



Effective: February 1st, 2011

EAS: Sound Absorption Panels

Green-Buildings' team of LEED® Accredited Professionals performed a benchmark analysis of Empire Acoustical Systems' line of sound absorption panels including the M90, Angle-Lok, Silent Screen and Silent Screen Septum and determined that they may contribute to a high performance sustainable building in the following ways:

- A. Improve Building Durability**
- B. Reduce Demand for Raw Materials**
- C. Conserve Energy and Electricity**
- D. Improve Indoor Environmental Quality**

Green-Buildings believes that this may contribute meaningfully to green building projects, such as those that pursue a LEED® Certification or other green rating systems.



EXECUTIVE SUMMARY

Empire Acoustical Systems (EAS) based in Round Rock, Texas and Princeton, Illinois, focuses on the custom engineering, fabrication, and installation of acoustical enclosures, noise barriers and sound absorptive wall mountings.

Their sound absorptive panels are designed for wall-mounting indoor and outdoor applications, such as (but not limited to) attenuating the sound from highways, mechanical equipment yards or HVAC rooms within the building. These products provide excellent sound attenuation, thermal and fire resistance, are manufactured using a high percentage of pre and post-consumer recycled materials, and have little to no VOC content.

Empire Acoustical Systems worked with Green-Buildings to complete a review of their M-90 “Backless” wall mounted panel, the Angle-Lok, the Silent Screen “Standard” and Silent Screen “Septum” panels.

Green-Buildings’ team of LEED® Accredited Professionals performed an analysis of EAS’s M-90 “Backless” wall mounted sound absorption panels and determined that these products may:

- A. Improve Building Durability**
- B. Reduce Demand for Raw Materials**
- C. Conserve Energy and Electricity**
- D. Improve Indoor Environmental Quality**

Green-Buildings believes that several characteristics of EAS’s M-90 panel are congruent with green building principles and, as such, the product may be considered applicable to high-performance sustainable buildings and also may contribute meaningfully to green building projects that pursue a LEED® Certification.

DETAILS

The EAS sound absorption panels are fabricated from either 16 or 22 gauge galvanized steel and may be coil coated or powder coated depending on the application. The Angle-Lok panel is a 22 gauge cold formed sheet steel panel in which the sound strikes the panel and is reflected back to the noise source. The M-90, Silent Screen and Silent Screen Septum panels are either 16 or 22 gauge steel panels where the steel tray is filled with mineral rock wool insulation. Mineral rock wool insulation is made in a process using basalt and iron-ore slag that is melted, spun into fibers, and held together with a phenolic resin. This insulation absorbs the remaining sound not reflected back towards the noise source.

All four EAS sound absorbing panels are non-corrosive, have a melting point of over 2,000 degrees Fahrenheit, and have a flame spread of less than 15 and a smoke development of 0 when tested in accordance with ASTM Standard E-84. They are rated incombustible by ASTM Standard E-136, are non-hygroscopic, and have a Noise Reduction Coefficient (NRC) of greater than 1 and Sound Transmission Class (STC) between 22 and 39. When specified, the EAS panels may use an alternative absorptive material such as fiberglass.

The EAS M-90 “Backless” wall mounted panels are a 22 gauge cold formed sheet steel panel and use a two-inch mineral rock wool sound absorbing batt with a density of 6 pounds per cubic foot with a galvanized or pre-coated steel face panel. Since the M-90 panel is backless, it does not have an STC rating. The Silent Screen “Standard” panel is either a 16 or 22 gauge sheet steel panel with a 2-3/4” layer of mineral rock wool insulation, and the Silent Screen “Septum” uses a 3” layer of insulation.

A. Improve Building Durability

A key green building principle is the improvement of building quality and durability to reduce or eliminate the frequency of building maintenance, replacement and repair. Often, the greenest buildings are those that do not need to be replaced. Products that help promote a durable design and ongoing performance enhancements may result in a building that will last longer, thereby avoiding future downstream waste.

Steel is one of the strongest and most durable materials available, while mineral rock wool insulation board is water repellent, non-combustible and designed for high temperature applications where durability and high flexibility are required. The high density of the mineral rock wool insulation makes it an excellent sound absorber, as displayed with an NRC of greater than 1 and STC between 22 to 29, helping to create a quieter environment in the facility.

Flame spread is a metric used to describe the surface burning characteristics of a material and is one of the most tested fire performance properties of a material. One of the most common tests of flame spread is ASTM Standard E-84, which measures how far and how fast flame spreads across the surface of a material. With a melting temperature of over 2000 degrees Fahrenheit and a flame spread of less than 15, the mineral rock wool insulation is considered a Class A material per NFPA 101 (Life Safety Code) and provides increased fire resistance and improved life safety in the facilities in which it is used.

Mineral rock wool insulation is also water-repellent and allows for reduced probability that deterioration may occur if moisture is introduced to a building’s envelope. Mineral rock wool insulation does not support mold, mildew and/or fungus, which can further weaken interior building elements and/or require materials replacement.

B. Reduce Demand for Raw Materials

By incorporating recycled content into building materials, green builders may not only reduce the impact that results from the extraction and processing of raw materials, but also reduce the volume of solid waste that is produced as a byproduct of our built environment.

Steel is the most recycled material in North America and in the world, and in the United States alone, almost 83 million tons of steel were recycled or exported for recycling in 2007¹. Individual company statistics are not applicable or instructive because of the open loop recycling capability that the steel and iron industries enjoy, with available scrap typically going to the closest melting furnace².

The supplier of the sheet metal used in the EAS panels (Majestic Steel) uses both the Basic Oxygen Furnace (BOF) and Electric Arc Furnace (EAF) technology at all of its steel recycling facilities. In 2007, the American Iron and Steel Institute (AISI) calculated the pre-consumer recycled content of steel made in the BOF process is 6.8% pre-consumer and 25.5% post-consumer and in the EAF process the recycled content is 31.4% pre-consumer and 56.9% post-consumer. These values are slightly different than the values that Majestic Steel reported in for its Prime Painted and Non-Painted, Hot Dipped Galvanized Non Chem-treat G90 flat roll steel which are the same in the BOF process but are 8% pre-consumer and 60% post-consumer recycled content for steel made in the EAF process.

The mineral rock wool insulation used in EAS sound absorbing panels, Roxul RHT 60 mineral rock wool, is a semi-rigid insulation made from basalt rock and steel slag. This particular type of insulation is manufactured with 14% pre-consumer and 0% post-consumer recycled content.

C. Conserve Energy and Electricity

According to the U.S. Department of Energy, buildings are responsible for approximately 39% of the energy consumed in the United States. It is estimated that a significant portion of this energy use would be unnecessary if all buildings were properly insulated.

Mineral wool insulation is not only a good material for sound attenuation; it also provides excellent thermal resistance and can play a significant role in reducing the energy used in heating and cooling residential and commercial buildings. By reducing the transfer of heat energy through a building's envelope, EAS's M-90, Silent Screen and Silent Screen Septum panels not only helps to minimize the amount of energy needed to heat and cool a building, but also reduces

¹ Steel Recycling Institute, www.recycle-steel.org

² American Institute of Steel Construction www.aisc.org

the greenhouse gas (GHG) emissions, such as CO₂, commonly produced by coal-fired power plants.

The thermal resistance (R-value per inch) of the Roxul mineral rock wool insulation is 4.2 hr-ft²-F / BTU, as tested by ASTM Standard C 518. Therefore, the 2 inch Roxul insulation in the EAS M-90 panel has an R-value of 8.4, which would be additive to the R-value of the wall in which it was installed. The R-value of the Silent Screen panel is 11.55 hr-ft²-F/BTU and the Silent Screen Septum has an R-value of 12.6 hr-ft²-F/BTU. Roxul mineral rock wool has a fairly high R-value when compared to other typical types of rigid board insulation, which range anywhere from approximately 2.7-8.2 per inch³, providing excellent thermal resistance and hence has a better ability to conserve energy.

D. Improve Indoor Environmental Quality

Providing a comfortable thermal environment while improving indoor environmental quality enhances occupant health, productivity and well-being and is an essential goal for any green building. The U.S. Environmental Protection Agency (EPA) estimates that indoor pollution and/or contaminant levels may be two to five times (and potentially up to one hundred times) greater than outdoor levels. Potential threats to indoor environmental quality include the presence of hazardous chemicals, high concentrations of airborne fibers, and smoke, mildew, mold and/or fungus contamination.

Mineral rock wool contains no asbestos or chemical additives. Neither the raw materials used in manufacturing nor the finished product contain any ozone depleting chemicals. Also, mineral rock wool insulation products are not classified as, nor do they contain, hazardous air pollutants. While phenol-formaldehyde is present in the manufacturing process, aspects of the process itself, such as high temperature heat curing and an inherent chemical reaction, eliminate all free formaldehyde from the final insulation product. While formaldehyde is a known carcinogen, mineral wool fibers are classified as non-carcinogenic by the International Agency for Research on Cancer (IARC). As discussed previously, mineral rock wool insulation also is water-repellent and does not support mold, mildew and/or fungus.

The sheet metal can be either color coated using Akzo Nobel Coatings Inc's TRINAR 2 Coat Color System or powder coated (depending on customer preference) with the Sherwin Williams Powdura[®] powder coating. The Akzo Nobel Coatings Inc's TRINAR 2 Coat Color System has an initial VOC content range of 659-718 g/L; however when applied to the M-90 panel in a thermal oxidation process, those VOCs are consumed and leave the final product with little to no VOC content. The Sherwin Williams Powdura[®] powder coating has a VOC content of 0 g/L.

³ Per ASHRAE Fundamentals Handbook, 1997

There are two properties which are used to measure the performance of acoustical panels, sound absorption and sound transmission.

Sound absorption is the ability of a noise panel to internally dissipate (as heat) incident acoustical energy. This is measured in terms of a sound absorption or noise reduction coefficient. The higher the value of the coefficient, the more sound will be “absorbed,” leaving less to be transmitted or reflected. Theoretically, a coefficient value of 1.0 indicates that all incident energy is absorbed.

Sound transmission loss is a measure of the amount by which a noise level is reduced as the noise “passes through” a panel or barrier. Transmission loss is measured in decibels, and a high transmission loss indicates that a panel will be able to block substantial amounts of noise.

EAS panels have been tested in an independent acoustical laboratory.⁴ Typical performance data for standard panels is listed in Table 1. Sound transmission loss tests were performed in accordance with ASTM-E90 and ASTM-E413. Sound absorption tests were performed in accordance with ASTM-C423 and ASTM-E795.

⁴ All acoustical tests are certified by Riverbank Acoustical Laboratories, an independent testing laboratory.

Table 1: Independent Laboratory Results for Noise Reduction

TEST ACOUSTICAL RATING	
SOUND ABSORPTION	
RAL-A90-1 (M-90) 22 gauge sheet steel Composite Panel with perforated metal facing and 2” insulation	NRC-1.1
RAL-A90-462 (Silent Screen Septum) 22 gauge sheet steel Composite Panel with perforated metal facing and 3” insulation	NRC-1.1
RAL-A95-63 (Silent Screen Standard) 18 gauge sheet steel Composite Panel with perforated metal facing and 2” insulation	NRC-1.05
SOUND TRANSMISSION LOSS	
RAL-TL90-352 (Silent Screen Septum)	
Composite Panel with perforated metal facing	STC-39
RAL-TL92-204 (Silent Screen Standard) Composite Panel with perforated metal facing	STC-35
Angle-Lok 22 gauge cold formed sheet steel panel	STC-22

The Noise Reduction Coefficient (NRC) is a single-number index determined in a lab test and used for rating how absorptive a particular material is. This industry standard ranges from zero (perfectly reflective) to 1⁵ (perfectly absorptive). For example, a material with an NRC of 0.80 will absorb 80% of the sound that comes in contact with it, and will reflect 20% of the sound back into the space.

⁵ Based on the testing methodology, and depending upon the material's shape or surface area, some products can test at an NRC above 1 (www.nrcratings.com).

A higher Sound Transmission Class (STC) rating blocks more noise from transmitting through a partition. Loud speech can be understood fairly well through an STC 30 wall, but should be inaudible through an STC 60 wall⁶. A change in STC +/- 5 is clearly noticeable, while a change of +/- 10 is twice (or half) as loud.

NRC and STC are completely exclusive of one another. A high NRC does not necessarily correlate to a high STC, and vice-versa. Table 2 displays NRCs for various common building materials. As compared to the NRC of these materials, the EAS Panels are extremely effective at absorbing and reflecting sound in the spaces in which the product is properly installed.

Table 2: Noise Reduction Coefficients (NRC) for Common Building Materials⁷:

Material	NRC
Brick, painted	.00 - .02
Brick, unpainted	.00 - .05
Carpet, indoor-outdoor	.15 - .20
Carpet, heavy on concrete	.20 - .30
Carpet, heavy on foam rubber	.30 - .55
Concrete (smooth), painted	.00 - .05
Concrete (smooth), unpainted	.00 - .20
Concrete (block), painted	.05
Concrete (block), unpainted	.05 - .35
Cork, floor tiles (3/4" thick)	.10 - .15
Cork, wall tiles (1" thick)	.30 - .70
Drapery, light weight (10oz.)	.05 - .15
Drapery, medium weight (14oz.), velour draped to half	.55
Drapery, heavy weight (18oz.), velour draped to half	.60
Fabric on Gypsum	.05
Fiberglass, 3-1/2" batt	.90 - .95
Fiberglass, 1" Semi-rigid	.50 - .75
Glass	.05 - .10
Gypsum	.05
Linoleum on Concrete	.00 - .05
Marble	.00
Plaster	.05
Plywood	.10 - .15

⁶ www.acoustics.com

⁷ www.nrratings.com

Polyurethane Foam (1" thick, open cell, reticulated)	.30
Rubber on Concrete	.05
Seating (occupied)	.80 - .85
Seating (unoccupied), metal	.30
Seating (unoccupied), wood	.30
Seating (unoccupied), fabric upholstered	.60
Seating (unoccupied), leather upholstered	.50
"Soundboard" (1/2" thick)	.20
Sprayed Cellulose Fibers (1" thick on concrete)	.50 - .75
Steel	.00 - .10
Terrazzo	.00
Wood	.05 - .15

In summary, when installed properly, EAS's sound absorption panels may improve indoor environmental quality by not contributing to mold germination and growth while also providing the ability to absorb noises transmitted through ceilings, walls and floors helps reduce internal noise pollution and sound transmission from outdoors.

LEED® CREDITS

To earn certification under the Leadership in Energy and Environmental Design (LEED®) rating systems, projects must not only satisfy all LEED system prerequisites, but also earn a minimum number of additional credits. Projects may earn a range of sequentially higher LEED certification ratings as determined by their compliance, as well as exemplary performance, in the credit categories within each system.

When applied properly, Green Buildings believes that EAS's M-90 panels will contribute materially toward earning additional credits in a LEED certification in the following prerequisite (s) and/or credit(s) under the LEED Green Building Design and Construction Rating System (BD +C, 2009, which includes New Construction & Major Renovations, Core & Shell and Schools) and LEED for Healthcare Rating System.

Note that no individual material or product is guaranteed to earn a credit or certification within the LEED rating system due to the fact that each category is dependent on the aggregate of all materials and their proportionate relationship to the total dollar cost of all materials. See individual product data sheets for details and check with local sales representative for appropriate product applications and eligibility. Only the Green Building Certification Institute (GBCI) can determine if a building or project qualifies for LEED certification.

Table 2: LEED BD+C (New Construction & Major Renovations, Core & Shell and Schools) Contribution Chart

LEED Credit and Category	LEED Requirement	Product contribution
Energy and Atmosphere (EA)		
Prerequisite 2: Minimum Energy Performance (M-90, Silent Screen and Silent Screen Septum)	Demonstrate a 10% improvement in the proposed building performance rating for new buildings and 5% in major renovations when compared with the baseline building performance rating as calculated per ASHRAE 90.1-2007 Appendix G using a computer simulation.	The mineral rock wool insulation in the EAS panels help deliver an energy-efficient building envelope thereby reducing energy associated with heating and cooling a building.
Credit 1: Optimize Energy Performance (1-19 points, New Construction/Schools OR 3-21 points, Core & Shell) (M-90, Silent Screen and Silent Screen Septum)	Demonstrate a percentage improvement over the prerequisite amount in the proposed building performance rating compared to the baseline building using a computer simulation.	
Materials & Resources (MR)		
Credit 4: Recycled Content (1-2 points) (All products)	Use materials with recycled content such that the sum of post-consumer recycled content plus ½ of the pre-consumer content constitutes at least 10 or 20%, based on cost, of the total value of the materials in the project.	Pre-consumer recycled content of steel made in the BOF process is 6.8% pre-consumer and 25.5% post-consumer and in the EAF process the recycled content is 31.4% pre-consumer and 56.9% post-consumer. The Roxul RHT 60 mineral rock wool semi-rigid insulation is manufactured with 14% pre-consumer and 0% post-consumer recycled content.

<p>Credit 5: Regional Materials (1-2 points) (All products)</p>	<p>Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10 or 20%, based on cost, of the total materials value.</p>	<p>Majestic steel procures steel products from manufacturing facilities throughout the US that are often within 500 miles of the project site. Roxul has 2 strategically located plants – one in Ontario and another in British Columbia – both are near highly populated areas and in close proximity to major transportation routes. Project site distances would have to be calculated for eligible Points.</p>
<p>Indoor Environmental Quality (IEQ)</p>		
<p>Credits 7.1: Thermal Comfort, Design (1 point) (M-90, Silent Screen and Silent Screen Septum)</p>	<p>Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy.</p>	<p>The mineral rock wool insulation in the EAS panels contribute to a comfortable indoor environment through its insulating properties.</p>
<p>Prerequisite 3: Minimum Acoustical Performance (LEED BD+C for Schools) (All products)</p>	<p>Design classrooms/core learning spaces to include sufficient sound-absorptive finishes to comply with ANSI standards and meet maximum background noise levels for HVAC systems of 45 dBA.</p>	<p>EAS panels contribute to an acoustically-sound indoor environment with an NRC of greater than 1, an STC between 22 to 29 and may aid in acoustical control when applied in exterior or interior walls and ceilings.</p>
<p>Credit 9: Enhanced Acoustical Performance (LEED BD+C for Schools) (1 point) (All products)</p>	<p>Design classrooms/core learning spaces to include sufficient sound-absorptive finishes to comply with ANSI standards to an STC rating of 35 and meet maximum background noise levels for HVAC systems of 40 dBA.</p>	<p>EAS panels contribute to an acoustically-sound indoor environment with an NRC of greater than 1, an STC between 22 to 29 and may aid in acoustical control when applied in exterior or interior walls and ceilings.</p>

Innovation in Design (ID)		
Credit 1 (1-5 points) (All products)	Achieve significant, measurable environmental performance using a strategy not addressed in the LEED 2009 for New Construction and Major Renovations Rating System. One point is awarded for each innovation achieved. No more than 5 points under IDc1 may be earned through PATH 1—Innovation in Design	The EAS panels provide superior thermal, acoustical and fire performance and may qualify for points in this category.

Table 3: LEED for Healthcare Contribution Chart

LEED Credit and Category	LEED Requirement	Product contribution
Indoor Environmental Quality (IEQ)		
Credit 2: Acoustic Environment (1-2 points) (All products)	Design the facility to meet or exceed the sound and vibration criteria outlined in the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (2010 Guidelines) and the Sound and Vibration Design Guidelines for Health Care Facilities, including New Guidelines for NICUs (January 1, 2010; Version 2.0) (SV Guidelines).	EAS panels contribute to an acoustically-sound indoor environment with an NRC of greater than 1, an STC between 22 to 29 and may aid in acoustical control when applied in exterior or interior walls and ceilings.
Credit 4: Low-Emitting Materials (1-4 points) (All products)	Ceiling tiles, including suspended acoustical tiles, and wall coverings shall comply with the testing and product requirements of the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers version 1.1 (CDPH/EHLB/M-500 Standard Method v1.1) modeled using the standard office building protocol parameters and certified as compliant by an independent third party	The Sherwin Williams Powdura® powder coating products all have a VOC content of 0 g/L. Akzo Nobel Coatings Inc’s TRINAR 2 Coat Color System has little to no VOC content when used in a thermal oxidizing process.
Materials & Resources (MR)		

<p>Credit 3: Sustainable Sourced Materials and Products (1-4 points)</p> <p>(All products)</p>	<p>One point and up to a maximum of four will be awarded for each 10% of the total value of all building materials and products used in the project (based on cost) that meet the criteria listed in the LEED for Healthcare reference guide for salvaged/reused material, recycled material, regionally sourced material, rapidly renewing material and certified wood.</p>	<p>Pre-consumer recycled content of steel made in the BOF process is 6.8% pre-consumer and 25.5% post-consumer and in the EAF process the recycled content is 31.4% pre-consumer and 56.9% post-consumer. The Roxul RHT 60 mineral rock wool semi-rigid insulation is manufactured with 14% pre-consumer and 0% post-consumer recycled content. Majestic steel procures steel products from manufacturing facilities throughout the US that are often within 500 miles of the project site. Roxul has 2 strategically located plants – one in Ontario and another in British Columbia – both are near highly populated areas and in close proximity to major transportation routes. Project site distances would have to be calculated for eligible Points.</p>
--	--	---

Energy and Atmosphere (EA)

<p>Prerequisite 2: Minimum Energy Performance</p> <p>(M-90, Silent Screen and Silent Screen Septum)</p>	<p>Demonstrate a 10% improvement in the proposed building performance rating for new buildings and 5% in major renovations when compared with the baseline building performance rating as calculated per ASHRAE 90.1-2007 Appendix G using a computer simulation.</p>	<p>The mineral rock wool insulation in the EAS panels help deliver an energy-efficient building envelope thereby reducing energy associated with heating and cooling a building.</p>
---	---	--

<p>Credit 1: Optimize Energy Performance (1-24 points) (M-90, Silent Screen and Silent Screen Septum)</p>	<p>Demonstrate a percentage improvement over the prerequisite amount in the proposed building performance rating compared to the baseline building using a computer simulation.</p>	
<p>Innovation in Design (ID)</p>		
<p>Credit 1 (1-4 points) (All products)</p>	<p>Achieve significant, measurable environmental performance using a strategy not addressed in the LEED 2009 for Healthcare Rating System. One point is awarded for each innovation achieved. No more than 4 points under IDc1 may be earned through PATH 1—Innovation in Design</p>	<p>The EAS panels provide superior thermal, acoustical and fire performance and may qualify for points in this category.</p>

CONCLUSION

The EAS sound absorption panels including the Angle-Lok, M-90, Silent Screen Standard and Silent Screen Septum meet four significant criteria used in green building initiatives. Through its sustainable sourcing, recycled materials, fire resistant material qualities and excellent acoustical and thermal insulating properties, the EAS panels can improve building durability, maximize energy efficiency, minimize heat and/or cooling loss, improve indoor environmental quality and minimize impact on the environment through decreased usage of raw materials for building construction.

All of these characteristics make the EAS sound absorption panels a product that Green-Buildings.com would recommend for any project with sustainable design or performance goals or any project that is pursuing LEED® certification.

Product Reviewed by: David M. Pratt, P.E., CEM, LEED® AP (BD + C)