

**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. The key benefit is "Re-Usability".

**Applications:** Centrifugal Compressors, Exhaust Ducts, Fan Housings, Machinery, Process Piping & Fittings, PRV Stations, Silencers, Steam Turbines, Turbochargers

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

**Service Temperature:** Up to 800°F (427°C).

**Acoustic Performance:** 4 – 15 DBA Reduction Overall Finished

**Surface Mass:** 1.7lb/ft<sup>2</sup> (8.3 kg/m<sup>2</sup>) to 3.7lb/ft<sup>2</sup> (18.1 kg/m<sup>2</sup>)

**Product Components:** The Outer Jacket is a 16.5oz/yd<sup>2</sup> (560g/m<sup>2</sup>) PTFE Teflon® Impregnated Fiberglass Cloth. The "Reflector" a Mass Loaded Vinyl "Reflector" – 1.0lb/ft<sup>2</sup> (4.9kg/m<sup>2</sup>)-2.0lb/ft<sup>2</sup> (9.8kg/m<sup>2</sup>). The inner jacket consists of a layer of Stainless Steel Knitted Wire Mesh on the outside, encasing a layer of 17.7 oz/yd<sup>2</sup> (601g/m<sup>2</sup>) Plain Fiberglass Cloth. The "Absorber" an Insulation Core Material is an 11 lb/ft<sup>3</sup> (176.2 kg/m<sup>3</sup>) Fiberglass Needled Mat-Type "E" Fiber. The Fiberglass Mat is encapsulated by the inner & outer jacketing. 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 per cm). Raw jacket edges will have a tri-fold Silicone Fiberglass Cloth binding. No raw cut jacket edge will be exposed. Stitching will be PTFE fiberglass thread. Monel metal bevel point staples 3/8" (0.95cm) wide, must follow the outer jacket edge for re-enforcement and to be spaced no greater than 1" (2.5 cm) apart on center. Staples will penetrate the binding edge. 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" (5cm). 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" (5cm) or larger than existing insulation must be end capped to eliminate open air void.



**Single Wheel – Steam Turbine**

**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 mm<sup>2</sup>) will be placed at random locations no greater than 12" (30cm) 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:** A stainless steel wire 20 Gauge (0.5 mm<sup>2</sup>) 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 (2.5 mm<sup>2</sup>). Wiretwists will be spaced at most 6" (15cm) on center along closing seams with matching lacing pins for securing.

**FASTENER OPTIONS:**

**1.) Metal "D" Ring Strap w/ 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" (12.7 cm) 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.

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

**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 standard generic blanket designs will be accepted. This will assure a "Custom Fit" design with maximum acoustic 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.

**Record Keeping:** The correlating Project Production Drawings will also be kept on file with the blanket manufacturer. The latest revisions, if any after installation, will be recorded and filed on the CAD drawing system. This file will also be kept for a minimum of ten years.

**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" (18cm x 23cm) 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:**

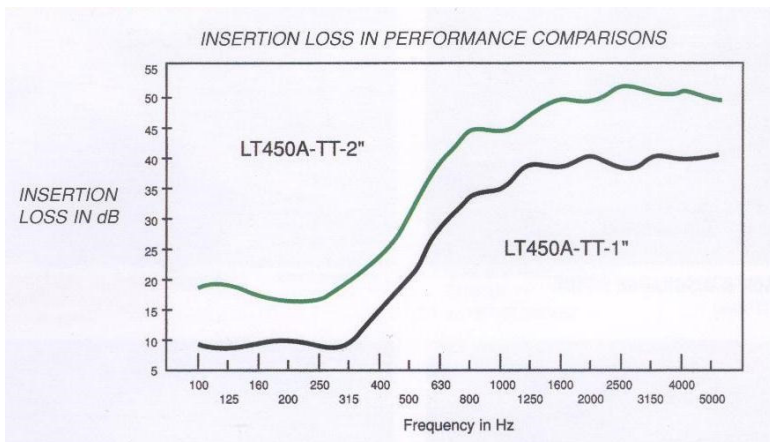
Operating Temp	Thickness	Surface Temp	Thickness	Surface Temp	Thickness	Surface Temp
121° C (250° F)	25 mm ( 1")	37.9° C (100.2° F)	40 mm( 1.5")	33.3° C (92.0° F)	50 mm (2")	30.8° C (87.4° F)
149° C (300° F)	25 mm ( 1")	42.6° C (108.6° F)	40 mm (1.5")	36.8° C (98.2° F)	50 mm (2")	33.5° C (92.3° F)
177° C (350° F)	25 mm( 1")	47.3 °C (117.2° F)	40 mm (1.5")	40.3° C (104.6° F)	50 mm (2")	36.3° C (97.4° F)
204° C (400° F)	25 mm ( 1")	52.2° C (126.0° F)	40 mm (1.5")	44.0 °C (111.2° F)	50 mm (2")	39.3 °C (102.7° F)
232° C (450° F)	25 mm ( 1")	57.2° C (135.1° F)	40 mm (1.5")	47.8 °C (118.0° F)	50 mm (2")	42.3 °C (108.2° 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 <sup>2</sup> to 2.8 lb/ ft <sup>2</sup> (8.8-13.7kg/m <sup>2</sup> )	1.5 DBA to 6 DBA Reduction
1 ½" (3.8CM)	2.2 lb/ ft <sup>2</sup> to 3.2 lb/ ft <sup>2</sup> (10.7-15.6kg/m <sup>2</sup> )	4 DBA to 8 DBA Reduction
2" (5CM)	2.6 lb/ ft <sup>2</sup> to 3.6 lb/ ft <sup>2</sup> (12.7-17.6kg/m <sup>2</sup> )	5 DBA to 10 DBA Reduction
2 ½" (6.4CM)	3.0 lb/ ft <sup>2</sup> to 4.0 lb/ ft <sup>2</sup> (14.7-19.5kg/m <sup>2</sup> )	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)
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:

<b>Insulation Core:</b>	"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)
<b>Jacketing Materials:</b>	<b>Outer Layer:</b> PTFE Teflon® Fiberglass Composite Material weight 560g/m <sup>2</sup> (16.5 oz/yd <sup>2</sup> ) Continuous Service Temperature 316°C (600°F) 538°C (1000°F) Tensile Strength: Warp: 410lbs/in (3664N/50mm) / Fill: 355lbs/in (3137N/mm) Inner Layer: Plain Fiberglass Fabric – Material Weight 18.0 oz/yd <sup>2</sup> (611g/m <sup>2</sup> ) Continuous Service Temperature 1000°F (538°C) <b>Inner Layer:</b> Stainless Steel Type 304 Knitted Wire Mesh 011" Dia. @16 ft <sup>2</sup> /lb (.28 mm Dia. @ 3.3 m <sup>2</sup> /KG)

#### INSULTECH® Blanket Design Testing:

ASTM C 335	Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.
<b>ASTM E 1222 – 90</b>	<b>Standard Test Method for the Laboratory Measurement of the Insertion Loss of Pipe Insulation - USA</b>
<b>ISO 15665</b>	<b>Standard Test Method for the Laboratory Measurement of the Insertion Loss of Pipe Insulation – Int'l</b>
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.