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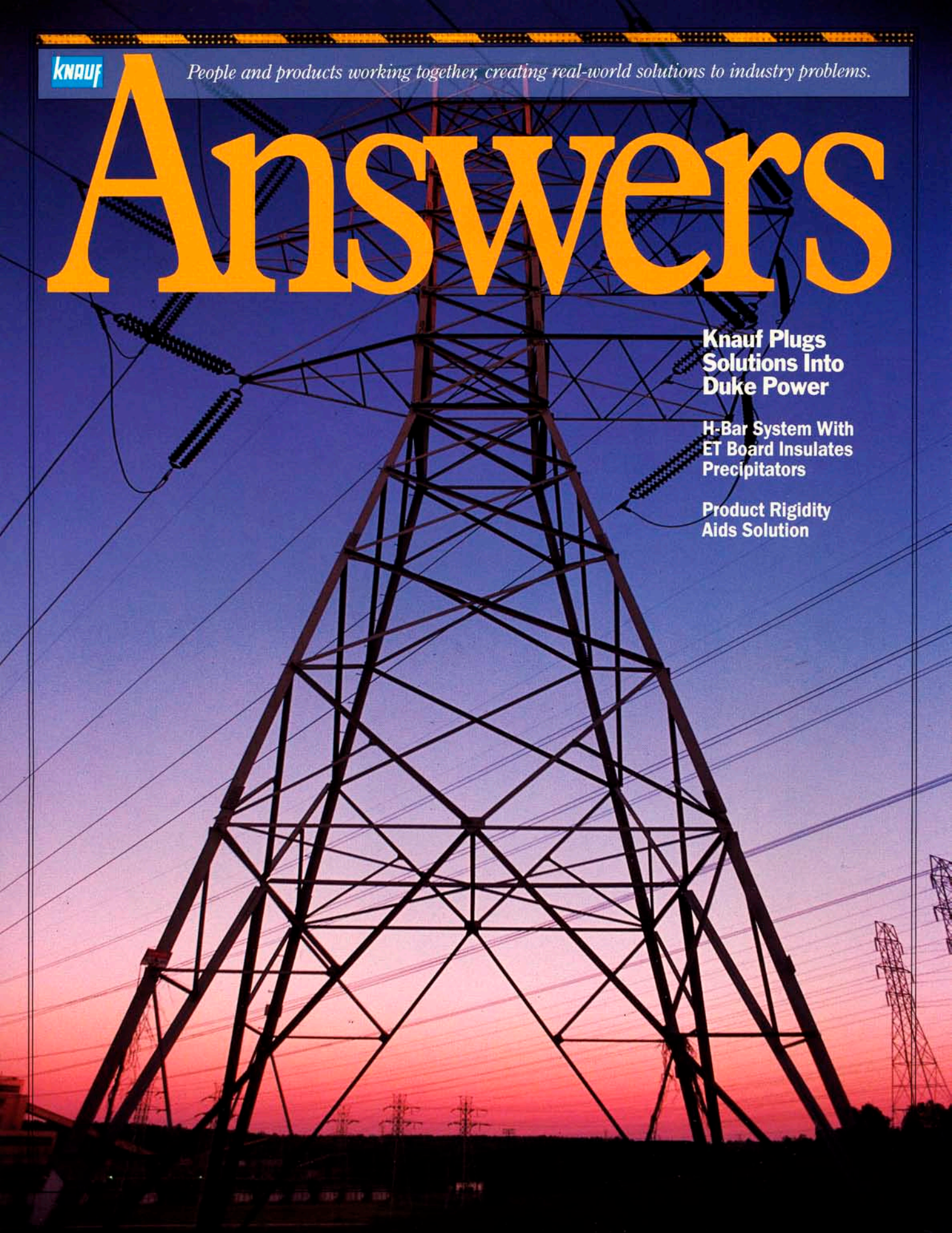
People and products working together, creating real-world solutions to industry problems.

Answers



Knauf Plugs Solutions Into Duke Power

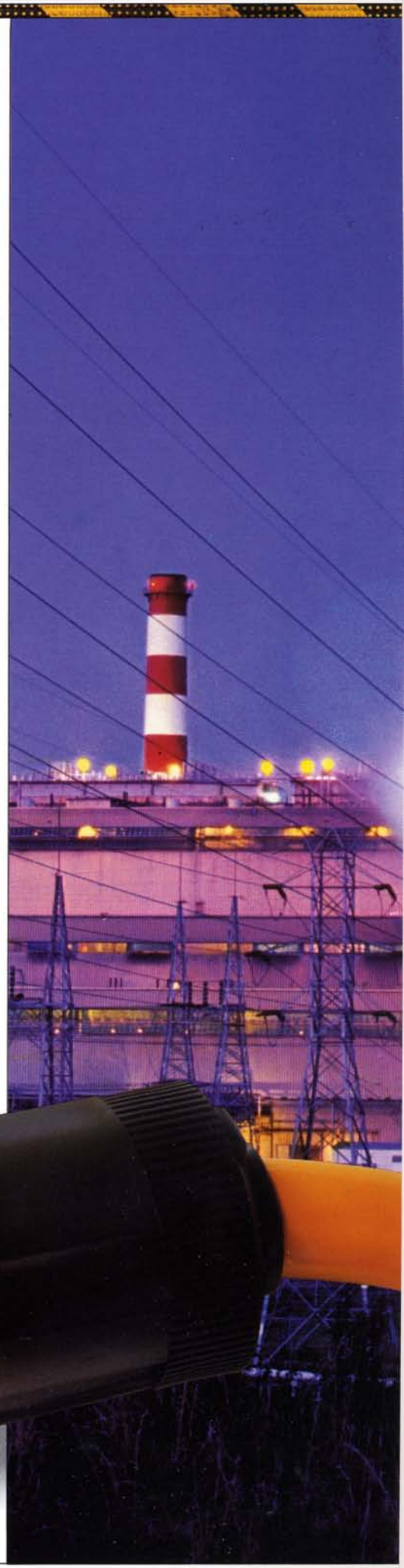
H-Bar System With ET Board Insulates Precipitators

Product Rigidity Aids Solution

The Challenge

Duke

Late in 1989, Duke Power had a problem to solve at its Allen Steam Station, a fossil fuel power plant in Belmont, NC. The mineral wool insulating Allen's five precipitators was deteriorating. EPA mandates also required upgrading the performance of the precipitators. This meant upgrading the insulation.



The Site:
Allen Steam, a fossil fuel plant in Belmont, NC.

Design-Construct Firm:
Duke Power, the nation's seventh-largest investor-owned utility and largest utility-owned design-construct firm.

Project Manager:
Dave Walker, Duke Power

Design Engineer:
Phil Hammond, Duke Power

Knauf Product:
Elevated Temperature Board. Chosen for its ability to withstand high temperatures (up to 850°F) and vibration, and for its resilience, light weight, rigidity and consistency, as well as ease of handling.

Applications:
5 precipitators in the 100,000-square-foot plant.

Precipitators require a rugged insulation system to withstand the high temperatures and constant vibration necessary to clean the air emitted from the combustion process. The Allen plant needed a new insulation system that could go up to 750°F and remain intact over time while enduring vibration of 720 cycles per minute. The traditional application of mineral wool supported by road mesh was a short-lived answer that was difficult to install and time-consuming to repair. Unable to withstand the constant vibration, the mineral wool that had been used on the job had partially disintegrated. It was slumping and falling off.

Clearly, another method of insulation had to be found, one that could withstand difficult job conditions and meet Duke engineers' high performance standards.

Knauf had the solution. Because of previous successful projects, Knauf also had the field expertise, technical expertise and quality products necessary to present its innovative ideas to Duke.

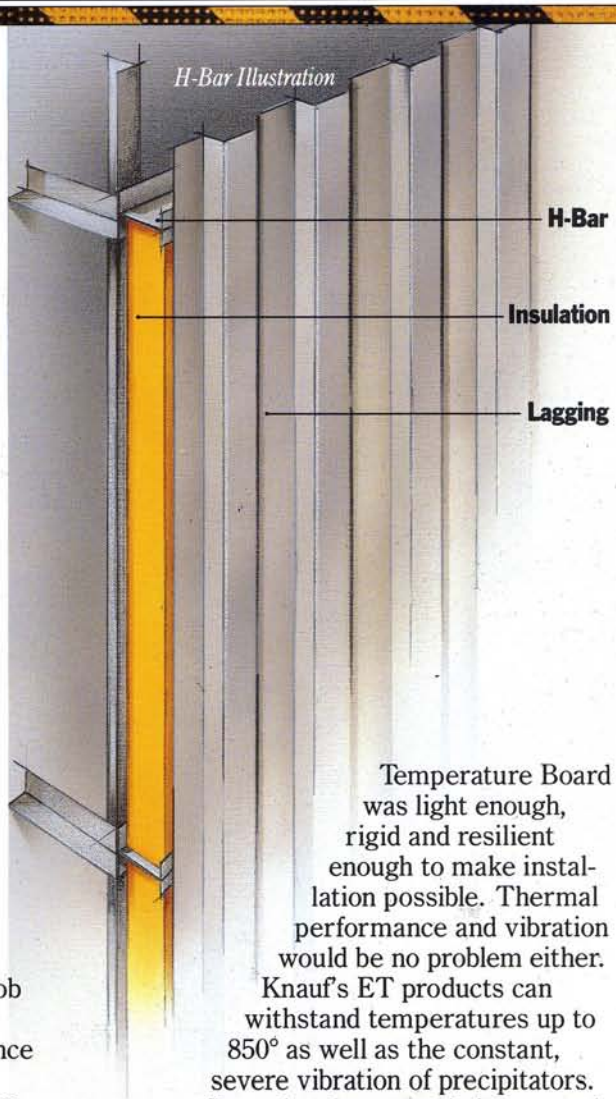
Knauf had already proven that. In 1983 Duke replaced ductwork at the Dan River Steam Station, a fossil fuel plant in Eden, NC. The equally challenging problem there: how to insulate 30,000 sq. ft. of crossover duct operating at 750°F, while allowing for expansion and contraction of the huge sheet metal ducts of up to 6 inches for every 100 feet. The insulation system had to be able to move with the duct.

The solution was a unique sliding H-Bar system using Knauf Elevated Temperature Board. The system design and product performance were a great success.

Duke Remembered

Then, at the Allen Steam project, Duke needed even more performance from the insulation.

Knauf recommended a modified H-Bar system. Knauf's Elevated Temperature Board was light enough, rigid and resilient enough to make installation possible. Thermal performance and vibration would be no problem either. Knauf's ET products can withstand temperatures up to 850° as well as the constant, severe vibration of precipitators.



Soon sketches were being passed between Duke and Knauf. Knauf's technical support, test data and field experience helped Duke engineers design a reliable system that could be installed quickly, easily and without having to shut down.

All of this is possible because a steel framework of H-shaped channels suspends the Knauf ET Board away from the precipitator. The rigid, resilient boards pop into place in the grid. The entire system is then sheathed with galvanized lagging that is screwed—not welded—to the channels.

The Allen installation is an excellent example of how real-world solutions to industry problems evolve from a company's interaction with a forward-thinking supplier.

"Will it go to 750°F?" Duke asked Knauf.

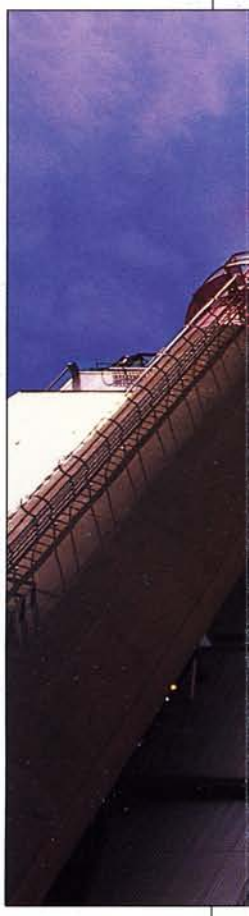
The answer: "It can go to 850°."

The H-Bar System

The H-Bar system of precipitator insulation utilizes a framework of H-shaped 20-gauge galvanized metal channels to hold Knauf Elevated Temperature Board 6-to-10 inches away from the precipitator surface. The insulated precipitator is then sheathed with galvanized lagging screwed to the channels of the H-Bar, installed with a ¼"-to-½" gap every 20 feet to allow for expansion and contraction of the metal panels.

The H-bars are installed four feet on center. At roof edges and corners, J-shaped channels are installed to complete the system, holding the 2-by-4-foot boards of elevated temperature insulation in place.

Because this system is suspended several inches away from the precipitator surface, flue stops must be placed every 36 feet up the exterior to stop the stack effect of escaping air. The stops are created by installing ET Board sideways with angle bars.



History of the H-Bar System

Knauf's experience with the H-Bar system began with an earlier association with QSi, an insulation contractor in Pittsburgh, who has designed, developed, and tested several H-Bar systems. At that time, QSi was experimenting with various types of insulation for the new and very practical H-Bar system. After testing mineral wool and other materials that slumped, broke or disintegrated during use, QSi sought the assistance of Knauf.

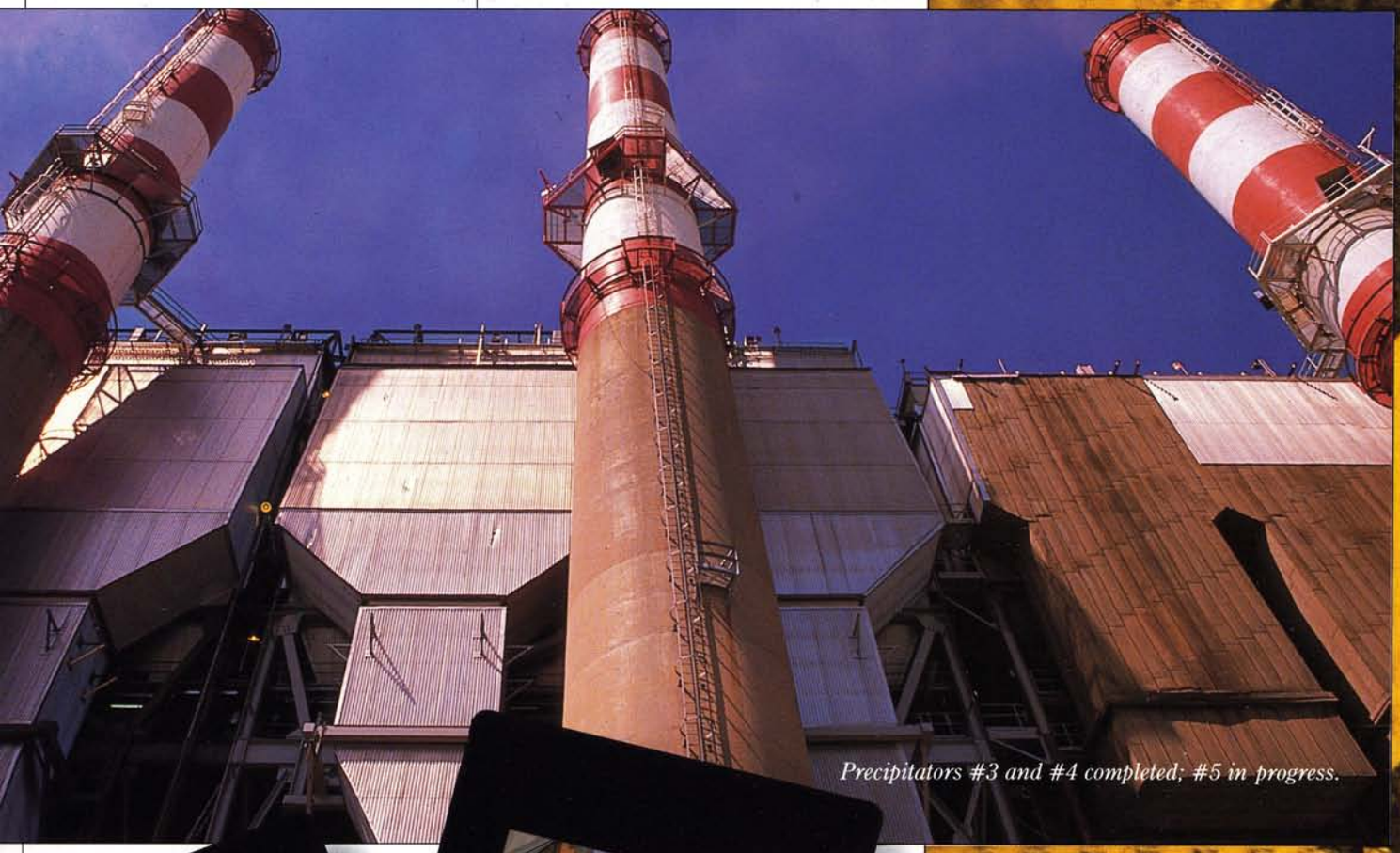
That collaboration resulted in the use of Knauf Elevated Temperature Board. Because of the product's rigidity and high temperature tolerance, it proved to be the right complement to QSi's innovative system.

In 1983 and 1984, Knauf and QSi worked together to develop their first joint installation. With over one million square feet of ET Board, the Sammis Power Plant owned by Ohio Edison is the largest installation of its type.

In 1985, Knauf took the H-Bar system idea to Duke Power, and a similar system was developed for Duke's Dan River Steam Station at Eden, NC, using sliding plates that allowed for the expansion and contraction of the huge sheet metal ducts. Using over 30,000 square feet of Knauf ET Board, the hot duct-work system was so vast that the H-Bar framework had to allow for up to 6 inches of expansion per 100 feet of duct.

The combination of Knauf products and innovative ideas met Duke's high standards. The system exceeded expectations.

Later, when Duke renovated portions of the Allen Steam Plant, high temperature was the challenge. Capable of withstanding temperatures up to 850°, Knauf ET Board once again played an important part in the solution.



Precipitators #3 and #4 completed; #5 in progress.

Installing new insulation in H-Bar over old road mesh.

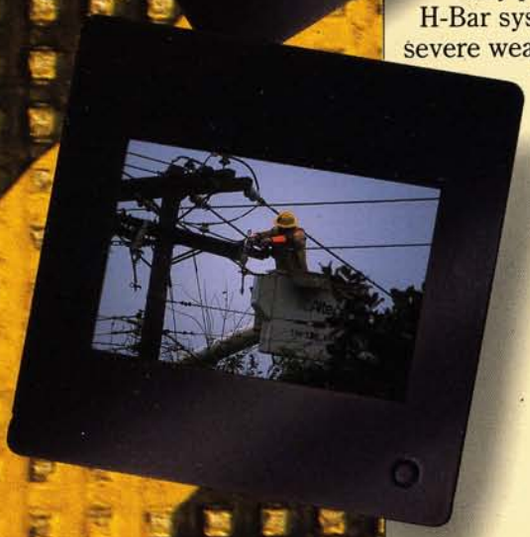
Applying lagging.

Hurricane Hugo

The H-Bar system's ability to withstand abuse was put to the test when Hurricane Hugo devastated the Carolinas in September, 1989. In Hugo's wake, nearly 700,000 Duke Power customers were powerless, and for some, repairs would take over two weeks. Ultimately, 9,000 people—in an unprecedented and incredible recovery effort—would virtually rebuild in days a system that took years to build.

In the days following Hurricane Hugo, Duke's crews were the most popular people in town as they worked around the clock to restore all service. Hugo gave thousands of customers a new sense of appreciation for Duke Power line technicians.

Allen Steam employees, too, had a greater sense of appreciation when they saw how the newly installed portions of H-Bar system weathered the hurricane. Although it was only partially in place, the H-Bar system came through the severe weather virtually unscathed while the sections of old insulation and road mesh were badly damaged. This only increased the Duke engineers' belief in this innovative and now proven, reliable system.



The Benefits of the System

The H-Bar system at Allen Steam has many benefits for Duke, including easier installation, cost savings and ease of repair when the system needs routine maintenance.

- The Allen steam precipitators did not have to be shut down for the H-Bar system installation, so no downtime added to the actual cost of the installation.
- The H-Bar system saved time and labor because it could be installed over the old road mesh without removing it. Workers simply removed the old lagging and any remaining mineral wool, and began installing the new system.
- Knauf ET Board has the product integrity to withstand the constant vibration of the precipitators without disintegrating or slumping like mineral wool.
- Installing anything around a precipitator a hundred feet in the air is a slow, tricky and difficult job at best. Because Knauf ET Board is lighter than other types of insulation, such as mineral wool, it is easier to hoist up to the point of installation. Mineral wool weighs eight pounds per cubic foot, while Knauf ET Board weighs only three.
- Compact packaging of Knauf Elevated Temperature Board makes it easier to get the insulation up to where it is needed—as high as six stories at Allen.
- The rigidity of Knauf ET Board is a large factor in the success of the Allen Steam H-Bar installation. LOI tests demonstrate Knauf's superior rigidity, making installation easier and the system more stable in use over time.
- Should repair be necessary at any time in the future, it will be easy at Allen Steam. Because each piece of Knauf ET Board fits in an individual frame of steel channel, one section can be worked on without removing or disturbing other sections.

Knauf Elevated Temperature Board Product Data:

Description
- A lightweight insulation made from inorganic glass fibers bonded with a high-temperature thermosetting resin.
- A semi-rigid, board-like form with superior handling properties and insulating effectiveness at minimum cost.

Applications
- An elevated temperature, light density insulation for boiler walls, hot precipitators, hot duct work, cylindrical tanks, towers, stacks and industrial ovens.
- Designed for maximum operational temperature of 850°F (454°C) and thicknesses not to exceed 6″ (15.24 cm).

Features and Benefits
Energy Conservation
- Offers excellent resistance to heat loss.
- Saves energy; lowers operating costs.

Large Sizes
- Up to 4′ x 10′ (121.92 cm x 304.8 cm).
- Reduces the number of joints and installation time.
- Eliminates potential sources of heat leakage.

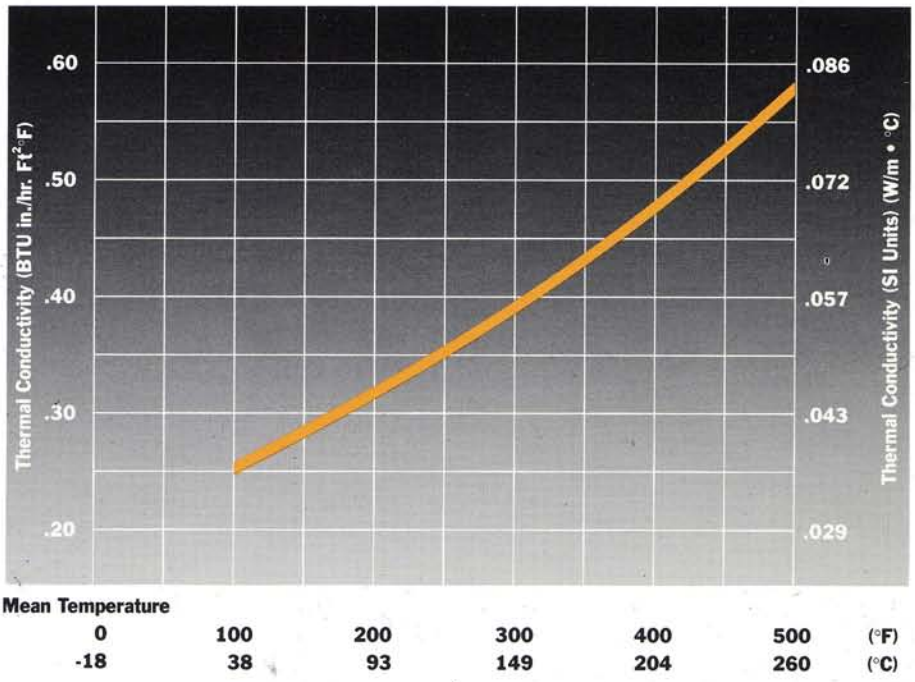
Technical Data
Surface Burning Characteristics
- UL Classified.
- (ASTM E 84, UL 723 and CAN 4-S102) Does not exceed 25 flame spread, 50 smoke developed.

Temperature Limitation (ASTM C 411)
- Designed for applications to a maximum operational temperature of 850°F (454°C).

Alkalinity (ASTM C 871)
- Less than 0.6% as Na_2O.
- pH between 7.5 and 12.0.

Resistance to Fungi and Bacteria (ASTM C 665)
- Does not promote growth of fungi or bacteria.

Thermal Efficiency (ASTM C 177)



Specification Compliance
- USCG 164.009/214/0
- MIL-I-24244B
- ASTM C 795
- Canadian Coast Guard 100/F1-109
- MIL-I-15475C (Ships)
- ASTM C 612 Class 1, 2, 3
- HH-I-558B (Amend. 3) Form A Class 1, 2, 3
- NRC 1.36 Reg. Guide
- MIL-I-22023D Type III

In Canada:
- CGSB 51-GP-10M
- DND 15280-02 E-2
- CCG 100/FI-109

Forms Available
- Length: 24″ through 120″ (60.96 cm through 304.8 cm) in 1″ (2.54 cm) increments.
- Width: 24″ and 48″ (60.96 cm and 121.92 cm).
- Thickness: 1″ to 4″ (2.54 cm to 10.16 cm) in ½″ (1.27 cm) increments.

Notes
The chemical and physical properties of Knauf Elevated Temperature Board represent typical average values determined in accordance with accepted test methods. The data is subject to normal manufacturing and testing variations. The data is supplied as a technical service and is subject to change without notice. References to numerical flame spread ratings are not intended to reflect hazards presented by these or any other material under actual fire conditions. Check with your Knauf regional office to assure information is current.

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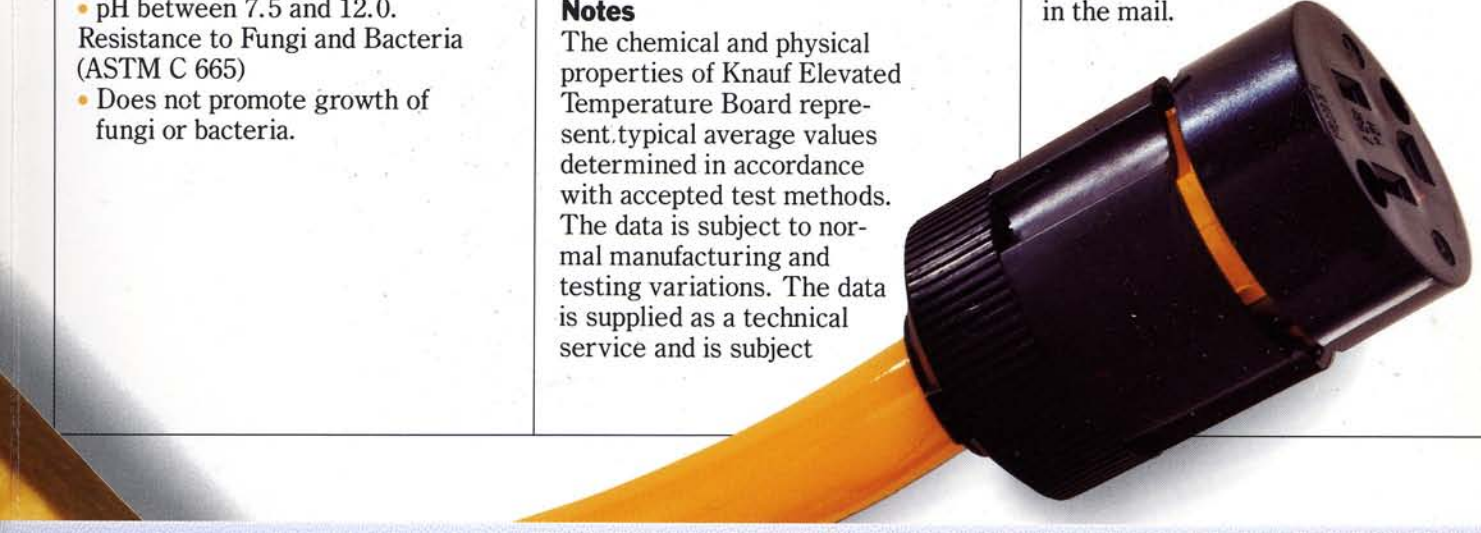
Knauf Turns Technical Support Into Answers
Knauf people solve problems with the customer's total needs in mind. From technical expertise to field service support, Knauf is ready to show you that the Knauf reputation for innovation is well-deserved. For more information about Knauf products and how the Knauf team can help you find real-world solutions, just fill out one of the attached business reply cards and drop it in the mail.



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