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Chapter 1 : Thermal Building Concepts LLC

Cellulose insulation is perhaps one of the most eco-friendly forms of insulation. Cellulose is made from recycled cardboard, paper, and other similar materials and comes in loose form. Cellulose has an R-value between R and R

Rising demand for insulation especially from the residential and non-residential application segments owing to the rising energy costs and growing awareness regarding energy conservation is expected to drive the demand for thermal isolation materials market. Thermal isolation materials help in reducing the accumulation of heat within the buildings, thus resulting in lower dependence on air conditioning , and thereby also cutting down the energy costs. Moreover, the government initiatives to promote energy efficiency and sustainable development through insulation technologies expected to play a crucial role in supporting the market growth. Residential building sector dominates the market and is expected to observe higher growth prospects on account of single unit housing sector growth in the region. Refurbishment and re-insulation activities for old homes are also likely to aid the increasing demand. The Nordic countries, Germany, France, and the U. Many European countries have passed legislation regarding the grade of thermal barriers to be installed at home, based on the R-value of the material and the climatic conditions in the country. In developed markets, future economic growth is expected to be primarily led by domestic demand. With diminished reliance on exports, this region will focus increasingly on trade and investment in their home market. This will be facilitated by relatively easy access to finance and a robust local labor market. Over the longer term, the trend will strengthen because the growing middle-class population and rising income levels will fuel domestic demand further. Product Insights Mineral wool has advantages such as efficient heat barrier, fire safety, dimensional stability, ecological compatibility, bio-stability, chemical resistance, water repellency, sound absorption and vapor permeability. EPS also resists water, is rot-proof, non-toxic, and completely recyclable. These are some of the factors that are expected to boost the demand for EPS over the forecast period. Glass wool is comprised of glass fibers bound systematically into a texture similar to wool and is relatively lighter than rock wool. It is produced in slabs and rolls along with several other mechanical properties. Moderate growth of other products such as cotton wool, wool slag, and aerogel is expected to register modest growth rate over the forecast period on account of its lack of awareness among consumers. Its growth is supposed to be driven by increasing penetration in the North America market. Stringent regulations by agencies such as U. Mineral wool is widely used for insulating wall cavities, internal walls and external walls, lofts, etc. Increasing usage of mineral wool in thermal barrier applications in residential, commercial and public buildings is expected to drive its growth over the forecast period. Application Insights Most of the individual homes in the U. Wall insulation holds the highest share and is expected to dominate the market demand over the forecast period. Growing infrastructure sector in emerging markets of China, India, Brazil, Mexico and South Africa is expected to drive thermal insulation demand in non-residential constructions. EPS and XPS are typically employed for pros, such as long-term and stable R-value of the materials, recyclability, the ability to be placed below grade, applicability for inverted assemblies over membrane , etc. Although, exposure to sun, irreversible damages caused by solvent-based materials, incompatibility with certain thermoplastics, and flammability can turn out to be the cons related to the utilization of polystyrene. Also, they are manufactured in a variety of board sizes, usually a minimum of 1-inch thick. Tapered units, too are produced for use in roofing assemblies, where the insulation is used for creating a slope for positive drainage. Wall application dominates the overall demand. The main reason for the penetration is the large surface area of the walls in a building. The presence of a large number of single homes will trigger the segment growth. End-use Insights Growing infrastructure sector in emerging markets of China, India, Brazil, Mexico and South Africa is expected to drive thermal insulation demand, mainly in non-residential constructions. Initiatives by the U. Residential construction is expected to gain 0. The residential re-insulation market is a significant contributor to the industry, as a large number of under-insulated houses have turned to re-insulation to save energy. Barrier materials are heavily applied in the manufacturing industry, where there is a high necessity for thermal and acoustic isolation. Regional Insights Resurgent building construction activity coupled with the implementation of strict building codes such as the

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International Energy Conservation Code IECC , in North America, is likely to boost thermal insulation demand in the region. Moreover, the initiatives focused towards making existing buildings more energy efficient in the U. The EU initiatives to promote thermal insulation as a means of energy conservation strategy are expected to support the market growth. Increasing energy costs and high awareness among consumers regarding benefits of insulation are expected to have a positive impact on the regional market growth. Governments of China, India, and Japan have been increasing their construction spending to improve public and commercial infrastructure. These trends coupled with energy conservation initiatives to reduce greenhouse gas emissions are expected to drive Asia Pacific market growth over the forecast period. Presence of key market players is a significant factor, which is likely to support the market growth in North America. The market in Asia Pacific is characterized by high demand in residential and commercial buildings. Building Thermal Insulation Market Share Insights High level of integration exists in the foamed plastic market as the raw material suppliers have a forward integration with the insulation products manufacturers. This enables these companies to expand their scope of operations and enter new application markets. The raw materials required for the manufacturing of fiberglass insulators such as silicon, limestone, borate, and feldspar, are sourced from different suppliers. The manufactured insulation products usually follow supply chain and reach end-users through distribution channels such as government contractors, retailers, wholesalers, and lumberyards. In some cases, the manufacturers directly establish relationships with these integral members of the supply chain and provide solutions to the end users. The end users are mostly homeowners, contractors, etc. The end users are mostly homeowners, building insulation contractors, etc. Key players such as Huntsman International LLC, Owens Corning, have focused on acquisitions, to expand their market presence and penetration. A majority of manufacturers are focused on developing application-specific thermal insulation materials having no adverse effect on the ozone layer. Segments Covered in the Report This report forecasts revenue growth at global, regional, and country levels and provides an analysis on latest industry trends in each of the sub-segments from to For the purpose of this study, Grand View Research has segmented the global market report on the basis of product, application, end-use and region:

Chapter 2 : 5 Most Common Thermal Insulation Materials | Thermaxx

The main objective of thermal insulation of heat insulation of a building is to conserve a constant heat or temperature inside building, irrespective of temperature changes outside. Methods of Heat Insulation or Thermal Insulation The heat in a building structure is mainly transmitted through the roofs, exposed walls and exposed wall openings.

Different countries may stock different materials , and based on the type of building it may be used for, you could be recommended different insulation types. On this page we are going to look at some of the most common and most popular types of thermal insulation in buildings. We will even go so far as to recommend our expertly chosen favourite insulation for you. Perlite Similar in appearance to polystyrene, the expanded silicaceous glass derivative is a popular choice for roof insulation. Quite commonly, perlite will be adapted and fitted with a layer of asphalt and adhesives to make it more waterproof. It can also be used by DIY insulators as it requires no machinery or specialist skills to install. Wood Fibre Combined and solidified with fillers, binders and adhesives, wood fibre insulation is an effective method of insulation, especially against moisture. The wood fibres are generally not alone, but are mixed with cane and vegetable fibres too, meaning the ultimate composition is organic and clean. Wood fibre insulation works a lot like thatched roofing, and as such is a popular choice for lofts. Icynene Spray Foam Out of all of these types of thermal insulation in buildings, Icynene spray foam is our recommended choice. It leads in terms of innovation, environmental performance, application and insulating qualities. Icynene is completely airtight, expands to more than x its liquid form, and is self extinguishing in case of fire. Interestingly, it is likely to outlast the building it is installed in! As a leading Home Logic spray foam insulation installer providing sustainable, energy efficient solutions to residential and commercial buildings, Spray Foam Experts have been endorsed by Which? Click here to arrange a free survey today. Popular for lofts and ceilings especially, glass wool involves fibres of glass spun into a wool-type material, trapping small pockets of air in the process. Glass wool does not perform well in the long run, and is also a human irritant, meaning great care should be taken when installing the rolls or batts. Cellular Glass Insulation In terms of appearance, cellular glass insulation resembles tarmac, but its chemical makeup is very different. Crushed and powdered glass is combined with a blowing agent, before being placed into a mould and blasted with incredibly high temperatures. You can usually purchase this insulation in squares, bricks or rounded pieces that are designed to cover pipes. Some types of thermal insulation in buildings are malleable, but foam glass is very rigid and also lightweight. Expanded Polystyrene Polystyrene polymers are injected with a foaming agent and then exposed to very high temperatures, causing them to expand, often into a mould. This closed-cell insulation type is a good option for walls and ceilings and is very cheap. EPS has great thermal conductivity and is incredibly lightweight. Gypsum Board This soft white mineral is a popular among the different types of thermal insulation for buildings, though is also a main component of Plaster of Paris. Gypsum is easy to install, fire resistant, soundproof , durable, affordable and versatile! As the most advanced of these insulation types, we cannot look past Icynene, though the other options do offer some positive benefits. To talk with an expert, call us today on For a call back, you can fill this quick Contact Form. Off Peak Rates Available! Subscribe to Home Logic Living By clicking subscribe, you are agreeing to receive email updates on our products and services. Please check your details, and try again.

Chapter 3 : Thermal insulation - Wikipedia

Thermal insulation material is an ideal material for inner heat insulation of walls in construction, mainly of concrete buildings, thermal bridges, parts of walls behind heating elements, where due to condensation, mould can appear and for all spaces which are inadequately heat insulated and where it is required to increase the temperature in a.

Thermal insulation is a construction material with low thermal conductivity, often less than 0. These materials have no other purpose than to save energy and protect and provide comfort to occupants. Of the many forms, shapes and applications of thermal insulation, this section focuses on those that are commonly used for building envelopesâ€" i. These include industrial insulation products and the application of natural elements as thermal insulation. Mineral fibre products include rock wool, slag wool and glass wool, which can be sourced from recycled waste. These materials are melted at high temperatures, spun into fibre and then have a binding agent added to form rigid sheets and insulation batts. If removed in appropriate conditions, mineral fibre can be reused and recycled at the end of its life. Cellular plastic products are oil-derived and include rigid polyurethane, phenlic, expanded polystyrene, and extruded polystyrene. The products are available as loose fill, rigid sheets and foam. In the past, the production process involved ozone depleting agents, such as HCFCs. However, the production process has switched to using neutral hydrocarbons. As such, when sourcing cellular plastic insulation products, it is important to ensure the specified products have production processes that do not use ozone depleting agents. Cellular plastic products can be recycled but it is a cumbersome process. It is more suitable for cellular plastic products to be incinerated for energy recovery at their end of life. These products have low embodied energy, as the materials can be sourced from renewable raw materials. The products are in the form of fibre, batts or compressed board. Their production involves chemical treatment to ensure appropriate properties, such as fire resistance and no vermin infestation. As such, at the end of life, it is difficult to use it for energy recovery through incineration. Building envelope thermal insulation is a proven technology that contribute to energy efficient buildings. Two new trends have recently been observed in the development of thermal insulation â€" the development of phase change materials PCMs and innovative use of raw natural elements as thermal insulation. Phase change materials PCMs work based on the latent heat storage principle. Therefore the take up of energy cannot be detected by touch. The temperature only rises detectably after a complete change of phase has taken place. When a change takes place, the latent heat involved is equal to the heat of melting or crystallisation of the storage medium. The advantage of PCMs is that large amounts of heat or cold can be stored within small temperature ranges. Because phase changes between solid and liquid, PCMs such as paraffin have to be encapsulated prior to use. Encapsulated paraffin PCMs are mixed with mortars applied on building envelopes. Used in combination with night cooling strategies, PCMs can be effective in preventing heat gain through the building envelope. At present, PCMs are at the research and development, and test bedding stage. PCMs are promising technologies because they are lightweight, easy to apply and blend in well with conventional construction methods. The second development trend of thermal insulation is the innovative use of raw natural materials as thermal insulation. An example is the use of untreated straw bales as insulation. In order to overcome a firehazard issue, straw bales are sandwiched between fire-resistant cladding materials, such as metal-based cladding, or glass panels to create aesthetic effects by making straw bales visible. Another natural element used as thermal insulation is air, which has a thermal conductivity of about 0. Its application is often found in the provision of an air gap in cavity wall construction to enhance thermal insulation performance see figure 1. Use of air gaps is not sufficient for buildings in temperate regions, but could be sufficient for buildings in mild climate conditions. Air gap used in conjunction with insulated timber-brick wall. Feasibility of technology and operational necessities top: In developed and industrialised countries, building codes include requirements to safeguard minimum acceptable insulation levels for building envelopes, and thus provide the opportunity for deploying the application of thermal insulation technologies. However, this is usually not the case in many developing countries, especially least developing countries and remote rural areas. Therefore, a critical factor leading to large scale implementation of thermal insulation in these countries is to put in place supporting policies, both

incentive and mandatory measures. In addition, the cellular plastic production process mentioned earlier involved the use of ozone depleting agents, such as HCFCs, which have switched to using neutral hydrocarbons. When sourcing cellular plastic insulation products, it is important to ensure that the specified products with production process are not associated with ozone depleting agents. It is more effective if local regulations are in place to ban products with production processes associated with ozone depleting agents. The application requirements of most building envelope thermal insulation products include appropriate detailed design, good workmanship and appropriate product selection, handling and installation methods. Therefore, capacity building, such as workshops to train design professionals and construction work forces in these areas are required. Unlike the straightforward process of incorporating building envelope thermal insulation in new buildings, when retrofitting existing buildings it is crucial to identify suitable locations to include thermal insulation. The key locations are: Roof space in temperate regions: Solid masonry or concrete walls: Concrete floor in temperate regions: Raised timber floor in temperate regions: For both new construction and retrofitting existing buildings, it is important to understand and provide the conditions for thermal insulation products so that they can achieve their expected performances over their life span. Mineral fibre products are available in batts, rolls and loose. They can be applied in off-site and insitu construction. Due to the open structure, the products are air and vapour permeable, which can reduce their thermal insulation performance. It is, therefore, necessary to provide foil backing and good workmanship to prevent the product from being exposed to vapour and water. Cellular plastic products are considered to be long-lasting materials. The products are not susceptible to decay or vermin infestation. Besides rigid sheets, cellular plastic products can be in the form of foam, which is applied to the building envelope through spraying. Spray foam insulation is applied as liquid, using a hose and spray gun. It is a combination of two substances that blend upon contact, and after a few seconds become a thick foam. The insulation can be sprayed after electrical and plumbing services are in place, as it expands during curing, sealing all gaps. Although chemical treatment is often provided in the manufacturing process, the chemical treatment can leach out if the products are wet or exposed to high humidity conditions. Preventive measures include provision of backing, good workmanship, and avoid applying the products in wet and moist conditions. Good detailing and workmanship to prevent air leakage are crucial for all types of building envelope thermal insulation. It is important to pay additional attention to detail, when installing insulation materials at the electrical outlets and wiring inside walls, cutting and shaping the insulation materials to tightly enclose with the wall frame. Furthermore, as an overall quality control measure for building in extreme climatic conditions, it is recommended to have building envelope commissioning with attention paid to thermal insulation, especially in larger-scale buildings. Status of the technology and its future market potential top: Building envelope thermal insulation products have been widely used in temperate regions. In many developed and industrialised countries, thermal insulation is a regulatory requirement for energy efficiency and occupant health purposes, which provide a fairly constant market for the thermal insulation manufacturers. The market for building fabric thermal insulation products is not as large in hot and humid tropical regions, where natural ventilation, not air-tightness, is a more appropriate strategy for thermal comfort. Roof insulation, however, is applicable in all climate regions, including the hot tropical bell. How the technology could contribute to socio-economic development and environmental protection top: The primary contribution of building envelope thermal insulation is to provide thermal comfort to its occupants. This supports healthy living environments and better productivity at workplaces. Thermal insulation reduces unwanted heat loss or heat gain through a building envelope. This, in turn, reduces energy demand for cooling and heating of buildings, and thus is a mitigation measure to reduce GHG emissions. Large-scale implementation of thermal insulation has also been proven to be an economic stimulus. There are ample business and job creation opportunities for developing countries, if successful North-South and South-South transfer programmes for building envelope thermal insulation are in place. Financial requirements and costs top: Financial requirement for building envelope thermal insulation includes the costs of the products and their installation. The product and installation costs of thermal insulation are computed based on per unit of area and per unit of thermal conductivity value. The installation cost for loose fill products are lower than that of other insulation products, because it is easy to install. However, due to the

lack of additional protection from moisture and vermin infestation, long-term durability is a consideration. Maintenance costs for thermal insulation products is low and not even required for cellular plastic products. For naturally-ventilated buildings in mild climatic conditions, roof insulation and west-facing wall insulation are the most effective methods of preventing heat gain through the building envelope, and thus have better return on investment compared to applying insulation to the entire building envelope. Use of straw bales and air gaps in cavity walls incur insignificant cost, except for the thickness of the wall. However, long-term performance is an issue to look out for. Cellular plastic products are rigid, stable and performed well in the long term. They require the least maintenance cost. Insulation for Sustainability â€" A Guide.

Chapter 4 : Types Of Thermal Insulation In Buildings | Which? Trusted Traders

Building envelope thermal insulation products have been widely used in temperate regions. In many developed and industrialised countries, thermal insulation is a regulatory requirement for energy efficiency and occupant health purposes, which provide a fairly constant market for the thermal insulation manufacturers.

In addition, energy-efficiency innovations in home building have resulted in substantial efficiency improvements over the last 20 years. Nevertheless, homes built in the last 10 years consume more energy than those built in the previous three decades, resulting in the ongoing need to pursue energy-efficient solutions for buildings. The buildings construction industry is notable for its slow acceptance of new technologies. As a result, DOE-funded research plays a critical role in developing technological advancements that reduce energy consumption and increase building longevity. Major ORNL accomplishments in the buildings technology arena are described below. New Calculator and Simulation Tools ORNL has developed an arsenal of building design and simulation tools and standards that assist practitionersâ€"ranging from homeowners to architectsâ€" in selecting energy-efficient envelope options. Some recently developed tools include: WUFI-ORNL â€" More than licensed building design professionals are using this tool to determine moisture problems, reducing callbacks and health-related problems with indoor air quality http: ZIP-Code Calculator â€" This tool provides location-specific advice on insulation and moisture control to the more than people who visit this site daily http: Roof Radiation Control Calculator â€" computes the potential energy savings and peak demand for various roof selections http: Other frequently used tools include the Air Leakage Calculator based on research data collected from sources such as the air leakage tester pictured above , Whole-Wall Calculator, and WeatherFileAnalyzer â€" a unique tool that can develop the exterior hygrothermal load for any U. Moisture Control and Hygrothermal Performance Studies This research emphasizes mitigating and preventing mold, which degrades the performance of insulation and can lead to poor air quality and health problems in high-performance buildings. Key moisture-design performance issues have been investigated for three classes of wall systems. A prominent city official has indicated that ORNL provided exceptional benefits: ORNL has worked with several industrial partners in testing and developing foam that is blown with several non-ozone-depleting chemicals. This research has supported industry in the transition to more environmentally acceptable insulation materials for walls, roofs, refrigerators, and freezers. The development of panel insulation offering three times the thermal resistance of insulations of similar thickness is finding applications in specialty consumer appliances, medical material protection, and defense field applications. New cool-pigmented roof colors employ complex organic color pigments, termed cool roof-color materials CRCMs , that are added to roof paints. These pigments improve thermal performance by making a dark roof reflect in the near-infrared portion of the spectrum, maintaining a lower roof temperature and reducing heat leakage. Several metal roofing manufacturers have incorporated CRCMs in new painted metal products at an additional cost of only 5 cents per square foot with a payback period of only 3 years. Challenges and Opportunities Research that supports the next generation of buildings includes: Designing advanced thermal insulation and materials technologies to support Net Zero Energy Buildings. Smart roofs and exterior walls incorporate temperature-sensitive polymers that provide an artificial surface overlaying conventional roof tiles and wall cladding and stucco. Energy savings for roofs is from 5 to 10 cents per square foot when compared with the best available roofing material. Developing an R, 4-inch wall system for on-site construction. Pursuing advanced computer modeling tools to simulate hygrothermal responses to various external climate conditions. Extended capabilities for measuring hygrothermal properties of insulation materials would be used to develop and publish a database of materials properties. Improving the building envelope to shave and shift peak-demand energy requirements. Such technological breakthroughs would enable building envelopes to contribute for the first time to electric reliability. Using advanced modeling tools to specify materials with optimum property requirements for sheathing and cladding systems and then achieving these materials through appropriate component selection.

Chapter 5 : Roof insulation | Isoboard - Thermal Insulation South Africa

To overcome this loss in buildings thermal insulation is provided to maintain required temperature inside the building. The aim of thermal insulation is to minimize the heat transfer between outside and inside of building.

Building envelope[edit] The thermal envelope defines the conditioned or living space in a house. The attic or basement may or may not be included in this area. Reducing airflow from inside to outside can help to reduce convective heat transfer significantly. High humidity can be a significant issue associated with lack of airflow, causing condensation , rotting construction materials, and encouraging microbial growth such as mould and bacteria. Moisture can also drastically reduce the effectiveness of insulation by creating a thermal bridge see below. Air exchange systems can be actively or passively incorporated to address these problems. Thermal bridge[edit] Thermal bridges are points in the building envelope that allow heat conduction to occur. Since heat flows through the path of least resistance, thermal bridges can contribute to poor energy performance. A thermal bridge is created when materials create a continuous path across a temperature difference, in which the heat flow is not interrupted by thermal insulation. Common building materials that are poor insulators include glass and metal. A building design may have limited capacity for insulation in some areas of the structure. A common construction design is based on stud walls, in which thermal bridges are common in wood or steel studs and joists , which are typically fastened with metal. Notable areas that most commonly lack sufficient insulation are the corners of buildings, and areas where insulation has been removed or displaced to make room for system infrastructure, such as electrical boxes outlets and light switches , plumbing, fire alarm equipment, etc. Thermal bridges can also be created by uncoordinated construction, for example by closing off parts of external walls before they are fully insulated. The existence of inaccessible voids within the wall cavity which are devoid of insulation can be a source of thermal bridging. Some forms of insulation transfer heat more readily when wet, and can therefore also form a thermal bridge in this state. The heat conduction can be minimized by any of the following: One method of reducing thermal bridge effects is the installation of an insulation board e. Another method is using insulated lumber framing for a thermal break inside the wall. Building insulation materials There are essentially two types of building insulation - bulk insulation and reflective insulation. Most buildings use a combination of both types to make up a total building insulation system. The type of insulation used is matched to create maximum resistance to each of the three forms of building heat transfer - conduction, convection, and radiation. Conductive and convective insulators[edit] Bulk insulators block conductive heat transfer and convective flow either into or out of a building. The denser a material is, the better it will conduct heat. Because air has such low density, air is a very poor conductor and therefore makes a good insulator. Insulation to resist conductive heat transfer uses air spaces between fibers, inside foam or plastic bubbles and in building cavities like the attic. This is beneficial in an actively cooled or heated building, but can be a liability in a passively cooled building; adequate provisions for cooling by ventilation or radiation [22] are needed. Radiant heat barriers[edit] Main article: Radiant barrier Radiant barriers work in conjunction with an air space to reduce radiant heat transfer across the air space. Radiant or reflective insulation reflects heat instead of either absorbing it or letting it pass through. Radiant barriers are often seen used in reducing downward heat flow, because upward heat flow tends to be dominated by convection. This means that for attics, ceilings, and roofs, they are most effective in hot climates. However, much greater insulation can be achieved through the addition of bulk insulators see above. Some radiant barriers are spectrally selective and will preferentially reduce the flow of infra-red radiation in comparison to other wavelengths. For instance low-emissivity low-e windows will transmit light and short-wave infra-red energy into a building but reflect the long-wave infra-red radiation generated by interior furnishings. Similarly, special heat-reflective paints are able to reflect more heat than visible light, or vice versa. Thermal emissivity values probably best reflect the effectiveness of radiant barriers. Eco-friendly insulation[edit] Eco-friendly insulation is a term used for insulating products with limited environmental impact. The commonly accepted approach to determine whether or not an insulation products, but in fact any product or service is eco-friendly is by doing a life-cycle assessment LCA. A number of studies compared the

environmental impact of insulation materials in their application. The comparison shows that most important is the insulation value of the product meeting the technical requirements for the application. Only in a second order step a differentiation between materials becomes relevant. A valuable way to graphically represent such results is by a spider diagram.

Chapter 6 : Building envelope thermal insulation | ClimateTechWiki

1 role of thermal insulation in buildings a technical presentation by lloyd insulations (india) ltd thermal insulation for buildings india is a tropical country.

Difficult to use around imperfections 1. Fiberglass is the most common insulation used in modern times. Because of how it is made, by effectively weaving fine strands of glass into an insulation material, fiberglass is able to minimize heat transfer. The main downside of fiberglass is the danger of handling it. Since fiberglass is made out of finely woven silicon, glass powder and tiny shards of glass are formed. Nevertheless, when the proper safety equipment is used, fiberglass installation can be performed without incident. Fiberglass is an excellent non-flammable insulation material, with R-values ranging from R If you are seeking a cheap insulation this is definitely the way to go, though installing it requires safety precautions. Be sure to use eye protection, masks, and gloves when handling this product. Mineral Wool Mineral Wool. Mineral wool actually refers to several different types of insulation. First, it may refer to glass wool which is fiberglass manufactured from recycled glass. Second, it may refer to rock wool which is a type of insulation made from basalt. Finally, it may refer to slag wool which is produced from the slag from steel mills. The majority of mineral wool in the United States is actually slag wool. Mineral wool can be purchased in batts or as a loose material. Most mineral wool does not have additives to make it fire resistant, making it poor for use in situation where extreme heat is present. However, it is not combustable. When used in conjunction with other, more fire resistant forms of insulation, mineral wool can definitely be an effective way of insulating large areas. Mineral wool has an R-value ranging from R Cellulose Cellulose Insulation Material. Cellulose insulation is perhaps one of the most eco-friendly forms of insulation. Cellulose is made from recycled cardboard, paper, and other similar materials and comes in loose form. Cellulose has an R-value between R Some recent studies on cellulose have shown that it might be an excellent product for use in minimizing fire damage. Because of the compactness of the material, cellulose contains next to no oxygen within it. Without oxygen within the material, this helps to minimize the amount of damage that a fire can cause. So not only is cellulose perhaps one of the most eco-friendly forms of insulation, but it is also one of the most fire resistant forms of insulation. However, there are certain downsides to this material as well, such as the allergies that some people may have to newspaper dust. Also, finding individuals skilled in using this type of insulation is relatively hard compared to, say, fiberglass. Still, cellulose is a cheap and effective means of insulating. Polyurethane Foam Polyurethane Insulation. While not the most abundant of insulations, polyurethane foams are an excellent form of insulation. Nowadays, polyurethane foams use non-chlorofluorocarbon CFC gas for use as a blowing agent. This helps to decrease the amount of damage to the ozone layer. They have an R-value of approximately R There are also low density foams that can be sprayed into areas that have no insulation. These types of polyurethane insulation tend to have approximately R Another advantage of this type of insulation is that it is fire resistant. Polystyrene is a waterproof thermoplastic foam which is an excellent sound and temperature insulation material. The two types differ in performance ratings and cost. Polystyrene insulation has a uniquely smooth surface which no other type of insulation possesses. Typically the foam is created or cut into blocks, ideal for wall insulation. The foam is flammable and needs to be coated in a fireproofing chemical called Hexabromocyclododecane HBCD. HBCD has been brought under fire recently for health and environmental risks associated with its use. Other Common Insulation Materials Although the items listed above are the most common insulation materials, they are not the only ones used. Recently, materials like aerogel used by NASA for the construction of heat resistant tiles, capable of withstanding heat up to approximately degrees Fahrenheit with little or no heat transfer , have become affordable and available. Pyrogel is one of the most efficient industrial insulations in the world. Although a little more expensive than some of the other insulation materials, Pyrogel is being used more and more for specific applications. Polyisocyanurate, similar to polyurethane, is a closed cell thermoset plastic with a high R-value making it a popular choice as an insulator as well. Some health hazardous materials that were used in the past as insulation and are now outlawed, unavailable, or uncommonly used are vermiculite, perlite, and urea-formaldehyde.

These materials have reputations for containing formaldehyde or asbestos, which has essentially removed them from the list of commonly used insulation materials. There are many forms of insulation available, each with their own set of properties. Only by researching each kind thoroughly can you discover which will be the right kind for your particular needs. As a quick overview: Aerogel is more expensive, but definitely the best type of insulation. Fiberglass is cheap, but requires careful handling. Mineral wool is effective, but not fire resistant. Cellulose is fire resistant, eco-friendly, and effective, but hard to apply. Polyurethane is an all around good insulation product, though not particularly eco-friendly. Polystyrene is a diverse insulation material, but its safety is debated.

Chapter 7 : Thermal Design, Inc. - Steel Building Insulation Systems

Building insulation is any object in a building used as insulation for any purpose. While the majority of insulation in buildings is for thermal purposes, the term also applies to acoustic insulation, fire insulation, and impact insulation (e.g. for vibrations caused by industrial applications).

Why would you use this method? What are the benefits? What is the uptake in SA? Are many people insulating this way? Is it also good for insulating normal pitched roofs, or is it mostly used for flat roofs and roofs that are also used as floors? What is the downside or challenges associated with inverted roof insulation? What are the most important aspects that need to be considered when going this route? Do we have the necessary skills locally to do this properly? Any new developments in terms of technologies or application? B Insulating the sides of buildings Is this important for SA where the focus is more on keeping buildings cool, rather than keeping heat inside? Are there any building regulations for insulating walls? What are the most common ways to insulate walls? What role does insulation board play in insulating walls? C Performance of installed insulation vs the potential performance How important is it to consider the performance of the installed product vs its potential maximum performance? Is there a big difference between the two? Inverted roofs have the insulation over the water-proofing layer. The benefits are that the entire volume of the roof slab is at internal temperature, insulated from the effects of the elements. The thermal mass of the roof slab assists to moderate the internal temperature beneath the slab. Also, the water proofing layer is protected from weathering, so requires very little if any maintenance. This is not as popular as it perhaps could be, but is becoming more so as designers and customers apply their minds to energy efficiency solutions, passive building principles and lifetime cost analysis. A3 Flat roof, gentle drainage slopes. The insulation needs to be secured in place by ballast of some form, so this solution is not suitable for severely sloping roofs. No real challenges, the IVR is a very elegant and simple solution. A5 Choosing appropriate insulation. The insulation material is exposed to water effect. Insulators which absorb water are not suitable. A6 As long as the roof is properly designed to accommodate the mass of ballast and the correct drainage of water from the roof, installing under supervision is very simple. A7 Not so much new technologies, as new uses for roof systems: As space becomes more valuable, people turn to green roof systems, roof top urban farming, Aquaponics, roof entertainment areas, living space, parking space, perhaps helicopter access. B1 Insulating the sides or walls of buildings is important, as part of the overall heat control solution for any building. Heat flows through the easiest route. As buildings get smaller, the ratio of roof to walls decreases, meaning walls have increasingly more influence on the internal temperatures. Also, in steel framed buildings, if the roof is well insulated but not the walls, heat will flow in through the walls, and become trapped under the roof insulation. In some climatic zones in South Africa, keeping heat in in winter is more important to energy efficient usage than keeping heat out in Summer, such as the Western Cape. B2 Not for masonry walls, however there are requirements for lightweight walls, such as timber or steel frame constructions, which must achieve a minimum thermal resistance, depending on the climatic zone in which they are constructed. Wall insulation can play a big part in limiting heat flows in a building, and as such are frequently considered as part of a rational design energy usage solution, as this will invariable be a cheaper solution than prescriptive compliance. Rational designs allow greater freedom of design expression, while keeping projects affordable. For instance, introducing wall insulation can eliminate costly glazing solutions. B3 In new buildings, masonry walls can be insulated by fitting a rigid insulator like IsoBoard between the bricks. Very popular internationally, particularly with light weight frame buildings, to bring existing building stock up to current regulatory standards for energy efficiency, but not common in SA as yet. C1 Insulation is affected by many factors, the most insidious of these being water. When choosing insulation for an application like inverted roofs, choose a product that is least affected by water, i. IsoBoard installations which are re-tested after long periods of installation in the harshest conditions have proven that the design value is appropriate, and can be relied upon by architects, engineers and customers as the worst case thermal performance of IsoBoard, and that this value can be sustained for the life of the building. This is particularly useful for concealed

applications, such as inverted roof or cavity wall. C2 There is always a fall-off in thermal performance over time in insulation products. The reasons for the degradation in insulation value vary as per type of product, and application. Buildings where this is not considered and anticipated will not achieve or sustain their energy usage design objective.

Chapter 8 : Building insulation - Wikipedia

Thermal insulation is the reduction of heat transfer (i.e. the transfer of thermal energy between objects of differing temperature) between objects in thermal contact or in range of radiative influence.

Chapter 9 : Building Thermal Insulation Market Size | Industry Report,

The control of heat flow in buildings requires insulation layers compromised with few thermal bridges, an effective air barrier system, good control of solar radiation, and management of interior heat generation.