WHITE PAPER

Building Owners: Insulate Your Bottom Line

Building owners can easily monetize the benefits of properly selecting and installing closed-cell elastomeric insulation on their building's mechanical systems. By understanding the advantages of various insulation products, and recommended installation practices, building owners can control system costs, achieve optimal energy performance, and protect their return on investments. Armacell has the product portfolio and technical expertise needed to optimize thermal efficiency and prevent depreciation of mechanical systems.

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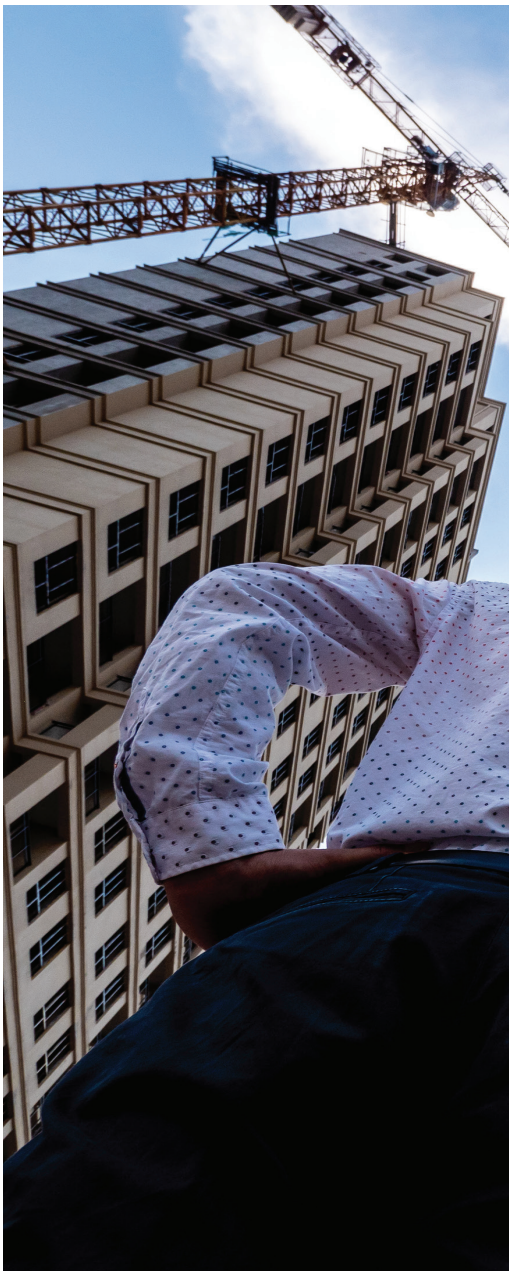
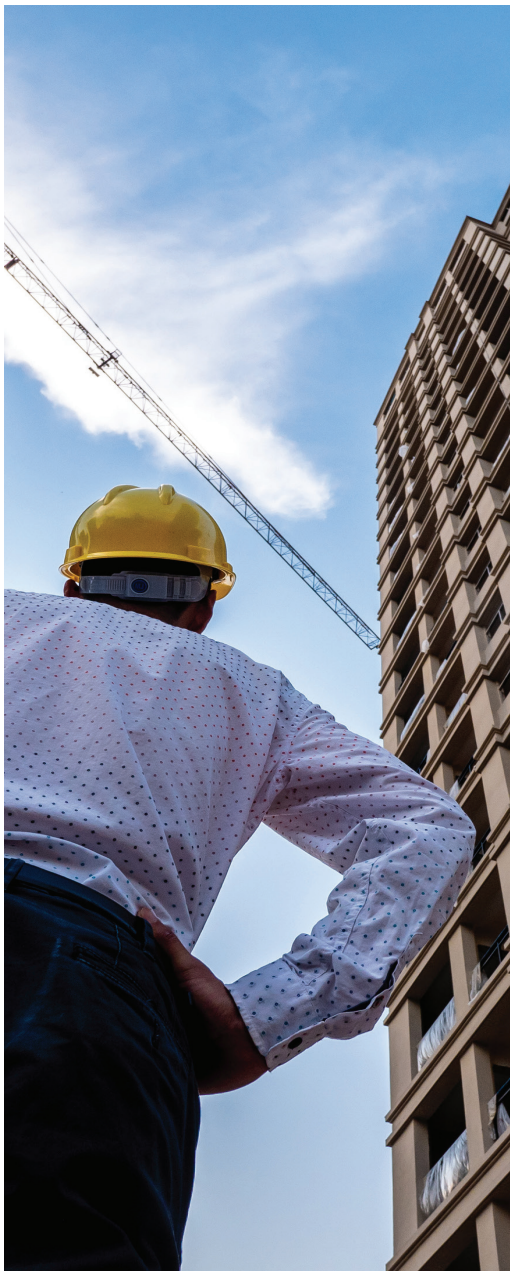
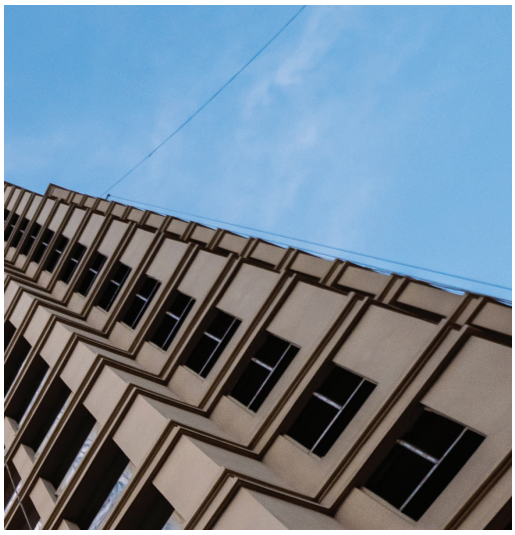
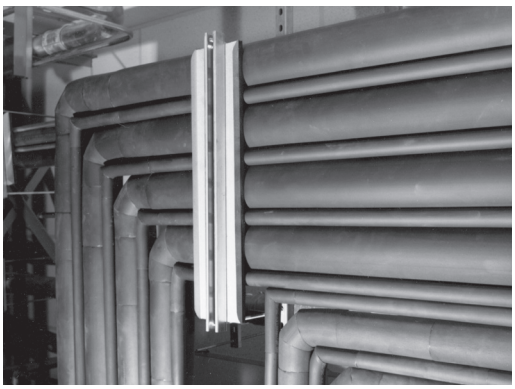








armacell®

MAKING A DIFFERENCE AROUND THE WORLD

WHITE PAPER

What Building Owners Want

Solutions that save energy, protect investments, and provide value over time.

Building owners play a key role in property development decisions and renovations. However, the responsibility of selecting, installing, and inspecting a mechanical insulation system is typically outsourced because owners do not have the time or technical know-how to ensure that their investment is properly insulated. By better understanding the financial consequences of some of the most common insulation pitfalls, owners can make better construction choices that have a positive return on investment.

Although mechanical systems come in a variety of types, sizes and designs, there are solutions that building owners can implement to reduce system maintenance, improve thermal efficiency, and lower energy use. While reducing energy consumption is sometimes perceived as only a side benefit of system performance, the global energy price crisis of 2021 and 2022 has increased awareness of consumption levels and the importance of improving efficiency. Just recently, in the Northeast and West [JB1] [NM2] coast of the United States, there are new regulations such as the Local Law 97 in New York City, which require improved energy efficiency and reduced greenhouse emissions for buildings effective January 1, 2024. In California, Title 24 has been a standard in energy efficiency building codes and effective January 2023, most new homes and buildings statewide will either need to be equipped with at least one highly efficient heat pump for either space heating or water heating or face high energy efficiency fines. These laws provide energy efficiency benchmarks and any building not operating at defined levels will be considered non-compliant and be subject to fines. This all drives the question: how can building owners obtain optimal thermal efficiency and cost savings over time?

Energy surcharges and changing legislation are now driving HVAC and refrigeration systems to become more costly, but also more efficient. The most efficient HVAC units use a variable refrigerant flow (VRF) system, which allows them to separately respond to different zones of a building. Using an INVERTER-driven compressor and continuous fan operation, a VRF system keeps each zone's temperature steady while consuming minimal energy. Armacell insulation products are the preferred choice for VRF refrigerant piping. VRF systems can also help a building become LEED® certified by contributing a number of points in the Energy & Atmosphere (EA) and Indoor Environmental Quality (IEQ) categories, making these units especially attractive for building owners. Consulting a LEED Accredited Professional is the best way to determine what systems and materials help a project achieve LEED certification.

Indoor Air Quality

In addition to energy efficiency and thermal performance, another aspect of building management is indoor air quality. Insulation materials can help defend against indoor air-quality problems and they should be non-particulating to avoid irritants for building occupants. Like other interior building products and finishes, insulation should also be low-emitting, with low VOCs and negligible off-gassing. A building's mechanical systems also require insulation that resists moisture while ensuring that the air passing over it remains mold-, dust- and fiber-free. The primary

consequence of moisture intrusion, in addition to loss of thermal performance, is that the insulation and the pipes or ducts can become breeding grounds for mold or mildew spores. Mold and mildew can grow unseen behind walls and in plenums due to wet pipes or wet insulation. Mold and mildew spores spread easily, especially in air-handling systems impacting building occupant's health.

If the system is under-insulated, not protected, or is covered with fibrous open-celled insulation, water vapor may condense on the surfaces when the temperature falls below the dew point or point of saturation, causing condensation issues and possible corrosion under insulation (CUI). All these instances can negatively impact indoor air quality and system operation.

After considering these points when installing an energy efficient mechanical system, the challenge becomes long term maintenance of the system. How can a building owner improve system performance, protect occupants, reduce maintenance, and avoid future breakdowns? Simple. Properly select and install the best insulation solutions.

With Insulation, it's All About the Installation

When installed correctly, insulation solutions will pay dividends over time through energy efficiency, reduced maintenance issues, increased thermal performance, condensation control, and extended system longevity. When insulation is installed incorrectly however, a system can deteriorate quickly, leading to costly break downs and time consuming maintenance call backs. For any pipe length, damaged insulation and moisture ingress compromise energy delivery, counteracting the cost savings of the installation on equipment.

Building owners benefit the most from properly installed insulation and should be cognizant of design and install choices during construction. Choosing value instead of small savings, poor installation, or construction short cuts can save time and money later and provide operational value over time. Being an industry leader, we have seen common problems and insulation installation mistakes that can easily be avoided. To prevent insulation and system issues, we have complied a guide for building owners to show what these pitfalls look like during construction and long after contractors have left the job site.

Improperly Selected or Installed Insulation Expense Chart

Moderate Cost

Compressing insulation with clamps causing thermal loss, damage, and condensation.

Gouging insulation with cable ties, tape, or tie wire causing a thermal break, damage, and deterioration.

Median Cost

Failure to provide proper spacing between pipes causing thermal loss, condensation, and complete renovation of pipe system.

Failure to establish a vapor barrier at termination points by using too much adhesive or not letting adhesive tack long enough to cure.

Not allowing for expansion or contraction to occur on variable temperature pipes resulting in movement causing saddles to shift and insulation to tear.

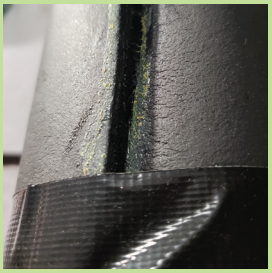
High Cost

Incorrect pipe supports used such as a steel struts, not insulating at the fixed points, or not using any pipe support system, causing galvanic corrosion, thermal loss, and condensation.

Failure to protect insulation from outdoor weathering and UV radiation causing exposed pipes, degrading of material and thermal loss.

Stretching insulation over a 90 degree fitting causing tearing and pipe exposure.

Moisture, contaminants, and dissimilar metals causing corrosion, system failure and refrigerant leaks which release greenhouse gas emissions 100x greater than CO2.



Sealing insulation with tape or not using the recommended adhesive to seal edges causing thermal loss and condensation.

Recommended Steps for Successful Elastomeric Insulation Performance:

- Specify the correct insulation thickness: use ArmaWin™ professional insulation thickness calculator.
- Specify ArmaFlex® WB Finish or a UV protective coating for exterior applications to prevent degradation.
- Specify ArmaFlex® Shield or a protective jacket for both weather and mechanical protection when installed in exterior environments.
- Specify ArmaFix® Insuguard pipe support saddles and ArmaFix EcoLight pipe support inserts to prevent insulation compression at pipe hanger locations.
- Seal insulation seams and terminations with a high-performance adhesive like ArmaFlex® 520 to provide a complete vapor seal.
- Use prefabricated fittings for pipe direction or angle changes where applicable.
- Reference Armacell's website for a technical resources library.

Our Solutions Portfolio Makes It Simple

One of the best things a building owner can do is invest in high-quality insulation materials and accessories that meet the exact needs of a project. High-quality insulation systems typically have a payback period of less than one year. From that point on, it's all savings.

By partnering with Armacell and utilizing our resources like specification reviews, technical training, installation training (AQIP), installation tutorials, Armacell Academy e-learning, jobsite inspections, and our Solutions Portfolio, building owners can assure proper insulation installation at no additional cost. Our targeted insulation Solutions Portfolio offers the right products for code compliance, system performance, and budget. The Solutions Portfolio groups the vast Armacell array of insulation products into two comprehensive packages aimed at making the specification of the right insulation for mechanical systems easier. Building owners can easily identify the best insulation products for use in an air plenum, HVAC ducts and handlers, on plumbing and mechanical piping, and on chilled water and hydronic heating systems – the key places where insulation is critical to the performance of the equipment.

In 2021, the commercial sector consumed 17.41 quads (1 quad = 10^{15} Btu) of primary energy, a 65% increase from 1980!

When building owners create a partnership with Armacell, they choose our trusted protection, including a 10- or 15-year warranty backed by the industry leader with over 70 years experience, ensuring a successful project.

Armaflex WB Finish

Armaflex Shield

ArmaFix Insuguard, ArmaFix EcoLight, and ArmaFlex System

Armaflex Fittings

Armaflex 520 Adhesive

ArmaFlex | Acoustics | WhitePaper | 092023 | NA | EN-A

ABOUT ARMACELL

As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With more than 3,300 employees and 27 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.

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