



# LEED™ Program Specification of Mechanical Insulations

Last Revised November 8, 2006

## How to Use This Document

This document is intended to be a guide for project teams to support compliance with LEED for New Construction (LEED-NC) Versions 2.1 and 2.2. Credit areas may also apply to other LEED programs including LEED for Existing Building (LEED-EB), LEED for Core & Shell (LEED-CS), LEED for Homes (LEED-H [currently in pilot phase]), and LEED Application Guides for schools, laboratories, lodging, retail, and health care.

This guide contains documentation for Johns Manville mechanical insulation products as required to support LEED credit compliance.

Specification of Johns Manville mechanical insulation products can contribute toward LEED-NC credits in the areas of:

- Energy & Atmosphere (EA)
- Indoor Environmental Quality (IEQ)
- Innovation & Design (ID)

Mechanical systems, components, and insulations are specifically excluded from being used in Materials & Resources (MR) credits under LEED-NC 2.0, 2.1 and 2.2. Information provided here related to mechanical insulation MR credits is for reference only, or for use in alternative green building programs.

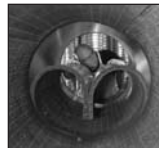
Mechanical insulation products discussed in this document include:



Duct Wrap



Rectangular Duct Liner



Round Duct Liner



Duct Board



Flexible Insulated Duct



Pipe Insulation



Tank & Equipment Insulation

## Energy & Atmosphere Credits

### **EA Prerequisite 2 – Minimum Energy Performance**

To meet the requirements of EA Prerequisite 2 for LEED-NC v2.1 or v2.2, duct insulation must be tested, rated and labeled using ASTM C 518 “Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus”. All Johns Manville duct insulation products are labeled with an R-Value according to ASTM C 518 and therefore support achievement of this prerequisite.

### **Credit 1 – Optimize Energy Performance**

Although mechanical insulations are critical in reducing energy losses and improving the energy efficiency of buildings, the Whole Building Energy Simulation method of assessing improvements to ASHRAE 90.1 baseline as required by LEED generally does not allow for calculating these improvements due to limitations in the available software models (usually DOE-2 software is used for the purposes of LEED). However, additions to code-minimum mechanical insulations can result in significant energy savings calculated as BTUs or \$ costs, and therefore can contribute to additional LEED credits.

As a supplement to the Whole Building Energy Simulation method, engineers may utilize other software programs such as 3E Plus® from the North American Insulation Manufacturers Association to demonstrate reductions in the process load of the building by increasing the levels of mechanical insulation in the project.

LEED™ is a registered trademark of the U.S. Green Building Council.

# LEED Program Specification of Mechanical Insulations

## Materials & Resources Credits

### **Credit 4.1 & 4.2 – Recycled Content**

According to CIR ruling dated November 2, 2006, all items specified under CSI MasterFormat 1995 Divisions 15 and 16 are to be excluded from MR credit calculations. This includes pipe and duct insulations, duct board, and flexible insulated ducts.

The cost/weight of these products is lower than many other building materials that are counted in MR credits. Johns Manville does not believe the exclusion of these products is warranted, and is encouraging changes in future versions of LEED that will allow recycled content in these products to count toward MR credits.

The recycled content and regional manufacturing information provided here is for reference only by LEED project teams, or may be used for submissions for alternative green building rating and incentive programs.

### **Notes on Recycled Content**

Several factors affect Johns Manville's ability to include recycled content in its products, including seasonal variation in the availability of recovered glass, variation in the type of recycled glass cullet (plate glass, bottle glass, etc.) and impurities inherent in recycled glass material (labels, colorants, etc.). A particular article of product may have as little as 5% or as much as 65% post-consumer glass content, and because fiber glass is manufactured using a combination of batch and continuous process technology, it is not feasible to know the precise recycled content used for a given article of insulation. Because of this, Johns Manville uses standard industry practice of calculating annual averages across a network of plants to calculate the amount of recycled glass used in some of its mechanical insulation products.

The percentage of recycled glass in a JM mechanical insulation product is adjusted for the density and percentage of glass in the final product in order to estimate the % of recycled content by weight of a finished product. Johns Manville considers this a leading industry practice, as some manufacturers only identify recycled content in the glass portion of their product and do not adjust for binders, facings, coatings, or other product components. Recycled content specified here is compliant with the following programs:

- LEED-NC v2.1 (Based on FTC guidelines for environmental claims)
- LEED-NC v2.2. (Based on ISO 14021)
- New York State Green Building Tax Credit Program
- NAHB Green Building Guidelines

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## Johns Manville Product Recycled Content

Table 1

Product Line	Product Type (If Applicable)	Thickness (in.)	Recycled Content		Manufacturing Site
			Minimum % Post-Consumer	Minimum % Pre-Consumer <sup>1</sup>	
800 Series Spin-Glas® Duct and Equipment Insulation	Type 812	1.5	17.5	4.0	Cleburne, TX
		2	17.5	4.0	
		2.5	17.5	4.0	
		3	17.5	4.0	
		3.5	17.5	4.0	
		4	17.5	4.0	
	Type 813	1.5	15.5	3.5	
		2	16.0	4.0	
		2.5	16.0	4.0	
		3	16.5	4.0	
		3.5	16.5	4.0	
		4	16.5	4.0	
	Type 814	1	15.5	3.5	
		1.5	16.0	4.0	
		2	16.5	4.0	
		2.5	16.5	4.0	
	Type 815	1	16.0	4.0	
		1.5	16.5	4.0	
		2	16.5	4.0	
		2.5	17.0	4.0	
		3	17.0	4.0	
		3.5	17.0	4.0	
		4	17.0	4.0	
	Type 817	1	16.5	4.0	
1.5		16.5	4.0		
2		17.0	4.0		
Micro-Flex® Large Diameter Pipe and Tank Insulation	n/a	1	16.0	4.0	Cleburne, TX
		1.5	16.5	4.0	
		2	17.0	4.0	
		2.5	17.0	4.0	
		3	17.5	4.0	
		3.5	17.5	4.0	
Microlite® XG™ Duct Wrap	Type 75	1.5	14.0	3.5	Winder, GA Willows, CA Innisfall, Alberta
		2	15.0	3.5	
		2.5	15.0	3.5	
		3	16.0	4.0	
	Type 100	1.5	15.0	3.5	
		2	15.5	3.5	
	Type 150	1.5	16.0	4.0	
		2	16.5	4.0	
LinaTex™ Duct Liner	Type 200	0.5	0	69.0	Houston, TX
	Type 150	1	0	72.0	
	Type 150	1.5	0	75.0	
Micro-Lok® HP Pipe Insulation	Minimum 20% Post-Consumer Recycled Content to be introduced for this product in April, 2007.				Defiance, OH

<sup>1</sup> Pre-Consumer content also qualifies as Post-Industrial content for older LEED versions.

# LEED Program Specification of Mechanical Insulations

## **Credit 5.1 & 5.2 – Regional Materials**

The requirements for Regional Material credits vary substantially between LEED-NC v2.1 and v2.2. This is one reason why it is **critical** for project teams to identify for contractors and vendors which certification is being sought.

Under v2.1, the first credit is granted for using 20% regionally manufactured materials. The second credit is granted if 50% of this content is also regionally extracted or harvested. Regional, for the purposes of these credits, is a distance of less than 500 miles from the project site.

Under LEED-NC v2.2, 10% of the content must be extracted/harvested and manufactured regionally (within 500 miles) to obtain the 1st credit (5.1) and 20% of the content must meet this requirement to obtain the 2nd credit (5.2).

Pipe and duct insulations, sheet metal ducts, duct board, and flexible ducts may not be counted toward calculations for these credits.

## **Johns Manville Mechanical Insulation Product Extraction & Manufacturing Locations**

The manufacturing locations of Johns Manville mechanical insulation products are identified here for reference only to the mechanical systems exclusion for MR credits. For alternative green building programs seeking regional/local building components, specifiers should verify with Johns Manville or their supplier that the product is available from the desired manufacturing location. The desired manufacturing location should be identified on all specification and procurement documents.

Johns Manville is currently auditing sources of raw materials for these products, but is currently not able to provide extraction-location information.

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**Mechanical Insulation Manufacturing Sites Showing 500 Mile Radii**

- ① Willows, CA 95988
- ② Innisfail, Alberta T4G 1A2
- ③ Cleburne, TX 76033
- ④ Houston, TX 77041

# LEED Program Specification of Mechanical Insulations



**Mechanical Insulation Manufacturing Sites Showing 500 Mile Radii**

- ③ Cleburne, TX 76033
- ④ Houston, TX 77041
- ⑤ Winder, GA 30680
- ⑥ Defiance, OH 43512
- ⑦ Edison, NJ 08837
- ⑧ Brossard, Quebec J4Y 2H5

# LEED Program Specification of Mechanical Insulations

Table 2

Application & Product	Available Manufacturing Locations
<b>Pipe, Tank &amp; Equipment Insulations</b>	
Micro-Lok® HP Pipe Insulation	Defiance, OH 43512
Micro-Flex® Large Diameter Pipe & Tank Insulation	Defiance, OH 43512
Spin-Glas® 800 Series Duct & Equipment Insulation	Cleburne, TX 76033
Spin-Glas® 1000 Series High Temperature Equipment Insulation	Cleburne, TX 76033
Zeston® PVC Fitting Covers & Jacketing	Edison, NJ 08837
Ceel-Co® PVC Fitting Covers & Jacketing	Edison, NJ 08837
<b>Insulations for Rectangular Steel Ducts</b>	
Linacoustic RC™ Duct Liner	Cleburne, TX 76033 Brossard, Quebec J4Y 2H5
Linacoustic™ R-300 Rigid Duct Liner	Cleburne, TX 76033
LinaTex™ Duct Liner	Houston, TX 77041
Spin-Glas® 800 Series Duct & Equipment Insulation	Cleburne, TX 76033
Microlite® Standard Duct Wrap	Winder, GA 30680
Microlite® XG™ Formaldehyde-free™ Duct Wrap	Winder, GA 30680 Willows, CA 95988 Innisfail, Alberta T4G 1A2
<b>Insulations for Round &amp; Spiral Steel Ducts</b>	
Spiracoustic® Plus Duct Liner	Cleburne, TX 76033
Microlite® Standard Duct Wrap	Winder, GA 30680
Microlite® XG™ Formaldehyde-free™ Duct Wrap	Winder, GA 30680 Willows, CA 95988 Innisfail, Alberta T4G 1A2
<b>Self-Insulated Duct Products</b>	
SuperDuct® RC™ Duct Board	Cleburne, TX 76033
Mat-Faced Micro-Aire® Duct Board	Cleburne, TX 76033

# LEED Program Specification of Mechanical Insulations

## Indoor Environmental Quality Credits

### **Credit EQ 3.2 – Construction IAQ Management Plan – Before Occupancy**

Option 2 for this Credit under LEED NC v2.2 requires testing for specific contaminant concentrations. For formaldehyde, the limits are:

- LEED NC v2.1 Credit 3.2 Option 2 : Formaldehyde <20 micrograms per cubic meter
- LEED NC v2.2 Credit 3.2 Option 2 : Formaldehyde ≤ 50 parts per billion

For the majority of fiber glass insulation products available today, urea-formaldehyde is an element of the binder that bonds the glass fibers to one another. A key strategy to achieving the formaldehyde limits set for either LEED version is to reduce the use of formaldehyde-containing building products during the specification stage. Two options are available for specification of mechanical insulation systems:

- GREENGUARD® Eco-Logo Certification : Products must fall below 50 ppb detection for formaldehyde.
- Johns Manville Formaldehyde-free™ : Products emit no measurable formaldehyde down to a detection limit of less than one part per billion.

The following table identifies Johns Manville products that should be specified when seeking this LEED credit option.

Formaldehyde-reducing Options for Mechanical Insulations		
Pipe, Tank & Equipment Insulation	Formaldehyde-free™	GREENGUARD® Certified
Linacoustic™ RC Duct Liner		✓
Microlite® XG™ Duct Wrap	✓	✓

### **Credit EQ 4.1 – Adhesives and Sealants**

The SCAQMD standard referenced by LEED-NC v2.1 and NC v2.2 have a substrate-specific VOC limit for adhesives and sealants used on fiber glass. Sealants used to install or repair duct liner must meet this limit of 200 g/L under LEED-NC v2.1, or 80 g/L under LEED-NC v2.2.

Johns Manville offers multiple products used in the installation and repair of fiber glass duct insulations that have been tested under the appropriate ASTM standards. These products may be specified for use in LEED projects during the fabrication and installation of fiber glass duct board and duct liner to contribute to obtaining a point under EQc4.1: Adhesives and Sealants.

Product	VOC Content
SuperSeal® HV	1.21 g/L.
SuperSeal® Edge Treatment	1.21 g/L.
SuperSeal® Duct Butter	60.3 g/L.

# LEED Program Specification of Mechanical Insulations

## Innovation & Design Process (ID) Credits

### Acoustic Comfort: Noise Pollution Reduction

According to Innovation in Design CIR Ruling dated 4/5/2004:

“A point in innovation may be available if the project team demonstrates that they have significantly exceeded standard practice for acoustic comfort within this building type. Please provide standards used as a baseline if applicable. All occupied building spaces should be included in this strategy, including corridors, break rooms, etc.”

In office and educational environments, the HVAC system may be a significant contributor of noise. A critical strategy for noise reduction for these mechanical systems is to specify fiber glass acoustical duct liners or duct board to reduce noise transmission resulting from:

- Fans, dampers and equipment
- “Crosstalk” traveling from room to room
- Sheet metal contraction and expansion

The acoustic performance of fiber glass duct insulation will vary based on several factors, however they generally provide superior performance over other typical duct materials. Increased thickness of fiber glass duct liners, especially in the last 20’ of duct prior to the vent or diffuser, can provide greater protection against measurable mechanical noise. In addition, for low-pressure systems, duct board provides an economical alternative to insulated sheet metal ducting and may offer increased acoustic and thermal performance.

**Table 3**

Acoustic and Thermal Performance of Duct Materials								
Material	Duct Noise Attenuation Loss - Frequency (Hz)*							Thermal R-Value (hr•ft <sup>2</sup> •°F)/Btu
	125	250	500	1000	2000	4000	NRC	
SuperDuct® RC™ Duct Board 1”	0.04	0.27	0.71	0.96	1.03	0.99	0.75	4.3
SuperDuct® RC™ Duct Board 1.5”	0.11	0.45	0.96	1.07	1.06	1.00	0.90	6.5
Linacoustic RC™ Duct Liner 1”	0.08	0.31	0.64	0.84	0.97	1.03	0.70	4.2
Linacoustic RC™ Duct Liner 1.5”	0.10	0.47	0.85	1.01	1.02	0.99	0.85	6.3
Spiracoustic® Plus Round Duct Liner 1”	0.05	0.21	0.71	1.01	1.07	1.04	0.75	4.3
Spiracoustic® Plus Round Duct Liner 1.5”	0.10	0.39	1.02	1.08	1.04	1.00	0.85	6.4
Elastomeric Foam 1”	0.01	0.02	0.12	0.34	0.23	0.19	0.25	3.8
Polyolefin Foam 1”	0.00	0.04	0.17	0.44	0.14	0.43	0.20	3.1
Bare Sheet Metal	0.10	0.10	0.10	0.10	0.10	0.10	0.10	n/a

\* Coefficients were tested in accordance with Test Method ASTM C 423-90 and ASTM E 795.

### Comprehensive Formaldehyde Reduction

As a strategy to provide a safe and healthy environment for both the construction teams and building occupants, a comprehensive formaldehyde reduction plan may warrant an Innovation in Design credit. Formaldehyde-free insulation is not addressed by “Indoor Environmental Quality Low-Emitting Materials Credits 4.1 – 4.4.” A whole building approach to formaldehyde reduction can begin with specifying Johns Manville Formaldehyde-free™ insulation products.

# LEED Program Specification of Mechanical Insulations

## Concerns on the Use of Fiber Glass Duct Liners and Duct Board

Although there is some resistance to the use of fiber glass duct liner or duct board for LEED projects due to concerns of mold growth or fiber erosion, these concerns are not justified. All Johns Manville duct insulation products that come in contact with the airstream are treated on the airstream surface with an EPA-registered anti-microbial agent to protect it against mold and bacteria.

According to the U.S. EPA, “Duct board and duct liner are widely used in duct systems because of their excellent acoustic, thermal, and condensation control properties. If the HVAC system is properly designed, fabricated, installed, operated and maintained, these duct systems pose no greater risk of mold growth than duct systems made of sheet metal or any other materials.”<sup>1</sup>

In addition, studies conducted over the last three decades demonstrate that fiber glass duct liner and fiber glass duct board exhibit insignificant signs of fiber erosion on surfaces in typical HVAC ducts. When properly installed, operated and maintained, these products do not increase airborne fiber levels in buildings. All Johns Manville duct airstream surfaces meet or exceed UL 181 test requirements for fiber erosion.

<sup>1</sup> <http://www.epa.gov/iaq/schooldesign/hvac.html>

# LEED Program Specification of Mechanical Insulations

Table 4

<b>Johns Manville Mechanical Insulation Summary Table</b>	Areas where product may contribute toward LEED Credits. Pre = Prerequisite Cr = Credit number			
	EA Energy & Atmosphere	MR Materials & Resources	EQ - Indoor Environmental Quality	ID Innovation & Design
<b>Pipe, Tank &amp; Equipment Insulations</b>				
Micro-Lok® HPP Pipe Insulation <sup>1</sup>	<b>Pre 2, Cr 1</b>	<b>Excluded from MR calculations under LEED NC</b>	–	–
Micro-Flex® Large Diameter Pipe & Tank Insulation	<b>Pre 2, Cr 1</b>		–	–
Spin-Glas® 800 Series Duct & Equipment Insulation	<b>Pre 2, Cr 1</b>		–	–
Spin-Glas® 1000 Series High Temperature Equipment Insulation	<b>Pre 2, Cr 1</b>		–	–
Zeston® PVC Fitting Covers & Jacketing	–		–	–
Ceel-Co® PVC Fitting Covers & Jacketing	–		–	–
<b>Insulations for Rectangular Steel Ducts</b>				
Linacoustic RC™ Duct Liner	<b>Pre 2, Cr 1</b>	<b>Excluded from MR calculations under LEED NC</b>	<b>Cr 3.2<sup>2</sup></b>	<b>Cr 1.1 - 1.4<sup>3</sup></b>
Linacoustic™ R-300 Rigid Duct Liner	<b>Pre 2, Cr 1</b>		–	<b>Cr 1.1 - 1.4<sup>3</sup></b>
LinaTex™ Duct Liner	<b>Pre 2, Cr 1</b>		–	<b>Cr 1.1 - 1.4<sup>3</sup></b>
Spin-Glas® 800 Series Duct & Equipment Insulation	<b>Pre 2, Cr 1</b>		–	–
Microlite® Standard Duct Wrap	<b>Pre 2, Cr 1</b>		–	–
Microlite® XG™ Duct Wrap	<b>Pre 2, Cr 1</b>		<b>Cr 3.2<sup>2</sup></b>	–
<b>Insulations for Round &amp; Spiral Steel Ducts</b>				
Spiracoustic® Plus Duct Liner	<b>Pre 2, Cr 1</b>	<b>Excluded from MR calculations under LEED NC</b>	–	<b>Cr 1.1 - 1.4<sup>3</sup></b>
Microlite® Standard Duct Wrap	<b>Pre 2, Cr 1</b>		–	–
Microlite® XG™ Duct Wrap	<b>Pre 2, Cr 1</b>		–	<b>Cr 1.1 - 1.4<sup>4</sup></b>
<b>Self-Insulated Duct Products</b>				
SuperDuct® RC™ Duct Board	<b>Pre 2, Cr 1</b>	<b>Excluded from MR calculations under LEED NC</b>	–	<b>Cr 1.1 - 1.4<sup>3</sup></b>
Mat-Faced Micro-Aire® Duct Board	<b>Pre 2, Cr 1</b>		–	<b>Cr 1.1 - 1.4<sup>3</sup></b>
<b>Duct Sealants &amp; Adhesives</b>				
SuperSeal® HV	–	–	<b>Cr 4.1</b>	–
SuperSeal® Edge Treatment	–	–	<b>Cr 4.1</b>	–
SuperSeal® Duct Butter	–	–	<b>Cr 4.1</b>	–

<sup>1</sup> Recycled content expected to be available April, 2007.

<sup>2</sup> Option 2 only.

<sup>3</sup> Acoustic comfort.

<sup>4</sup> Formaldehyde reduction.

## Additional Resources

For technical literature and tools for Johns Manville mechanical insulations, please visit:

For Air Handling applications: [www.jmairhandling.com](http://www.jmairhandling.com)

For Pipe and Equipment applications: [www.jmpipeinsulation.com](http://www.jmpipeinsulation.com)

# LEED Program Specification of Mechanical Insulations

## NOTES



### North American Sales Offices, Performance Materials Division

#### Eastern Region

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#### Western Region and Canada

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(800) 368-4431  
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## Johns Manville

### Performance Materials Division

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www.jmairhandling.com  
www.jmpipeinsulation.com

AHS-401 11-06 (New)

The physical and chemical properties of the Mechanical Insulation Products listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check with the Regional Sales Office nearest you to assure current information. **All Johns Manville products are sold subject to Johns Manville's Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville Limited Warranty and Limitation of Remedy, and information on other Johns Manville thermal insulations and systems, call (800) 654-3103.**



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