

Introduction:

Shannon Acoustic Blankets are a CAD designed, CNC produced, high quality, engineered insulation system designed to reduce noise levels, minimize insulation maintenance and improve the surrounding work environment. Shannon Acoustic Blankets are weather and chemical resistant. Shannon Acoustic Blankets are flexible, easy to install, remove and reinstall, allowing quick and easy access for serviceability. The key benefit is "Re-Usability".

Applications:

Shannon Acoustic Blanket Applications include; Compressor Housings, Motors, Blowers, Liquid Chillers, Gear Boxes, Valves, Piping, Oil Separators, Fittings, Pump Housings and Fan Housings.

Markets: OSHA Required Sound Limits on Equipment, HVAC Commercial, Process Industrial Markets and OEM Original Equipment Manufacturers.

Service Temperature:

This design is to act as a Thermal/Acoustic Noise Barrier with a maximum service temperature of 250°F (121°C).

Acoustic Performance: 4 – 15 DBA Reduction Overall

Finished Surface Mass: 1.7lb/ft² (8.3 kg/m²) to 3.7lb/ft² (18.1 kg/m²)

Product Components: Outer/Inner Jacketing – 18.0oz/yd² (611g/m²) Vinyl Coated Polyester Cloth. Mass Loaded Vinyl "Reflector" – 1.0lb/ft²-2.0lb/ft² (4.9kg/m²-9.8kg/m²). Insulation Core "Absorber" - 11lb/ft³ (176.2 kg/m³) Fiberglass Needled Mat-Type "E" Fiber. The Fiberglass Mat is encapsulated by the Outer/Inner Jacketing and sewn together, producing a "Self-Contained Blanket System". The Blanket System includes Integral Fasteners for install & removal.

Blanket Construction: Blanket construction shall be a "Double Sewn" lock stitch with a minimum 7 stitches/inch (2.8 stitches/CM). Blanket edges will have a tri-fold Vinyl Polyester cloth binding. No raw cut jacket edge will be exposed. Stitching will be Nylon or Polyester thread. No "On-Site Fabrication" to assure high quality.

Blanket Overlap: To minimize heat loss, the blanket will extend beyond mating flanges unto existing insulation for a minimum of 2" (5 CM). Where blanket cannot fit over existing oversized insulation, blanket will butt up to existing insulation with a friction fit closing seam. All sections of pipes will be insulated and open gaps are not acceptable. Blanket diameters which are 2" (5 CM) or larger than existing insulation must be end capped to eliminate open air void.



Centrifugal Liquid Chiller – 6-8 dBA Reduction

Blanket Insulation Weight: When designing blanket insulation where a multi-piece construction is necessary, the total number of pieces will be minimized. Any one piece will not exceed 40lbs (18 kg) in weight.

ID Plate: For easy identification and location, a stainless steel or aluminum name plate tag is riveted to each blanket piece. 1/8" (0.32CM) embossed lettering shows location, description, size, pressure rating and tag number sequence. Each blanket will include an I.D. Plate.

Quilting Pins: To enhance blanket quality and to maintain uniform thickness, stainless steel quilting pins @ 14 Gauge (2.5 mm²) will be placed at random locations no greater than 12" (30 CM) apart. Quilting Pins will prevent shifting of the insulation. Stainless Steel speed washers will secure the quilting pin stem in place.

Minimized Air Void: Equipment and equipment heads are typically a multi-piece design and are installed in tag number sequence. Heat exchanger heads, compressors and pump housings will be designed in two half sections. Blanket design will conform to the equipment with minimized air void.

Drawing Requirements: Each blanket project will include an instruction submittal package. This package will include Assembly Drawings identifying piece location, a Material List of all pieces and Instructions for Installation on how Shannon Acoustic Blankets will be installed. Accurate CAD files & project records must be kept by the manufacturer, for a minimum of ten years. All blankets are to be CAD designed / CNC produced to assure the highest quality and precise fit.

STANDARD FASTENER: WIRETWIST / Velcro® Vinyl Flap: Fabric Extended Jacketing Flaps with an integral Mass Loaded Vinyl are secured by the utilization of Hook/Loop (Velcro®) fasteners. A 2" (5cm) wide section of the (Velcro®) Hook will be stitched to the outer surface of the blanket. A 2" (5cm) wide section of the (Velcro®) Loop will be aligned and stitched on the mating inner surface of an extended 2" (5cm) Mating Seam or 2 ½" (6.4cm) Closure Seam Flap.

A stainless steel wire 20 Gauge (0.5mm Dia.) will be doubled up and twisted in a spiral fashion, with a minimum of 5-7 twists/Inch (2-3 twists/cm). Wiretwist length will be 16" (40cm). The Wiretwist will be secured to the lacing pin at the pin stem. Pin stems will be 14 gauge (2.5mm²). Wiretwists will be spaced at most 6" (15cm) on center along closing seams with matching lacing pins for securement.

FASTENING OPTIONS

1.) Lacing Pins - Stainless Steel Type 304 Lacing Pins. These pins will be 14 gauge. Location of pins on the blanket will be 2" (5CM) or more from blanket edge and 8" (20CM) or less from centerline to centerline along the blanket edge.

2.) Optional: Metal "D" Ring Strap with Velcro Tab: A three layer fabric strap is double sewn. One strap is a 12" (30CM) long pull-down strap, the other is a 3" (8CM) long stationary strap. Both straps are stitched to the outer jacketing of the blanket. The stationary strap includes a metal "D" Ring measuring 1"-1.5" wide (2.5-3.8CM). This is placed ½" (1CM) from the closing seam edge. The pull-down strap is placed 2" (5CM) in from the closing seam edge. Both matching straps are spaced along the closing seam edge no greater than 6" (15CM) apart. The pull-down strap includes hook-and-loop Velcro®, measuring at least 1" (2.5CM) wide by 5" (12.7CM) long, and is perimeter stitched to the strap surface. All closing seams have a 1.5" (3.8CM) extended fabric flap, which is placed along the stationary strap side of the closing seam.

Project Qualifications: All items insulated will require a site visit prior to bid submittal. Upon receipt of project contract, each item must be field measured for "Custom Fitting" to existing field conditions. Each item must be tagged and or marked for installation reference. At the time of installation, blankets must have a corresponding tag on the blanket and must match to an existing tag on the fitting. No generic standard blanket designs will be accepted. This will assure a "Custom Fit" design with maximum thermal efficiency.

Site Preparation: Apply Shannon Acoustic Blankets on clean, dry surfaces and avoid trapping oils, greases or combustible materials. Surfaces must be stripped of existing materials.

Warranty: We guarantee that all custom manufactured blankets will accommodate vibration probes, gauges, tubing, piping, brackets, etc. and fit correctly for optimum performance as per the design specification provided in the quotation process. In addition, for 18 months we will cover the cost of replacing the blanket should the failure be due to premature degradation of any component utilized in the blanket construction, as well as any defects due to poor workmanship.

Sample Submittal: Upon bid submittal a blanket design sample must be presented for review and product approval. A 7"x9" (18CMx23CM) Sample will be required and must identify all characteristics mentioned in the above fabrication requirements. Any deviations from the above stated requirements may result in a bid rejection.

Installation Guidelines:

Shannon Acoustic Blankets will follow these guidelines:

- Once material is received, open boxes with care. DO NOT "cut" deep into container to avoid damaging blankets.
- Locate the Instructions for Installation.
- Follow the Material List to determine blanket part number.
- Refer to the Assembly Drawing for orientation of each blanket part number and installation details of each part.
- Locate the Identification Tag on each blanket, for correct description and sequence of blankets.
- Material is installed in tag number sequence.
- Use leather gloves to install material.
- A physical effort is required for proper placement and fit.

Storage: Once shipment is received, protect Shannon Acoustic Blankets from water damage and/or other abuses prior to installation. Shannon Acoustic Blankets will be shipped in cardboard boxes or crated for export shipping. Packaging is not designed for outdoor storage, thus a tarp or covering of some type is necessary if stored outdoors until installation is completed.

Project Accuracy & Effectiveness: Must demonstrate the efficacy of precision, through the use of State-Of-The Art CAD Design. The efficacy of precision markings with the ability to maintain a high degree of repetitiveness and control of manufacturing tolerances for locations of I.D. tags, stitch lines, cut lines for stuffing, cutting of jacketing materials and cutting of insulation through the use of State-Of-The-Art CNC cutting systems & software.

Blanket Thickness Surface Temperature Reference:

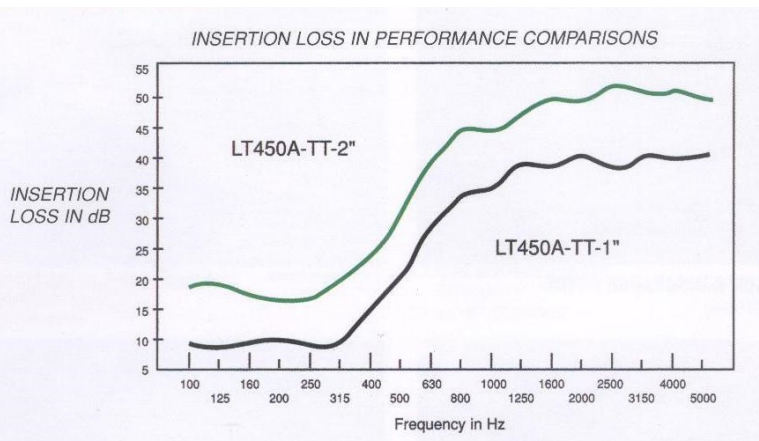
| Operating Temp | Thickness | Surface Temp | Thickness | Surface Temp | Thickness | Surface Temp |
|-----------------|-------------|--------------------|---------------|-------------------|-------------|-------------------|
| 121° C (250° F) | 25 mm (1") | 37.9° C (100.2° F) | 40 mm (1.5") | 33.3° C (92.0° F) | 50 mm (2") | 30.8° C (87.4° F) |

- * The above referenced Cold Face Surface Temperatures should be used as guidelines for blanket insulation thickness design.
- * The Cold Face Surface Temperature of the blanket should approach surrounding ambient temperature conditions.
- * The economic thickness of the blanket should consider blanket cost, thermal performance and blanket design constraints.
- * Heat Loss Calculations are based on a 21.1° C (70° F) ambient temperature using a flat surface condition.

Blanket Thickness to Acoustic Performance:

| Thickness | Surface Mass | Noise Reduction Range |
|--------------|--|----------------------------|
| 1" (2.5CM) | 1.8 lb/ft ² to 2.8 lb/ ft ² (8.8-13.7kg/m ²) | 1.5 DBA to 6 DBA Reduction |
| 1 ½" (3.8CM) | 2.2 lb/ ft ² to 3.2 lb/ ft ² (10.7-15.6kg/m ²) | 4 DBA to 8 DBA Reduction |
| 2" (5CM) | 2.6 lb/ ft ² to 3.6 lb/ ft ² (12.7-17.6kg/m ²) | 5 DBA to 10 DBA Reduction |
| 2 ½" (6.4CM) | 3.0 lb/ ft ² to 4.0 lb/ ft ² (14.7-19.5kg/m ²) | 7 DBA to 13 DBA Reduction |

- * The above referenced Acoustic Performance should be used as a guideline for blanket insulation thickness design.
- * The Acoustic Performance of the blanket should be bench marked against the ambient noise condition.
- * The economic thickness of the blanket should be considered in selection of a target reduction with consideration to blanket design constraints.
- * Contact Shannon Enterprises for guidance in selection, as the historical performance of each application varies significantly.



| 107dBA SOURCE | A-WEIGHTED MEASUREMENTS | | LINEAR WEIGHTED MEASUREMENTS | |
|------------------------|--|--|--|--|
| | LT 450A-TT-1" Noise Reduction (in dBA) | LT 450A-TT-2" Noise Reduction (in dBA) | LT 450A-TT-1" Insertion Loss (in dB) | LT 450A-TT-2" Insertion Loss (in dB) |
| Test Frequency (in Hz) | | | | |
| 100 | 8 | 19 | 8 | 18 |
| 125 | 8 | 20 | 7 | 19 |
| 160 | 9 | 17 | 9 | 17 |
| 200 | 9 | 16 | 9 | 16 |
| 250 | 8 | 17 | 8 | 16 |
| 315 | 10 | 20 | 9 | 20 |
| 400 | 14 | 24 | 14 | 23 |
| 500 | 21 | 30 | 20 | 30 |
| 630 | 28 | 39 | 27 | 39 |
| 800 | 34 | 44 | 33 | 44 |
| 1000 | 35 | 44 | 34 | 43 |
| 1250 | 38 | 46 | 37 | 46 |
| 1600 | 37 | 49 | 36 | 49 |
| 2000 | 38 | 48 | 38 | 48 |
| 2500 | 37 | 51 | 36 | 51 |
| 3150 | 40 | 50 | 39 | 50 |
| 4000 | 39 | 49 | 38 | 50 |
| 5000 | 41 | 49 | 40 | 49 |

With the following listed Noise Reductions measured in the A-Weighting, the total Noise Reduction from the 107 dBA loudspeaker level over a 100-5000Hz frequency band would be: 20.8 dBA for design LT 450A- TT-1" Thickness and 29.5 dBA for design LT 450A- TT-2" Thickness.

The above data is representative of Test Procedure ASTM E1222-87 for the Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems.

Shannon makes no warranties express or implied concerning the performance results of the Shannon-INSULTECH® Acoustic Blanket Insulation and shall be held harmless by the user and its agents for any damages whether direct or consequential that may arise from use of such information.

The published ASTM testing reflects a controlled laboratory environment. Field results will vary depending on conditions. These values should be interpreted as performance guidelines only.

Product Properties Specifications:

| | |
|-----------------------------|--|
| Insulation Core: | "Absorber" - Standard Specification for Fiberglass Needled Fiber Felt Thermal Insulation ASTM C 1086-88 "Absorber" - Maximum Service Temperature Up to 649°C (1200°F) ASTM E 90-90 "Reflector" - Test Method for Measurement of Airborne Sound Data/Transmission Loss "Reflector" - Acoustic Barrier – Barium Sulfate Loaded Vinyl (0.5 to 1.5 PSF) |
| Jacketing Materials: | Outer Layer: Vinyl Coated Polyester Fabric - Material weight 18.0 oz/yd ² (611g/m ²) Continuous Service Temperature 180°F (82°C) / Intermittent 250F (121°C) Grab Tensile Strength of Fabric Warp: 460 lbs - Fill: 425 lbs. Inner Layer: Vinyl Coated Polyester Fabric - Material weight 18.0 oz/yd ² (611g/m ²) PASSED - Oil Resistance after 1 hour in Aero Shell Oil #100 |
| MIL-C-20696E | |

INSULTECH® Blanket Design Testing:

| | |
|------------------|--|
| ASTM C 335 | Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation. |
| ASTM E 1222 – 90 | Standard Test Method for the Laboratory Measurement of the Insertion Loss of Pipe Insulation - USA |
| ISO 15665 | Standard Test Method for the Laboratory Measurement of the Insertion Loss of Pipe Insulation – Int'l |
| ASTM C 1045 – 07 | Standard Practice for Calculating Thermal Transmission Properties under steady state conditions |
| UL 1709 | Standard Fire Test of Protection Materials for MOV / Structural Steel |
| ASTM E-84-17 | Surface Burning Characteristics of Building Materials (Flame Spread & Smoke) |
| ASTM E-136 | Combustion Characteristics of Building Materials / Fire Test Response |
| ASTM D3787 | Burst Strength Evaluation for ASTM F1138 – Spray Shield Compliance |

Caution: Typical industry handling practices should be exercised for the protection of the worker. Worker should wear long-sleeved, loose-fitted clothing, head covering, leather gloves, eye protection and appropriate respiratory protection (as required) when handling and applying INSULTECH® material. Wash with soap and cold water after handling INSULTECH® material. Wash work clothes separately and rinse washer. For specific handling practices, refer to the product MSDS sheets for the Thermal Blanket System.

Notes: The chemical and physical properties of Shannon-INSULTECH® Blanket represent typical average values determined in accordance with accepted test methods. The data is subject to normal manufacturing variations and is supplied as a technical service subject to change without notice. In addition, test data are average results of tests conducted under standard procedures and are subject to variation. Results should not be used for specification purposes. Design Guidelines are as follows: to access the true limitations of this recommended design, refer to the technical data for each product component. Following these guidelines will produce the highest achievable service life. Blanket design quality can be reduced or enhanced by changing any one component. If a question arises regarding deviations from those stated guidelines, or to insure the information is most current please contact your regional representative or call Shannon. Enterprises direct.