Shannon
GLOBAL ENERGY SOLUTIONS

CSI 10 Part Format
"Acoustic Shield Specification"
Blanket Design: LT250AS (LT121C-AS)
"HVAC Commercial/Industrial Applications"

Introduction:
Shannon Acoustic Shield is a custom fit high quality engineered acoustic insulation system, designed to reduce harmful noise and improve the surrounding work environment. Shannon Acoustic Shield is weather proof and water resistant, is flexible and easy to remove and reinstall to allow quick access for service, inspection & repair. Acoustic Shield incorporates a Weather Rain Shield Cap to protect the acoustic shield system. Shannon Acoustic Shield is a "Self-Contained" noise reduction solution.

Applications: Scroll Compressors, Compressor Housings, Compressor Discharge Piping, Mufflers, Piping, Blower Housings, Fan Housings, Equipment and various complex surfaces that otherwise would be left untreated.

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

Service Temperature:
This design is to act as a "SOUND ATTENUATION" and Thermal Barrier, with a maximum service temperature of 250˚F (121˚C).

Product Components:
The Outer Jacketing is a Non-Reinforced Mass Loaded Vinyl Barrier Sheet 1lb/sf to 2lb/sf (4.9kg/m²-9.8kg/m²). The Insulation Core consists of ¾" (2CM) thickness, EPDM Elastomeric Closed Cell Foam Insulation, with a smooth and durable surface, which acts as a sound "Absorber" in conjunction with the Mass Loaded Vinyl Barrier. A high performance scrim reinforced acrylic pressure sensitive adhesive (-15ºF to 280ºF max. continuous service temp.) is utilized to adhere the material to the outer jacketing. The Shannon Acoustic Shield integrates, Velcro® hook-and-loop fasteners for easy installation, removal & re-installation.

Acoustic Shield Construction:
The Acoustic Shield typical construction shall be CAD generated CNC contour cut outer jacket. Where sewing is required (generally the Velcro® hook-and-loop fasteners), it shall be a double sewn lock stitch with a minimum of 4 stitches per inch. Stitching will be done with a black Polyester thread. No "On-Site Fabrication" to assure high quality.

I.D. 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.

Scroll Compressor - Body Wrap & Rain Shield Cap

Assembly Drawing Requirements:
All INSULTECH® projects of significant (multiple) piece quantities where clarification of installation locations is required each project will include an instruction package shipped with the acoustic shield material. This package will include Assembly Drawings identifying piece location, a Material List of all pieces and Instructions for Installation on how Shannon-INSULTECH® will be installed. Accurate CAD files & project records must be kept by the manufacturer. For a minimum of ten years these records will assure accuracy in re-ordering and individual parts replacement.

Record Keeping:
The correlating Project Production Drawings will also be kept on file with the Acoustic Shield manufacturer. The latest revisions, if any after installation, will be recorded on the CAD drawing system. This file will also be kept for a minimum of ten years to assure accuracy in re-orders of replacement parts.

Integral Rain Shield Weather Cap:
The Outer Jacket is an 18.0oz/yd² (611g/m²) Vinyl Coated Polyester Cloth, combined with a 1 lb mass loaded vinyl adhered to a ¾" elastomeric form. Fastener is a Velcro Flap attached to the body.

Minimized Acoustic Void Leaks:
All acoustic shield pieces which match mating seams and expose hot spots, will include an extension of a 2" vinyl flap to cover the exposed seam and minimize potential noise leaks.

Installation Guidelines
Shannon-INSULTECH® will follow these simple guidelines:

- Once material is received, open boxes with care. DO NOT "cut" deep into container to avoid damaging Acoustic Shields.
- Locate the Instructions for Installation.
- Follow the Material List to determine Acoustic Shield part number.
- Refer to the Assembly Drawing for orientation of each Acoustic Shield part number and installation details of each part.
- Locate the Identification Tag on each Acoustic Shield, for correct description and sequence of Acoustic Shield.
- 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 Shield from water damage and/or other abuses prior to installation. Shannon-INSULTECH® Acoustic Shield Insulation 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 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 generis standard blanket designs will be accepted. This will assure a "Custom Fit" design with maximum thermal efficiency.

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

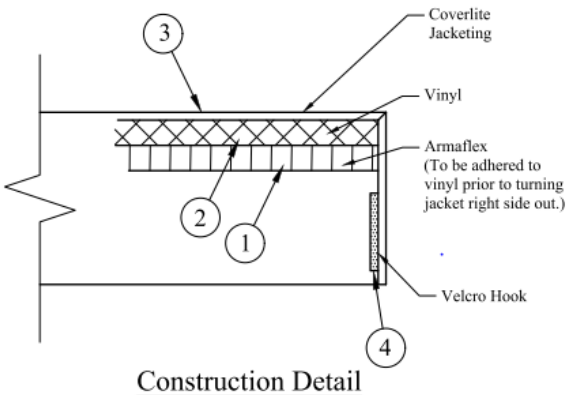
Record Keeping: The correlating Project Production Drawings will also be kept on file with the blanket manufacturer. The latest revisions, if any after installation, will be recorded and filed on the CAD drawing system. This file will also be kept for a minimum of ten years

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" (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.

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.

Rain Shield Construction:



Construction Detail

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
3/4" (1.9CM)	1.8 lb/ft² to 2.8 lb/ ft² (8.8-13.7kg/m²)	1.5 DBA to 6 DBA Reduction
1 ½" (3.8CM)	2.2 lb/ ft² to 3.2 lb/ ft² (10.7-15.6kg/m²)	4 DBA to 8 DBA Reduction

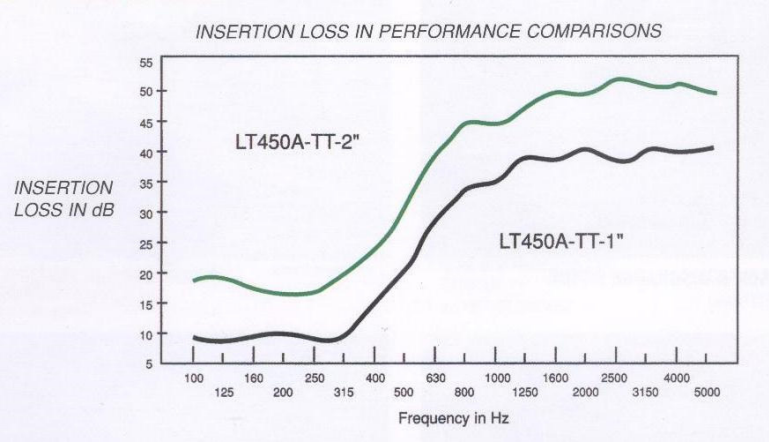
* The above referenced Acoustic Performance should be used as a guideline for blanket insulation thickness design.
* The Acoustic Performance of the blanket should be bench marked against the ambient noise condition.
* The economic thickness of the blanket should be considered in selection of a target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

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.



107dBA SOURCE	A-WEIGHTED MEASUREMENTS		LINEAR WEIGHTED MEASUREMENTS	
Test Frequency (in Hz)	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

Product Properties Specifications:

Insulation Core:	Standard Specification for Aerocel® EPDM Elastomeric Foam Insulation ASTM C 411 Service Temperature Up to 149˚C (300˚F) ASTM E-84 Composite Surface Burning Characteristics (Flame Spread < 25 , Smoke Developed < 50) 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)
Rain Shield Jacketing Materials:	**Outer Layer:** Vinyl Coated Polyester Fabric - Material weight 18.0 oz/yd² (611g/m²) Continuous Service Temperature 180˚F (82˚C) / Intermittent 250F (121˚C) Grab Tensile Strength of Fabric Warp: 460 lbs - Fill: 425 lbs. MIL-C-20696E PASSED - Oil Resistance after 1 hour in Aero Shell Oil #100

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 Shannon Acoustic Blankets. Wash with soap and cold water after handling Shannon Acoustic Blankets. 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 Acoustic Blankets 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.