75' (22.86 m)		R-6.8 (0.29)	R-5.6 (0.27)
	2¾" (56 mm)		75' (22.86 m)		R-7.4 (0.29)	R-6.0 (0.27)
	3" (76 mm)		50' (15.24 m)		R-10.2 (0.29)	R-8.4 (0.27)
	4⅝" (110 mm)		45' (13.71 m)		R-14.7 (0.29)	R-12 (0.27)
1.0 PCF (16 kg/m³)	1½" (38 mm)		100' (30.48 m)		R-5.6 (0.27)	R-4.5 (0.25)
	2" (51 mm)		75' (22.86 m)		R-7.4 (0.27)	R-6.0 (0.25)
1.5 PCF (24 kg/m³)	1½" (38 mm)		75' (22.86 m)		R-6.1 (0.24)	R-4.8 (0.23)
	2" (51 mm)		50' (15.24 m)		R-8.2 (0.24)	R-6.4 (0.23)

THERMAL EFFICIENCY ASTM C177							
 The graph shows thermal conductivity (k) in BTU·in/hr·ft²·°F and W/m·°C on the y-axis (0.031 to 0.061) against mean temperature in °F and °C on the x-axis (-18 to 200). Three curves are plotted for 0.75 PCF (12 kg/m³), 1.0 PCF (16 kg/m³), and 1.5 PCF (24 kg/m³), all showing an increase in conductivity with temperature.	Mean Temperature	0.75 PCF (12 kg/m³)		1.0 PCF (16 kg/m³)		1.5 PCF (24 kg/m³)	
		k	k (SI)	k	k (SI)	k	k (SI)
	50° F (10° C)	0.28	0.040	0.26	0.037	0.23	0.033
	75° F (24° C)	0.29	0.042	0.27	0.039	0.24	0.035
	100° F (38° C)	0.31	0.045	0.29	0.042	0.26	0.037
	125° F (52° C)	0.33	0.048	0.31	0.045	0.28	0.040
	150° F (66° C)	0.36	0.052	0.34	0.049	0.31	0.042
	175° F (80° C)	0.39	0.056	0.37	0.053	0.33	0.048
	200° F (93° C)	0.43	0.063	0.40	0.058	0.36	0.052

INSERTION LOSS I (REDUCTION OF SOUND TRANSMITTED THROUGH DUCT WALL)
(SOUND AND VIBRATION DESIGN AND ANALYSIS, NATIONAL ENVIRONMENTAL BALANCING BUREAU, 1994)

		Duct Wrap		Insertion Loss, dB/LF of Duct						
Duct Dimensions	Sheet Metal	Nominal Thickness	Nominal Density	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
12" x 12" (305 mm x 305 mm)	24 GA	1½" (38 mm)	0.75 PCF (12 kg/m³)	0.6	0.6	0.6	0.7	7.4	14.2	20.9
24" x 12" (610 mm x 305 mm)	24 GA	1½" (38 mm)		0.6	0.6	0.6	0.7	7.4	14.2	20.9
48" x 12" (1219 mm x 305 mm)	22 GA	1½" (38 mm)		0.5	0.5	0.5	0.6	7.4	14.1	20.9
24" x 24" (610 mm x 610 mm)	22 GA	1½" (38 mm)		0.5	0.5	0.5	0.6	7.4	14.1	20.9
24" x 12" (610 mm x 305 mm)	26 GA	1½" (38 mm)		0.8	0.8	0.8	0.8	7.5	14.2	21.0
24" x 8" (610 mm x 203 mm)	26 GA	2" (51 mm)		1.0	1.0	1.0	3.6	10.4	17.1	23.9

STRETCH-OUTS

Labeled Thickness	Installed Compressed Thickness	Round	Square	Rectangular
1½" (38 mm)	1⅝" (29 mm)	P+9½" (241 mm)	P+8" (203 mm)	P+7" (178 mm)
2" (51 mm)	1½" (38 mm)	P+12" (305 mm)	P+10" (254 mm)	P+8" (203 mm)
2⅜" (56 mm)	1⅝" (42 mm)	P+13" (330 mm)	P+11" (279 mm)	P+8½" (216 mm)
3" (76 mm)	2¼" (57 mm)	P+17" (432 mm)	P+14½" (368 mm)	P+11½" (292 mm)
4⅝" (110 mm)	3¼" (83 mm)	P+22½" (572 mm)	P+18" (457 mm)	P+19" (483 mm)

P = Perimeter of duct to be installed.

APPLICATION & SPECIFICATION GUIDELINES

Storage

- Protect stored insulation from water damage, construction damage and other abuse.
- If stored outside, proper protection from weather conditions should be provided.

Preparation

- Install over clean, dry sheet metal ducts.
- All sheet metal joints and seams must be sealed to prevent air leakage from the duct.

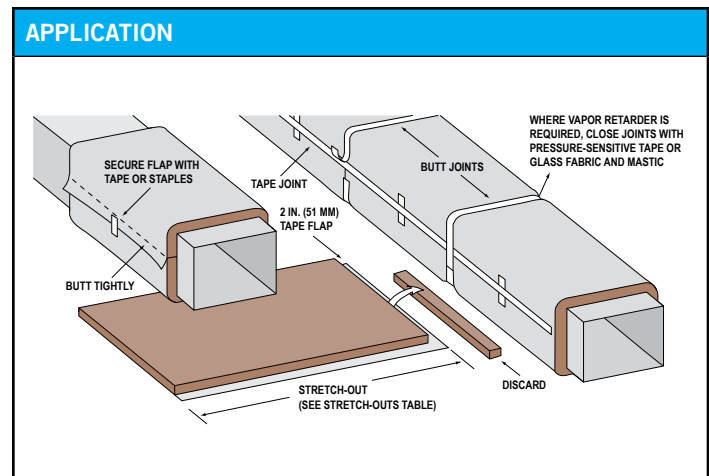
Application

- Install with facing to the outside to obtain specified R-value using a maximum of 25% compression.
- Butt all insulation joints firmly together. Longitudinal seam of the vapor retarder must be overlapped a minimum of 2" (51 mm). A 2" (51 mm) tab is provided for the circumferential seam and must be overlapped.
- Where vapor retarder performance is necessary, all penetrations, joints, seams and damage to the facing should be sealed with an FSK, PSK or foil tape or glass fabric and mastic prior to system startup.
- Pressure sensitive tapes should be a nominal 3" (76 mm) wide and be applied with moving pressure using an appropriate sealing tool. Staples should be outward clinch and placed approximately 6" (152 mm) on center.
- Closure systems should have a 25/50 F.H.C. per UL 723.
- For rectangular ducts over 24" (610 mm) wide, secure the insulation to the bottom side of the duct with mechanical fasteners spaced on 18" (457 mm) centers to reduce sag. Care should be taken to avoid over-compressing the insulation with the retaining washer.

- The use of bonding adhesive is not recommended for attaching duct wrap to the duct surface. The use of bonding adhesive may restrict duct wrap from expanding to full thickness. This loss of thickness will result in decreased thermal performance which may lead to condensation issues on below ambient ductwork. Use of bonding adhesive voids warranty and performance claims and potentially the UL rating of Knauf Insulation duct wrap.
- Unfaced Duct Wrap should be overlapped with a minimum of 2" (51 mm) and fastened with 4" (102 mm) to 6" (152 mm) nails or skewers placed 4" (102 mm) apart, or secured with a wire or banding system. Care must be taken to avoid damaging the duct wrap. Refer to diagram for staple stitching and butt-joint method.

Installation Procedures

- Use the Application graphic to determine stretch-outs required for the nominal thickness of insulation to limit average compression of the insulation 25% or less.



CERTIFICATIONS



Check with your Knauf Insulation Territory Manager to ensure information is current.

The chemical and physical properties of this product represent average values determined in accordance with accepted test methods. The data is subject to normal manufacturing variations. The data is supplied as a technical service and is subject to change without notice. References to numerical flame spread ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions.

This product is covered by one or more U.S. and/or other patents.
See patent www.knaufnorthamerica.com/patents

Visit knaufnorthamerica.com to learn more.

KNAUF INSULATION, INC.

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Technical Support

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FASSON® 0828

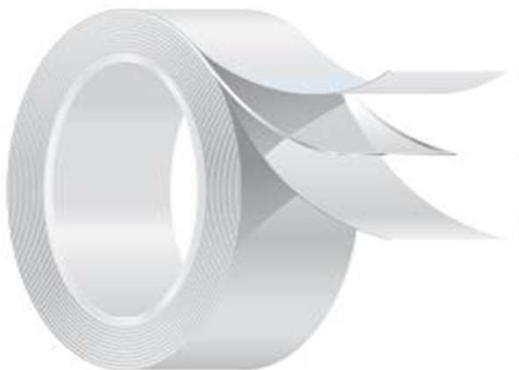
Avery Dennison FASSON® 0828 is suitable for die-cut shapes, shielding, moisture and vapor barrier sealing components or lamination to insulation materials.

FEATURES

- Specially formulated antimicrobial, extreme weather, COLD TOUGH® acrylic adhesive
- High initial tack and quick stick
- Meets ASTM C-1136 Type II and Type IV
- PSA complies with CDPH Standard Method V1.2
- UL 723 Recognition under File No. BVYS.R7078
- UL ULC S102 Recognition under File No. BVYS7.R7078

BENEFITS

- Tri-directional 8.0 mil FSK facestock reinforces seal
- Strong bond to a variety of substrates
- CDPH V1.2 recognized by USGBC LEED, WELL building standard, ANSI/GBI 01-2019, and more
- High-strength reinforced FSK reinforces seal and is decaBDE free
- Application temperature as low as 0°F
- Made in the USA



CONSTRUCTION:

Liner:

60# White Kraft

Adhesive:

COLD TOUGH® Acrylic

Carrier:

Tri-directional FSK Foil Laminate

General Use Tape Surface Burning Characteristics to

UL 723	Flame Spread	10
722S	Smoke Developed	15

FASSON® 0828**Adhesive Properties:****Typical Values**

Thickness	ASTM D3652	US Mils	MM's	Micron's (µm)
Liner		3.5	0.09	89
Adhesive		1.7	0.04	43
Carrier		8.0	0.20	203
Total Caliper without Liner:		9.7	0.25	246
Total Caliper:		13.2	0.34	335

Peel Adhesion

ASTM D3330

180° 12 in (300 mm) min @ Room Temp

Substrate		Lbf / in	N / Meter
SS	INITIAL	6.5	1,145

Static Shear

ASTM D3564

180° 1" sq (6.5 cm2) 2500 g @ Room Temp

Substrate		Min to Fail
SS	INITIAL	> 10000

Tensile

ASTM D882

180° 2 in (50.8 mm) / min @ Break @ Room Temp

Substrate		Lbf / in	N / Meter
Product	MD	40	7,044
Product	CD	25.0	4,403

TLMI Release

Product		Gf / 2 in w
	INITIAL	40.0

VOC

VOC		mg / m³
Product		< 0.5

TEMPERATURES

	° F	° C
Minimum Application Temperature	0° F	-18° C
Maximum Continuous Operating Temperature	200° F	93° C
Maximum Intermittent Operating Temperature	250° F	120° C

THE LISTED VALUES ARE TYPICAL AND NOT INTENDED TO SERVE AS PRODUCT SPECIFICATIONS

APPLICATION TECHNIQUES

- It is essential, as with all pressure-sensitive tapes, that the surface to which the tape is applied be clean, dry, and free of grease or oil
- Bond strength is dependent upon the amount of adhesive-to-surface contact developed
- Note that different pressure, time and temperature on different (film / rigid) surface achieves different performance

STORAGE / SHELF LIFE

- One year when stored at 64-72°F (18-22°C) / 30-70% relative humidity, out of direct sunlight and in original packaging.

Please refer to [Tapes.AveryDennison.com](https://www.AveryDennison.com) for complete terms and conditions, including warranty terms, relating to this product. You should periodically review the site as terms and conditions are subject to change without notice.

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