

ZONOLITE MASONRY INSULATION

Arabian Vermiculite Industries

AVI is a leading manufacturer of a wide range of quality products for use in all areas of construction, produced under licenses from W.R. Grace and Co., U.S.A. These include fire protection materials, wall and roof Insulation, Acoustical insulation and a wide range of Horticultural soils.

AVI dedication to the industry through ongoing research programs results in product improvements and new, innovative materials. **AVI** is a company with a heritage of proven performance, at present geared to state of the art technology, a future limited only by imagination and a commitment to remain one step ahead of a changing world.

Zonolite Masonry Insulation: The Best In-Core Insulation

Zonolite Masonry Insulation lightweight, free-flowing, inorganic vermiculite specially treated for water repellency. It provides a quick, inexpensive and permanent method for efficiently insulating masonry walls. It is the best in-core masonry insulation available today.

When poured into the core of masonry walls, **Zonolite Masonry Insulation** forms a non-toxic, non-settling barrier against the transmission of heat, sound and moisture. And because its inorganic, it is noncombustible and will not rot, emit odors or attract vermin.

Zonolite Masonry Insulation offers total, functional performance to the architect and building owner.

Highest R-Value of any In-Core Insulation

Zonolite Masonry Insulation offers the lowest in-place U-value (highest R-value) of any in-core insulation. This equates to greater energy savings and building comfort for the owner.

Year round building comfort is increased when masonry walls are insulated. In winter, inside wall temperatures may be up to 13°F higher when insulation is used because radiant hear loss is reduced. Conversely, in summer, insulated walls reduce radiant heat flow to the interior of the building.

Zonolite Masonry Insulation can help reduce unwanted heat flow and increase building comfort.

In-Place Performance: It's Just Not the Same as Calculated Performance

Traditionally, thermal performance values for in-core masonry insulations have been based on calculations using the assumption that heat flows unidirectional. That is, that is flows in a straight line.

However, in actual installations, heat flows following the path of least resistance. It "finds" voids, cracks and holes in the insulation and escapes, reducing the thermal efficiency of the insulation.

The difference between calculated and actual, in-place thermal performance was highlighted in test sponsored by W.R. Grace and Co, U.S.A.

The True Story of Block Walls

Tests were conducted by Dynatherm Engineering, a leading independent testing laboratory, according to the ASTM C236 standard, acceptable way to determine insulation efficiency in non-homogenous walls according to the American Society of Testing and Materials.

Masonry walls were construction 8" lightweight block according to common building practices. The thermal performance of these walls was identical before they were insulated. But, once insulated, substantial changes occurred and the results speak for themselves.



Zonolite Masonry Insulation Out-Performed all of the Other Insulations Tested

Zonolite Masonry Insulation delivered the highest in-place R-value of all the in-core insulations tested. It outperformed Expanded Polystyrene Scrap, Expanded Polystyrene Inserts and Urea Formaldehyde Foam.

Zonolite Masonry Insulation out-performed other tested insulations primarily because of one important characteristics of the material. It flows freely and completely fills the block core without settling. In contrast, other in-core materials develop insulation voids which provide a path for convective looping, thus dramatically reducing their thermal efficiency. Polystyrene Beads have a static charge which hinders complete filling of the wall; Polystyrene inserts, by design, do not completely fill a block core; and Urea-Formaldehyde Foam cracks and separates over time.

| Thermal Values of In-Core Masonry Insulations | | | | | | |
|---|------------|-----------------|------------|--------|--|--|
| (8" Lightweight Block Construction) | | | | | | |
| | U-value | U-value R-value | | | | |
| Material | Calculated | Actual | Calculated | Actual | | |
| | | Tested | | Tested | | |
| Zonolite | .14* | .17 | 7.1* | 5.9 | | |
| Masonry | | | | | | |
| Insulation | | | | | | |
| Polystyrene | .21 | .24 | 4.8 | 4.2 | | |
| Inserts | | | | | | |
| Polystyrene | .12 | .19 | 8.3 | 5.3 | | |
| Scrap | | | | | | |
| Urea- | .12 | .19 | 8.3 | 5.3 | | |
| Formaldehyde | | | | | | |
| Foam | | | | | | |

*Calculated system R-value using measured vermiculite thermal conductivity (k) of 0.39 and calculated block k density from ASHRAE, 1981

Calculated Values are Full of Holes

The tests previously outlined dramatically illustrate the problems associated with using only calculated values. **Zonolite Masonry Insulation does not** rely on calculated values for reporting thermal performance in block walls, and following our lead, many other manufacturers of in-core insulation systems are now beginning to recognize and report in-place thermal performance.

The specifier should consider how insulation will perform inplace in making specification decisions. Demand actual test results when an in-core insulation. And, remember, the better the insulation's ability to completely fill the void and eliminate convective looping, the better its thermal efficiency in-place.

Complies with Energy Standards

More and more building codes are adopting mandatory energy standards to help control energy loss. The most prominent of these is ASHRAE Standard 90-75, "Energy

Conservation in New Building Design". Using **Zonolite Masonry Insulation** in the cavities of masonry blocks helps meet the requirements of this standard, even when doors and windows are introduced into the wall system. **Zonolite Masonry Insulation** also meets the quality standards of the State of California.

Zonolite Masonry Insulation has been specified and used in Saudi Arabia and the Middle East since 1985 and conforms to SCECO and all the local specifying authorities in the Gulf.

Meets the Highest Standards

Zonolite Masonry Insulation can be manufactured to meet or exceed the following standards:

- American Society for Testing and Materials, Specification for Vermiculite Loose Fill Insulation, ASTM C516080, Type II Material
- Federal Specification for Insulation, Thermal (Vermiculite) HH-I-585C*
- City of New York MEA 117-72M
- Structural Clay Products Institute Criteria for Vermiculite-Insulated Cavity Walls
- National Concrete Masonry Association General Performance Criteria
- Federal Specification HH-I-585C superseded by ASTM C516 March 31, 1983

Zonolite Masonry Insulation will not burn.

It meets the highest Underwriters Laboratories, Inc. ratings and improved the fire rating of a wall system.

When tested according to ASTM E84 Tunnel test, **Zonolite Masonry Insulation** received the following ratings:

| Flame Spread | 0 |
|------------------|---|
| Fuel Contributed | 0 |
| Smoke Developed | 0 |

Extends Fire Protection Up to 6 Hours

Zonolite Masonry Insulation walls can easily provide fire ratings of over 6 hours. This means that in a fire, walls remain standing longer – providing greater time for evacuation, less damage to contents and extended protection for emergency personnel. In milder fire that does not destroy walls, **Zonolite Masonry Insulation** simplifies the rebuilding process, because reconstruction can begin with fully insulated walls already in place.

Combining the fire protection of **Zonolite Masonry Insulation** with its already demonstrated thermal performance results in a well-insulated wall with hours of fire protection.

Fire Wall Surpasses UL Equipment

The ASTM E119 test assembly at Underwriters Laboratories consisted of a concrete masonry wall 10 feet high by 10 feet wide constructed from $8" \times 8"$ 16" block. The wall carried a full design load through the entire test. One half of the wall was filled with **Zonolite Masonry Insulation** and the other side was left empty to establish baseline conditions.

A series of thermocouples was attached to the face of the block wall away from the fire to monito the temperature increases that resulted from the application test limit after 3 hours and 20 minutes of fire testing.

As the test progressed, it became evident that the side the wall filled with **Zonolite Masonry Insulation** was not increasing at the rate that would indicate failure before 5 hours. In fact, it appeared that the wall insulated with **Zonolite Masonry Insulation** would exceed the safety limits of the fire testing equipment before failure. Therefor to protect this equipment from damage, the test was discontinues at 6 hours and 5 minutes.

Severe Testing Does Not Destroy Wall

As the wall came away from the furnace still intact in test carrying full design load, the surface of the wall closest to the fire still glowed a brilliant incandescent yellow orange. As the high pressure fire hose stream struck this read hot surface, the thermal shock was audible, similar to firing a gun in a closed room. The wall successfully maintained its integrity and held the full design load throughout the five minute fire hose stream test.

The wall was allowed to stand overnight, still carrying a full load. The following morning, the load on the wall was increased to twice the deign load to check out the wall to see if an adequate safety factor was still maintained after this torturous test. The wall successfully held double the design load.

UL Rated Wall Designs

Because of **Zonolite Masonry Insulation's** outstanding performance, it can be utilized in the following UL Designs for the construction of wall assemblies when either loaded or non-loaded 2 to 4 hours fire ratings are required.

| UL | 901 |
|----|-----|
| UL | 904 |
| UL | 905 |
| UL | 907 |

Reduced Sound Transmission

Zonolite Masonry Insulation helps address one of

today's major problems: noise. As building construction, costs continue to rise, more and more activities are concentrated into smaller spaces and controlling sound has become a challenge.

Zonolite Masonry Insulation can help – whether the goal is to reduce the sound transmitted between walls within a structure or reduce the transmission of exterior sound into a building.

In independent testing, it was determined that a wall constructed from 8-inch lightweight block filled with ZMI and faced with 5/8-inch gypsum drywall achieved an STC rating of 51. This means that noise transmission through this wall assembly as reduced from an STC of 49 by 24% to a level where room to room conversation is inaudible.

Additional testing was also done on a wall constructed from 8-inch lightweight block with a crack intentionally introduced into the wall. This wall initially had an STC rating of 43. When the cores were filled with **Zonolite Masonry Insulation** the wall achieved an STC rating of 46 - a 41% reduction in the noise transmitted through the wall.

The excellent properties of **Zonolite Insulation** that make it the best in-core insulation also provide excellent reduction in sound transmission.

Prevents Water and Vapor Permeation

Specially-treated Zonolite Masonry Insulation eliminates moisture condensation. The Structural Clay Products Research Foundation conducted water transmission tests on Zonolite Masonry Insulation in cavity walls in accordance with procedures established by the National Bureau of Standards. Virtually no water permeation was evident across the cavity wall. Zonolite Masonry Insulation permits the cavity to drain without the transfer of moisture to the interior wythe. However, it should be noted that specially-treated **Zonolite Masonry** Insulation will not waterproof a poorly constructed masonry wall.

There is no need for a vapor barrier when the average indoor relative humidity does not exceed 50%, as confirm in FHA Bulletin UM-30.

Will Not Settle

Zonolite Masonry Insulation will not settle during the lifetime of the building and leave un-insulated voids. Its free-flowing characteristics allow it to completely fill the wall area during installation, and its ability to support its own weight means it will not compact over the years.

When tested under extreme conditions, **Zonolite Masonry Insulation** settled less that ¹/₄ of 1%.

Economical

Zonolite Masonry Insulation is recognized by owners, architects, specifiers and builders as a quick, easy and economical way to insulated masonry block walls. Since it pours freely, wall heights up to 20 feet can be readily filled in a single, direct-from-the-bag pour with no tamping or roding and nothing to cut, fit, patch, foam or inject. What's more, **Zonolite Masonry Insulation** is non-irritating and non-abrasive.

Because of its easy installation, Zonolite Masonry Insulation reduces labor and insulation costs.

The Following chart provides approximate coverage data for a wall area of 1,000 square feet. Other coverage calculations may be easily made using the 1,000 square feet coverage as a basis.

Estimating Guide for the Number of 4 Cubic Foot Bags Required to Fill:

| Sq. Ft. of | 6" | 8" | 10" | 12" | 1" | 2" | 2 ½" | 4" |
|------------|-------|-------|-------|-------|--------|--------|--------|--------|
| Wall Area | Block | Block | Block | Block | Cavity | Cavity | Cavity | Cavity |
| 1000 | 43 | 68 | 94 | 121 | 21 | 42 | 50 | 95 |

Thermal Design

The following thermal design values provides system thermal resistance (**B**) and thermal transmittance (**U**) values for common constructions insulated with **Zonolite Masonry Insulation**. Both the R-values and U-values in these tables have no interior finish, but include inside and outside air films at winter conditions.

| Concrete Block Walls | | | | | | |
|----------------------|---------------|-------------|---------|---------|--|--|
| Wall Thickness | Type of Block | | R-Value | U-Value | | |
| 6" | Lightweight | Uninsulated | 2.5 | .40 | | |
| | | Insulated | 3.8 | .26 | | |
| 8" | Lightweight | Uninsulated | 3.0 | .33 | | |
| | | Insulated | 5.9 | .17 | | |
| 8" | Heavyweight | Uninsulated | 2.1* | .48* | | |
| | | Insulated | 3.1* | .33* | | |
| 10" | Lightweight | Uninsulated | 3.2 | .32 | | |
| | | Insulated | 7.5 | .13 | | |
| 10" | Heavyweight | Uninsulated | 2.2 | .46 | | |
| | | Insulated | 3.3 | .30 | | |
| 12" | Lightweight | Uninsulated | 3.3 | .30 | | |
| | | Insulated | 8.0* | .12* | | |
| 12" | Heavyweight | Uninsulated | 2.3* | .44* | | |
| | | Insulated | 4.2* | .24* | | |

* Measured values

| Concrete Block and Brick Veneer Walls | | | | | | | | | |
|---------------------------------------|---------------|-------------|---------|----------------|-----------------|---------|--|--|--|
| Interior Wythe | | | | Exterior Wythe | | | | | |
| | Type of Block | | 4" Fac | e Brick | 4" Common Brick | | | | |
| THICKNESS | | | R-Value | U-Value | R-Value | U-Value | | | |
| 6" | Lightweight | Uninsulated | 3.0 | .33 | 3.3 | .30 | | | |
| | | Insulated | 4.3 | .23 | 4.6 | .22 | | | |
| 8" | Lightweight | Uninsulated | 3.5 | .29 | 3.6 | .26 | | | |
| | | Insulated | 6.3 | .16 | 6.7 | .15 | | | |
| 8" | Heavyweight | Uninsulated | 2.4 | .42 | 2.8 | .36 | | | |
| | | Insulated | 3.2 | .31 | 3.6 | .26 | | | |

| Eaco Brick (A" | Extorior Wytho) | | | | | |
|----------------|--------------------|--------------------------|---------|-----------|---------------|---------|
| Tace Drick (4 | | | | Cavity Di | mension | |
| Interior Wythe | Type | of Construction | 2 | 1/2" | <u>4 1/2"</u> | |
| Thickness | 1,900 | | R-Value | U-Value | R-Value | U-Value |
| 4" | Lightweight | Uninsulated | 4.8 | .21 | 4.9 | .21 |
| | Concrete Block | Cavity Insulated | 9.9 | .10 | 14.8 | .07 |
| 4" | Heavyweight | Uninsulated | 4.0 | .25 | 4.0 | .25 |
| | Concrete Block | Cavity Insulated | 9.1 | .11 | 13.9 | .07 |
| 4" | Concrete (Cinder) | Uninsulated | 4.4 | .23 | 4.4 | .23 |
| | Block or Clay Tile | Cavity Insulated | 9.5 | .11 | 14.3 | .07 |
| 4" | Face Brick | Uninsulated | 3.8 | .27 | 3.8 | .27 |
| | | Cavity Insulated | 8.8 | .11 | 13.6 | .07 |
| 4" | Common Brick | Uninsulated | 4.1 | .24 | 4.1 | .24 |
| | | Cavity Insulated | 9.2 | .11 | 14.0 | .07 |
| 6" | Lightweight | Uninsulated | 5.0 | .20 | 5.0 | .20 |
| | Concrete Block | Cavity Insulated | 10.0 | .10 | 14.8 | .07 |
| | | Cavity & Block Insulated | 11.3 | .09 | 16.1 | .06 |
| 8" | Lightweight | Uninsulated | 5.5 | .18 | 5.5 | .18 |
| | Concrete Block | Cavity Insulated | 10.5 | .09 | 15.3 | .07 |
| | | Cavity & Block Insulated | 13.4 | .07 | 18.2 | .06 |

Maximum Thermal Performance with Reduced Sound Transmission

The thermal efficiency of block walls can be greatly increased by adding 1" to 4" **Zonolite Thermo-Stud Wall**.

The effectiveness of the Thermo-Stud System, which minimize thermal shorts, stems from its unique design which includes: Expanded Polystyrene Foam Insulation Board, Thermo-Stud Furring Channel and optional T-Clip Fastener.

As noted below, adding Thermo-Stud Insulation increases the R-Value of the wall be as much as 250%.

For the 8" lightweight block cavity wall, adding 1" to 4" of Thermo-Stud Insulation increases the R-value by 42-170%.

For 8" lightweight block wall, adding 1" to 4" of Thermo-Stud Insulation increases the wall STC rating by 6 to 7 decibels. For example, an 8" lightweight block wall filled with Zonolite Masonry Insulation plus paint on one side and 5/8" gypsum drywall on the other side has an STC of 51. Adding 1" of Thermo-Stud Insulation prior to the drywall would increase the STC to at least 57 – a 100% decrease in sound transmission.

8" Lightweight Block; 4" Exterior Whythe Face Brick; (1" 8" Lightweight Block with Zonolite Masonry Insulation in cavity); with Zonolite Masonry Insulation in both core and cavity and ½" Interior Gypsum Drywall.

8" Lightweight Block; 4" Exterior Wythe Face Brick; (1" Cavity); with Zonolite Masonry Insulation in both core and cavity and 1/2" Interior Gypsum Drywall.



8" Lightweight Block with Zonolite Masonry Insulation in cavity and $\frac{1}{2}$ " Interior Gypsum Drywall.



| R* | U* | Wall System as Noted in Title Above |
|------|-----|--|
| 9.2 | .11 | Zonolite Masonry Insulation only |
| 13.1 | .08 | 1" Zonolite Thermo-Stud System added |
| | | to wall system |
| 15.0 | .07 | 1 ¹ / ₂ " Zonolite Thermo-Stud Sstem |
| | | added to wall system |
| 17.0 | .06 | 2" Zonolite Thermo-Stud System added |
| | | to wall system |
| 18.9 | .05 | 4" Zonolite Thermo-Stud System added |
| | | to wall system |
| 20.9 | .05 | 3" ZTSS added to wall system |
| 24.8 | .04 | 4" ZTSS added to wall system |

 Based on ASHRAE 1981 Fundamental Handbook standard with inside and outside air film resistance for winter

| R* | U* | Wall System as Noted in Title Above |
|------|-----|---|
| 6.6 | .16 | Zonolite Masonry Insulation only |
| 10.2 | .10 | 1" Zonolite Thermo-Stud System added |
| | | to wall system |
| 12.2 | .08 | 1 ¹ / ₂ " Zonolite Thermo-Stud System |
| | | added to wall system |
| 14.1 | .07 | 2" Zonolite Thermo-Stud System added |
| | | to wall system |
| 16.1 | .06 | 2 ¹ / ₂ " Zonolite Thermo-Stud System |
| | | added to wall system |
| 18.0 | .06 | 3" ZTSS added to wall system |
| 21.9 | .05 | 4" ZTSS added to wall system |

Specification

Description

The block/cavity wall insulation shall be Zonolite Masonry Insulation as produce by Arabian Vermiculite Industries, a treated water-repellent, free-flowing Vermiculite processed for the specific purpose of insulating masonry walls.

Scope

The walls to be insulated shall be as noted and shown in drawings and schedules. Weep holes must be provided to allow for drainage as recommended by AVI.

Materials

Block wall insulation material shall be treated for water repellency or conform to ASTM Standard C516-80, Type II Material (Specification for Vermiculite Loose Fill Insulation).

Installation

Insulation shall be poured from the bag into the concrete block core or wall cavity directly or via a hopper placed on top of the wall. Pours may be made at any convenient interval without bridging, but the height of any pour shall not exceed 5m. Rodding or tamping is not necessary. Block joints at plasters or other vertical members shall be mortared in by the mason, and weep holes shall be filled with glass fiber, rope or copper screen to prevent insulation leakage.

Safety, Storage and Handling Information

The best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered for this product and is available upon request