

ThermoHALL®

Insulated fabric clad buildings



AVIATION • SPORTS • PORTS & WAREHOUSING • MILITARY • MARINE
• MINING & ENERGY • ENVIRONMENTAL • EMERGENCY RELIEF

ThermoHALL®

Insulation System

Insulated fabric cladding saves energy and lowers operating costs

We live in an increasingly energy conscious world. The environmental choices we make now will have a great impact on our future. These concerns are reflected in the building industry as a whole and also in Rubb's relocatable structures. In this regard, Rubb is pleased to introduce **Thermohall**, a new and innovative means to efficiently insulate membrane buildings.

Development of the **Thermohall** concept began several years ago in Norway. The goal was to engineer a cost-effective, practical and eco-friendly insulation system for relocatable membrane clad structures. Today this Thermohall system is tested, proven and ready for use worldwide.



Truls Torgersen. RUBB Group CEO



LG Electronics

Three FXI Thermohall structures near Wrocław, Poland. Two buildings measure 30m (98.5ft) wide x 125m (410ft) long and one measures 30m (98.5ft) wide x 90m (295ft) long – all three have 5m (16.5ft) sidewalls. The buildings feature tunnels between the buildings.

www.rubb.com



Innovative insulation system for the **future**

The Thermohall product has received a very warm welcome from customers and Thermohall building projects have been successful in locations exposed to extreme weather.

The outer membrane cladding of a Thermohall building is manufactured using the same high strength PVC coated polyester material used and proven on Rubb's uninsulated buildings. These materials have a self cleaning exterior finish and feature coated weights ranging from 850 gm² (25 oz/yd²) to 950 g/m² (28 oz/yd²) for most applications. PVC battens are welded to the outer cladding panels at regular intervals and then to the inner fabric panels to create closed cells to hold the glass wool insulation. The +/-550 g/m² (16 oz/yd²) inner fabric is white and has a self-cleaning coating on the inside face. This white fabric helps reflect interior light. Glass wool insulation batts are enclosed within the completed PVC assembly which is then finish sealed to prevent moisture from entering.

A Thermohall building offers exceptional structural integrity and the Thermohall membrane is highly resistant to tearing, stretching and movement under load – even in very harsh weather conditions. It is securely fastened to the outside of the galvanized support structure and virtually eliminates thermal bridging and air infiltration through the building envelope. These features, together with our use of special high density insulation, mean that Thermohall typically out performs other systems that have higher insulation thickness but lower overall effective thermal resistance.



Thermohall's cladding is a composite structure consisting of a durable outer PVC layer and non-combustible glass wool high density insulation core inside an air-tight pocket and a self cleaning PVC inner layer.

The benefits of **Thermohall**

- Insulated panels include outer weather liner, integral glass wool insulation and inner liner
- System provides a full vapor seal greatly reducing infiltration losses as compared to other insulation systems
- Insulated panels completely cover the structural frame to minimize thermal bridging. This greatly reduces the condensation on framing members and improves insulation efficiency
- Roof and interior surfaces are provided in high gloss white to reduce solar load on the outside and increase reflectance within the building
- Factory pre-fabrication offers significant labor savings on site and greatly reduces installation time
- The system leaves the structural frame exposed internally allowing for more efficient installation and service of electrical and mechanical equipment
- The system is fully and easily relocatable
- Vacuum packaging reduces shipment volumes





Kongsberg Thermohall insulated warehouses for oil and gas components



Kongsberg is an international corporation with more than 5200 employees in 25 countries.

Kongsberg supplies high-technology systems and solutions to customers engaged in the oil and gas industry, the merchant marine, and the defense and aerospace sector.

Kongsberg Industrial Area was developing rapidly and urgently needed high quality, climate controlled storage space. The existing buildings in the area were not suitable for the storage of sensitive products, which required stable temperatures and humidity.

To meet the need for suitable space, Kongsberg management began searching the market for building solutions with large clear spans that were heated, ventilated, secure and fast to deliver. The total project time could not be more than 3 months, since winter was approaching.

Uncertain as to how long there would be a need for the storage space, Kongsberg management requested that the building be leased and relocatable, so as not to rule out future uses of the industrial area.

Rubb's Thermohall was selected as a pilot project and the first building of 1,000 m² (11,000ft²) was ready for use in less than 3 months.

The customer's experience from this first Thermohall building was so positive that over the next three years, Kongsberg ordered 14 more Thermohalls. Some of these will be in use permanently, while others are leased as temporary buildings.

The end-users and property managers at Kongsberg have found Rubb's Thermohall to be a very satisfactory system, both as permanent and temporary, high-quality building solutions.



ThermoHALL®

Case**Studies**

www.rubb.com

Hilding Polska

Thermohall insulated warehouse, mattress production for IKEA

Hilding Polska is a subsidiary of Hilding Anders, which is one of the five largest mattress manufacturers in the world. Hilding Polska is located in Poland and in early 2001 demand for Hilding's products increased considerably.

The existing space in the company's permanent buildings was no longer sufficient and at the start of 2002 planning commenced on rapid expansion. The alternatives were a conventional extension of the existing building or a Thermohall system.

Hilding Polska chose Thermohall, and thanks to Rubb's detailed technical documentation, the approval procedure was carried out effectively. Investors and management at the Polish factory were very satisfied with their choice of solution.



Kristiansand Council

Public swimming pool

Rubb has supplied a building to Kristiansand Council in Norway to cover a public swimming pool. The building is 20m (65.6ft) wide x 36m (118.1ft) long with 6m (19.7ft) sidewalls and features the patented Rubb Thermohall insulation system. The PVC cladding and hot dip galvanized steel frame provide resistance against corrosion. The Rubb building will be rented out for two-and-a-half years.

The international engineering consultancy company, Rambøll was responsible for the engineering on this project.

The fact that a Rubb Thermohall can be used to cover a public swimming pool demonstrates the excellent insulation properties of the Rubb Thermohall system.



Risavika Harbour

Office/warehouse facility

The Thermohall insulation system is featured in a combined warehouse and office building at Stavanger, Norway. This project was completed at Risavika Harbour and incorporates the Thermohall technology.

The warehouse building measures 1,500m² (16,146ft²) with a galvanized steel framework and external wall columns. It features insulated membrane walls and a white insulated inner membrane roof which provides excellent light working conditions. The outer non-insulated membrane is fixed 1.4m (4.5ft) from the inner skin. This facility is temperature controlled to protect products within the warehouse. The office section measures 250m² (2,700ft²) and includes facilities, shower, kitchen/ conference room, technical facilities and four electrical gates along with emergency exit doors.



Kongsberg



Hilding Polska



Kristiansand - Swimming pool



Risavika Harbour



LG Electronics

Thermohall insulated warehouses

Rubb was selected to help lay the foundations for Korean electronics giant LG's latest expansion in Europe. Rubb Poland applied its expertise to design, manufacture and install three FXI Thermohall structures to LG Electronics near Wrocław, Poland. NARA E&C commissioned the buildings on behalf of LG. Two buildings measure 30m (98.5ft) wide x 125m (410ft) long and one measures 30m (98.5ft) wide x 90m (295ft) long – all have 5m (16.5ft) sidewalls. The structures feature tunnels between the buildings.

The 30m (98.5ft) x 90m (295ft) FXI building was built with trans-shipping loading platforms for three trucks. The facilities include a total of 14 truck doors. There are also six fire rated personnel doors.

The Thermofabric cladding is 50mm (2") thick. All steel frames are hot dip galvanized after the welding process. The tunnels leading between the structures are constructed using steel plates (trapezoidal sheet metal), in anticipation of potential snow loads sliding down from the buildings.

Rubb was chosen for this project after LG chiefs were impressed by an existing Rubb project for ACERICO in Bielawa, Poland. The Thermohall insulation system helps maintain the correct temperature for the storage of high quality refrigerators and washing machines.



Borg Havn Thermohall insulated warehouse at the Port of Fredrikstad

The site at Borg Havn was an old landfill, which meant that foundation work would be an important planning consideration. Piling and heavyweight foundation solutions would be expensive. Rubb's solution was to put a Thermohall building on a concrete floating foundation as a flooring solution. This made it possible to reduce building costs considerably, since this type of building permits a certain amount of settling, to which the Thermohall building, with its adjustable base plates, is uniquely suited. Another advantage is that maintenance costs are substantially lower.

The investment costs of a Thermohall were also lower than for other types of building. That made the choice very easy, and the warehouse has proved to work very well.



ThermoHALL®

Case**Studies**

www.rubb.com

ThermoHALL® Technical Data

- Outer layer** Flame retardant heavy duty PVC fabric
- Core** High density glass wool insulation
- Inner layer** Self-cleaning, PVC fabric

Rubb's patented ThermoHall is the world's only flexible insulated fabric system which offers major advantages over other insulating systems:

- **Non-combustible glass wool insulated encapsulated in air and water tight pockets.**
- **Insulation thickness from 50mm to 200mm.**
- **Buildings are fully relocatable.**
- **No thermal bridges in the cladding.**
- **No air gaps in the cladding, which reduces heat loss and helps eliminate condensation.**

Development of the ThermoHall started several years ago, with the goal of a new and eco-friendly insulation system. ThermoHall is now fully developed and patented. ThermoHall offers great energy savings and is environmentally friendly, both in fabrication and operation.

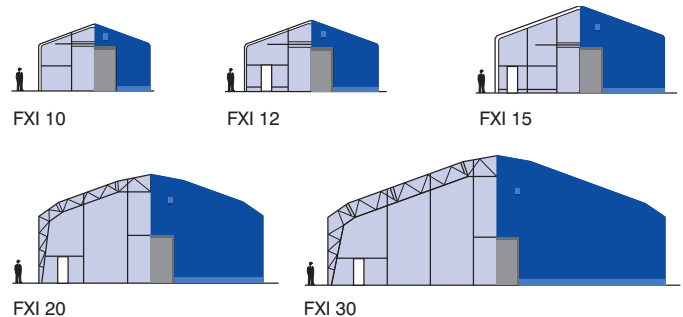
- We use a heavy duty PVC fabric with a long useful life (20+ years), and high density non-combustible glass wool insulation.
- All the materials are recyclable. Market reaction to our new membrane construction has been extremely positive and Rubb has supplied nearly 200,000m² (2,200,000ft²) of ThermoHall material to date at locations with extreme weather, such as northern Norway and coastal regions in North America and Germany.
- Competing insulation options are often poor imitations. Some of these employ PVC sheets with an air gap in between which gives poor thermal performance while being prone to condensation problems. Other systems use combustible insulation or rigid panels which don't allow for relocation of the building.
- Rubb ThermoHall is a properly insulated building which combines the best properties of both conventional buildings and fabric buildings, high thermal insulation and full relocatability and all ThermoHall buildings can be delivered to suit the customer's insulation requirements.

U-Values (R-Values) US approximate equivalent

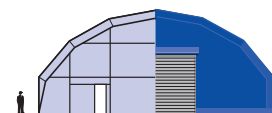
Thickness	U Value (SI) W/m ² K	R Value (US) ft ² -°F-hr/BTU
50mm (2in)	0.67 W/m ² K	R11
100mm (4in)	0.36 W/m ² K	R19
150mm (6in)	0.25 W/m ² K	R27
200mm (8in)	0.19 W/m ² K	R35

Some typical span configurations from the Rubb range of relocatable, engineered fabric structures. Rubb can provide both standard and custom solutions with clear spans up to 100m (328ft), vertical sidewalls to more than 20m (65.6ft) and unlimited building length.

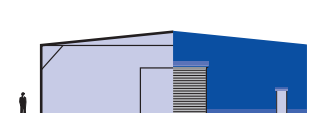
Rubb FXI Type profile (FXI 25 not shown)



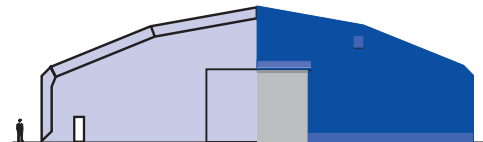
Rubb NV Type profile



Rubb BVR Type profile

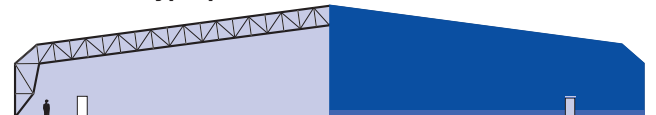


Rubb BVE Type profile



BVE spans range from 20m (65.6ft) up to 61m (200ft) - also available with Rubb highwall option, details available on request.

Rubb BVL Type profile



BVL with spans of up to 100m (328ft) - also available with Rubb highwall option, details available on request.

Rubb Multispan



Multispan - Shown in BVE Type configuration



Military



Sports



Aviation



Industry

Rubb has the capability and experience to design, manufacture, deliver and install custom structures

With Rubb you can be sure everything is under control from concept to completion – including cost, quality and delivery. While we generally have the right standard structure available to meet project needs, Rubb can also design custom solutions to meet special requirements. We have the in-house resources to provide a cost effective solution customized to our clients' needs.

- Design - Using proven engineering software and design principles our experienced structural engineers and design staff can tailor the project to the specific requirements of the site, products stored, logistics needs and local building codes.
- Production - Steel and membrane components are fabricated by qualified and capable personnel utilizing 'first class' equipment and quality control.
- Installation - Rubb site personnel are thoroughly familiar with best construction practices and Rubb products. This ensures a safe, smooth and efficient assembly and a solid finished product.

Peace of mind when you choose a Rubb Structure...

Rubb structures are designed, manufactured, installed, serviced and warranted by the companies of the Rubb Group. Rubb's expertly engineered product design and the highest quality materials are backed by over forty years' experience worldwide. More importantly, Rubb has a reputation for accountability and for providing practical solutions to weather protection problems of all kinds.

Our buildings are designed, manufactured and erected to ISO 9001:2008 standards and meet international building code standards for wind, snow and seismic loads.

After-sales service includes repairs and any further adaptation, relocation or refurbishment work. So your peace of mind extends well into the future.



USA - CERTIFICATE
No. US97/0897



UK - CERTIFICATE
No. 95/6243



Norway - CERTIFICATE
No. 144535A



we will never stop innovating



RUBB AS.

Sundvoldhovet, 3535 Kråderen,
Norway.

Tel: +47 24 048150. Fax: +47 24 048151
E-mail: post@rubb.no



RUBB BUILDINGS LTD.

Dukesway, Team Valley Trading Est. Gateshead.
Tyne & Wear NE11 0QE, England.

Tel: +44 191 482 2211. Fax: +44 191 482 2516
E-mail: info@rubb.co.uk



RUBB Inc.

1 Rubb Lane, Sanford Airport,
Sanford, Maine 04073 USA.

Tel: 1 207 324 2877. Fax: 1 207 324 2347
E-mail: info@rubbusa.com



RUBB STANDARD.

122 East Pembroke Avenue
Hampton, Virginia 23669 USA.

Tel: 1-888-289-7822. Fax: 1-757-722-5443
www.rubbstandard.com E-mail: post@rubbstandard.com



RUBB POLAND Sp. z o.o.

ul. Starowiejska 232/234
08-110 Siedlce/Poland.

Tel: +48 25 632 77 88. Fax: +48 25 632 88 99
E-mail: biuro@rubb.pl



RUBB AB.

Eolsborg 533 73 Källby
Sweden

Tel: 0510-54 11 78. Mob: 070-990 34 35
E-mail: info@rubball.se



RUBB PTE. LTD.

31 Toh Guan Road East,

#05-08 LW Technocentre, Singapore 608608
Tel: +65 64254134. Mobile: +65 97225016
E-mail: rfarrell@rubb.com



RUBB AUSTRALIA & NEW ZEALAND.

52 Charolais Crescent, Benowa Waters 4217
Queensland, Australia.

Mobile: +61 413 610 710
E-mail: cunger@rubb.com