Why Use SUPER THERM® to Reduce Energy Cost and Improve Energy Efficiency in Buildings, Ceilings, Walls and Roofs

One of the most challenging issues of our time is the effect of urban heat island and the impact it has on our environment not to mention our wallet. With rising cost to both heat and cool buildings, we are headed for a real show down if we do not adopt new solutions to address the same old problem. There are many reasons buildings are energy inefficient. **Two of the main reasons are associated with the inability of existing homes and buildings to retain heat in the winter time and the ability keep buildings from loading with heat in the summer**. We have to be proactive in finding new ways to address these issues. 30 years ago, the idea was introduced to consumers that you could not keep a building or home from loosing heat or loading with heat in the summer, so we introduced the idea of slowing the transfer of heat, coming into a home or building in the summer, or leaving the home or building in the winter. So, voila, we were introduced to the concept of R -Value insulation. The "R-value" is touted to the American consumer to the point where it has taken a "chiseled in stone" status. The reality is that the R-value by itself is almost a meaningless number.

It is impossible to define the insulation impact of a particular material with a single number. It is imperative we know more than a single "R" number. So why has the R-value standard been allowed to be perpetuated? I don't know if anybody knows. It obviously favors fiber insulation. Consider the **R-value in terms of performance of a piece of insulation after it has been compromised by the impact of moisture, water or with a 20 mile per hour wind blowing through it. Obviously, the R-value of fiber insulations would go close to zero.** Under these same conditions, there are other 21 century materials that would be largely unaffected (**Super Therm®)** by these conditions. Again R-value numbers are somewhat "funny" numbers. They are meaningless unless we know other characteristics.

None of us would ever buy an asset of any kind if we knew only one dimension of the asset. For example, suppose a salesman tried to sell you a cell phone and said it was a five. You would instantly wonder if that meant it would last five days, allow five calls, receive five texts, take five pictures or whatever. Basically, one number cannot accurately describe anything. The use of an R-value alone is absolutely ridiculous. Yet we have Code bodies mandating R-values of 20's or 30's or 40's. A fiber insulation having an R-value of 25 placed in a 1, 5, 10, 20 or 30 year old house or building, not properly sealed, will allow the wind to blow through

it as if there were no insulation. Maybe the R-value is accurate as a tested material in the lab, but that is not even a remote indication of how it will perform in the real world. It is imperative that we consider some additional dimensions to our insulation. We really need to know its' resistance to air penetration, to free water, and to vapor drive. In other words, **"What is the R-value of the insulation after it is subjected to real world conditions? How does it perform?''**

The R-value is a fictitious number that is supposed to indicate an insulation material's ability to resist or slow the transfer of heat. When we insulate, **we are always trying to control the heat, never the cold.** In the summer, we are trying to keep the heat from coming in and the winter, we try to keep the heat from leaving out, as the heat is always trying to move to the cool. So when you consider how an R rated piece of insulation slows the transfer of heat, and the operative phrase here is, "**slows the transfer of heat**" because it does not stop it. We all have seen the impact of slowing the transfer of heat. The sun hits our roof and the R rated insulation slows the transfer of heat. When the R rated insulation gets full, it allows the transfer of heat between solids causing conduction, which leads to the building or home heating up. The sun goes down and the air conditioner cycles and cycles, even thought the sun is not shinning, at 12 midnight or 4 am in the morning, costing us money every time it cycles on. The opposite happens in the winter where the furnace cycles all day and night. Thankfully, today there are 21 century new materials (Super Therm®) and solutions today that provide remedy to these issues, ensuring that existing and new buildings with fiberglass are able to perform as desired.

The Test used to determine the "R" value:

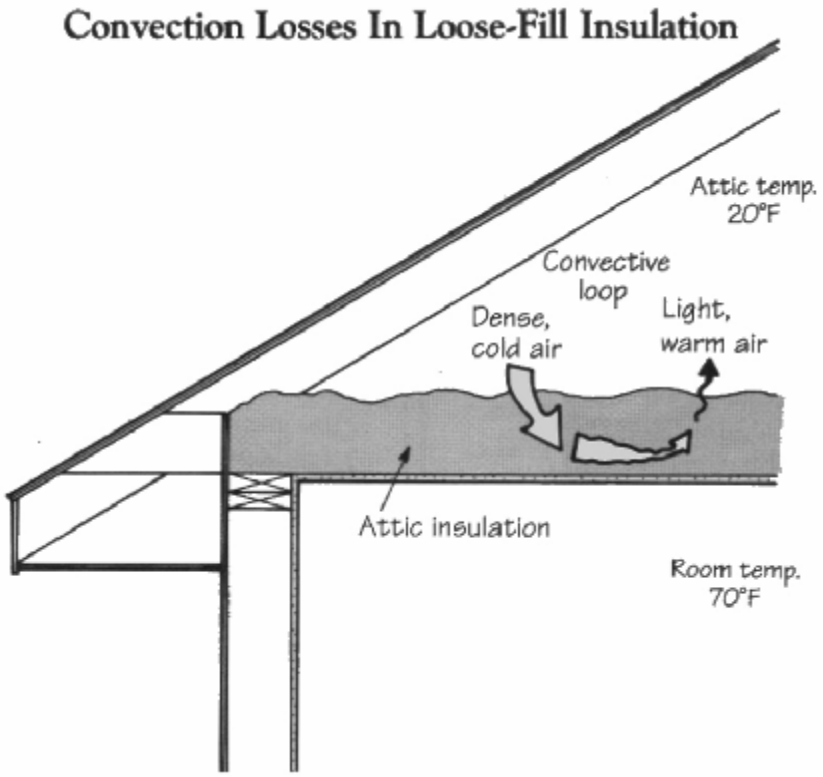
The test used to produce the "k" value is an ASTM test. This ASTM test was designed by a committee to give us measurement values that would be meaningful. A major problem lies in the design of the test. The test favors fiber insulations — fiberglass, rock wool, and cellulose fiber, which is what we find used as insulation in the walls, ceiling and roofs of most homes and buildings

The test does not account for air movement (wind) or any amount of moisture (water vapor) and its impact on the insulation in real world conditions. In other words, the test used to create the R-value for most insulation is a test in non-real-world conditions (lab test). For instance, fiberglass is generally assigned different R-values such as 3, 5, 10, 19 and so on. It will only achieve that stated R-value on the insulation if

tested in an absolute zero wind and zero moisture environments. Zero wind and zero moisture are not real-world. **Those are lab conditions!** Our houses and buildings leak air and they often leak water. Water vapor from the atmosphere, showers, cooking, breathing, etc., constantly moves back and forth through the walls and ceilings. If an attic is not properly ventilated, the water vapors from inside a house will very quickly semi-saturate the insulation above the ceilings. **Even small amounts of moisture will cause a dramatic drop in fiberglass insulation's R-value or ability to insulate— as much as 50 percent or more and this is precisely the case in most existing homes and buildings today. See why most building or homes need a remedy?**

Vapor Barriers:

Sometimes, people will try to put vapor barriers on both sides of the insulation. Vapor barriers on both sides of fiber insulation can cause some serious problems. Vapor barriers will stop most moisture, but not all. Small amounts of moisture will move into the fiber insulation between the two vapor barriers and be trapped. It will accumulate as the temperature swings back and forth. This accumulation can become a huge problem performance-wise. For example, if you wanted to re-insulate a food storage that originally was insulated with fiberglass, and then add a vapor barrier on both sides. Within a year or two, the insulation would completely fail to insulate. The trapped moisture between the vapor barriers would saturate the fiberglass insulation to the point of holding buckets of water. Fiber insulation needs ventilation on one side and, with **Super Therm® applied, it would breathe so that trapped vapor can escape, which would prevent the possibility of mold or mildew growth**.



At very cold temperatures, when the temperature difference across the attic insulation reaches a certain critical point, convection within the insulation can reduce R-value.

Nisson, J.D. Ned, JLC, "Attic Insulation Problems In Cold Climates" March 1992, pp. 42-43

We understand air penetrates through the wall of homes and buildings. In some homes when the wind blows, we often can feel it. But what most people, including many engineers, do not realize is that very serious convection currents occur within the fiber insulations. These convection currents rotate vast amounts of air**. The air currents are not fast enough to feel or even measure with anything but the most sensitive instruments. Nevertheless, the air is constantly carrying heat from the underside of the fiber pile to the top side, letting it escape**. If we seal off the air movement with a non breathable material, we generally seal in water vapor. The additional water often will condense (this becomes a source of water which rots the structure). The water, as vapor or condensation, will severely decrease the insulation value — the R-value. The only way to deal with fiber insulation is to ventilate. But to ventilate means moving air—which also decrease the R-value and insulation performance of the fiberglass in the attic, allowing high humidity. Super Therm® is a breathable material but also a water barrier

that is unaffected by air flow and moisture load.

Air Penetration:

What is the R-value of a furnace filter? The filter medium for most furnace filters is fiberglass — the same spun fiberglass used as insulation. Fiberglass is used for an air filter in furnaces because it has less impedance to the air flow, and it's cheap. In other words, air flows through it very readily. It is ironic how we wrap our house in a furnace filter that will strain the bugs out of the wind as it blows through the house. There are tremendous air currents that blow through the walls of a typical home or building. To demonstrate, hold a lit candle near an electrical outlet on an outside wall when the wind is blowing. An average home or building, with all doors and windows closed, has combined air leaks equal in size to an open door. There is a problem with loose-fill fiberglass attic insulation in cold climates. It appears that, as attic temperature drops below a certain point, air begins to circulate into and within the insulation, forming "convective loops" that increase heat loss and decrease the effective R-value. At very cold temperatures, on the exterior, the R-value may decrease by up to 50%."

The best insulation solution to prevent free air flow and moisture build up while at the same time breathing is Super Therm. Super Therm will not only, in our opinion, perform far better than fiber insulation whenever there is wind or moisture involved, **but it is also the perfect solution for remedying existing buildings or homes that already have fiberglass insulation in them** and need to be refurbished or weatherized, to reduce heating and cooling cost..

And what of solid insulation materials? Well, most solid insulations materials used on buildings are placed as sheets or board stock (i.e. Iso boards). They suffer from a very similar problem. They don't fit tight enough to prevent air infiltration. It matters not how thick these board stocks are if the wind gets behind them. **We see this often in roof insulation systems used in commercial applications where, on a 50,000 sq ft building when mechanically installing ISO boards, it requires 40,000 fasteners to meet wind uplift requirements. Those 40,000 fasteners create 40,000 thermal shorts, not to mention a haven for air penetration and moisture build up**. The same is seen in masonry construction where board stock is used between a brick and a block wall.

Unless the board stock is physically glued to the block wall, air will infiltrate behind it. Air flows through the weep holes in the brick and around the insulation, rendering it virtually useless.

This is why Super Therm®, along with **its tested ability to block 95% of solar radiation,** is so effective on roofing applications whether the desire is to install a new commercial roof or refurbish an existing one.

Super Therm® is a ceramic insulation material that is fluid applied that will dry to a monolithic smooth finish that absolutely will effect a total seal. This total seal is impossible to overestimate.

In the opinion of many, a significant amount of the heat loss in homes has just as much, if not more, to do with the seal rather than the insulation. Air infiltration can most effectively be stopped with the use of Super Therm® as a monolithic seamless insulation system that, as a result of the special ceramics used, has little density and resist the load of heat. **SUPER THERM® is a 21 century ceramic coating material that, when properly applied, will provide a total breathable monolithic seal while at the same time block the load of heat (ASTM C-236 and ASTM-C411, ASTM 1269, ASTM E1461-92)**. The R-value of a material is of no interest or consequence if air can get past it. **Super Therm®, while not having an R value does provide the same performance benefit because it blocks heat transfer, has a high emissivity (0.91, verified by ASTM 1371) and has the ability to seal free air flow while still breathing and being impervious to the impact of moisture. As a result it provides the same performance as an R19 or better.**

Why Super Therm® is the remedy for existing and new construction buildings that use fiberglass.

Super Therm® blocks the load of heat with the use of special ceramics that do not have density and cannot load heat while providing its own breathable vapor retarder, water barrier, and wind barrier. **Because of these deliverables and more, Super Therm® is the perfect remedy for existing homes and buildings that depend on fiberglass insulation to keep their home or office warmer the winter and cooler in the summer. The fiber insulations in our walls and ceiling must be protected from wind,**

water and moisture vapor.

It is a given that air is the best insulator, having volume to fill with heat before heat can move through to the next pocket or volume of air.

If the air pockets are smaller, the resistance to heat load and movement is greater because each pocket stands alone with its' resistance. Larger pockets or areas have only one resistance to the loading of heat compared to the equal space with many small and individual pockets.

Therefore, given that most all substrates and surfaces are filled with small pockets of air (pores) and cracks which allow air and moisture to load and move through them, **if you seal this surface with breathable insulation technology like SUPER THERM®, you have now sealed the substrate and all its' individual pores and cracks from air flow and moisture load**. This would cause the substrate and all its' pockets or pores to form a massive resistance to heat load and transfer. SUPER THERM® is a water barrier which would block the loading of moisture and the free flow of air into and through a substrate, **making it the ideal solution to remedy existing ceilings, walls and roofs that are underperforming or as a compliment to newly constructed buildings or homes that use traditional insulation. According to DOE specialist doing testing in homes and buildings, "…if you can keep a substrate dry and free of air flow, you will improve your HVAC performance by 30%..." and Super Therm® specifically performs this by being a moisture barrier restricting airflow as validated by Denver testing performed by DOE energy specialist and ASTM D7088, ASTM D6904, ASTM1653 and ASTM E96 testing.**

Compared to fiberglass which is constructed of 90% air and 10% fiber and is not sealed on either side to form a "sealed air pocket" to block moisture load nor air flow, the heat, whether radiant, convection or conduction is allowed to flow easily and steadily into and through the material. Also, when the smallest amount of moisture is allowed to load into an insulation substrate, the substrate is no longer dry and if not fully dry, it loads heat faster and loses the initial ability to stay dry to resist heat load and cannot produce the R value it was tested for in very dry laboratory testing environment to achieve its' stated R value.

When SUPER THERM® covers a surface, the surface is sealed from air and moisture load and flow. Because the surface now has many small

pores or pockets of air, the resistance to heat load is massive which gives SUPER THERM® the same effect of blocking heat whether coated over a 3" board or a ¼" board. The problem with the standard R value calculations is that a **minimum of 1**" thickness of insulation must be used to offer any kind of simple resistance to heat conduction. **Whereas, SUPER THERM® seals the initial surface that fiberglass cannot do, blocks the initial heat and moisture load, repels the radiation heat on exterior or convection heat on interior due to its' emissivity of 0.91 (ASTM 1371).**

With a layer of SUPER THERM®, the heat never has the opportunity to load because the ceramic compounds used in Super Therm® have very low density and resist heat load. The substrate never has the assistance of moisture to dampen the surface and allow the faster loading of heat, which results in the maximum resistance to heat load.

SUPER THERM®may be applied by brush, roller (1/2 to ¾ "" nap) or spray (remove filters from gun and pump) resulting in a smooth flat finish when applied to interior ceiling and walls. For interior use after SUPER THERM® dries, paint color of choice. Do not tint or water down. If rolled on use up down cross hatch application technique. When used as a cool roof solution (white roof) SUPER THERM®is more than just an elastomeric reflective white coating. SUPER THERM® blocks 95% of solar gain including infra red radiation. SUPER THERM® can be applied to interior ceiling and walls without (Super Base primer). Use Superbase primer when applying to virgin dry surfaces such as asphalt, cap sheets cement and non metal roofing applications. To receive a commercial roofing warranty using SUPER THERM®, SUPER THERM® **must be applied by a certified applicator** please contact us bellow for applicator in your area and warranty.

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