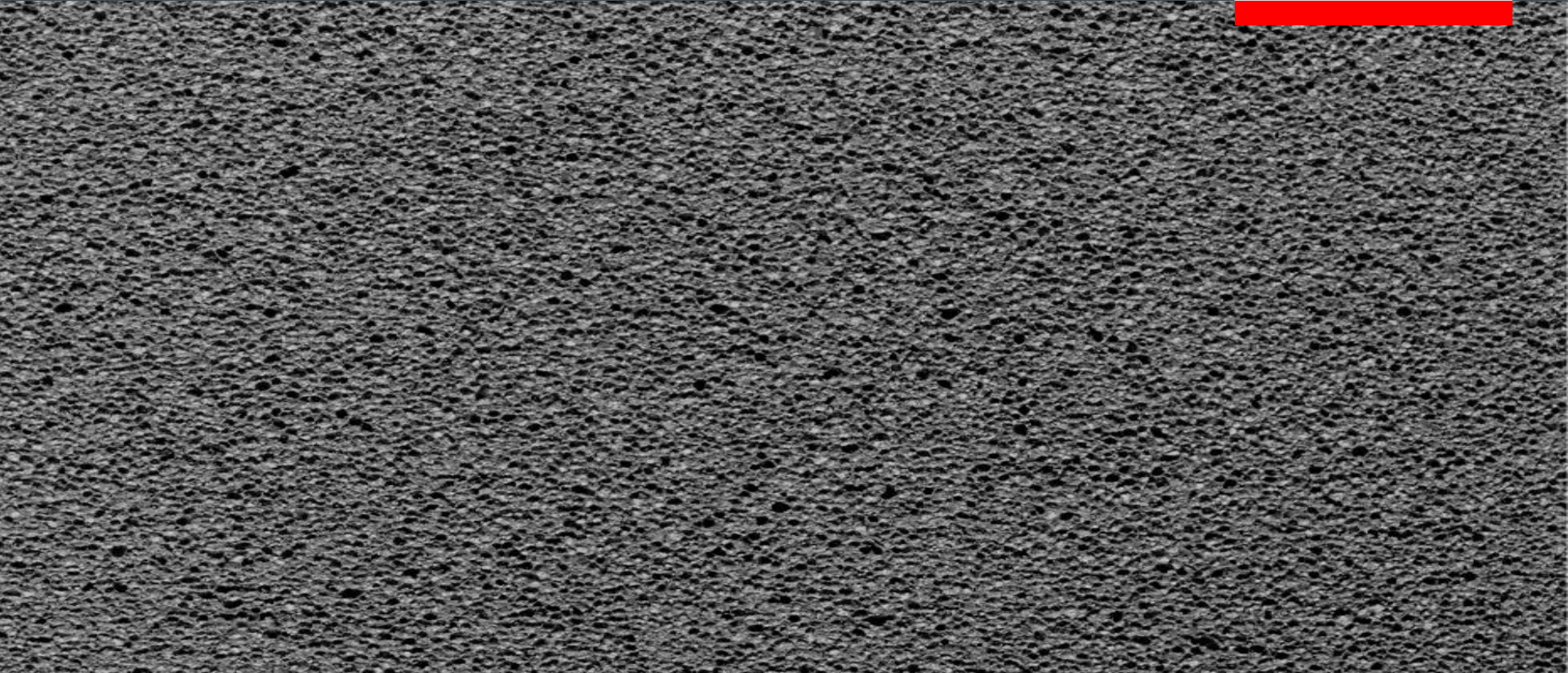
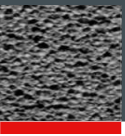


Understanding insulation as a key safety and sustainability component”

FOAMGLAS®
Building

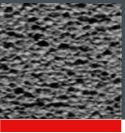




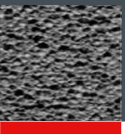
“*Pittsburgh Corning Middle East (FOAMGLAS)*” is a Registered Provider with ***The American Institute of Architects Continuing Education Systems (AIA/CES)***. Credit(s) earned on completion of this program will be reported to ***AIA/CES*** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



- **Cellular Glass Insulation – what is it?**
- **How to choose the right thermal insulation?**
- **How to prepare against the risk of humidity**
- **How to prepare against the risk of fire and smoke**
- **Conclusion**



- **Cellular Glass insulation and what makes it different to other thermal insulation products?**
- **Sustainability consideration before, during and after usage and how to measure**
- **Close look at the reaction of different thermal material under vapour pressure.**
- **Learning the different factors what makes a flat roof safe and secure.**
- **Examples for facade planning under the consideration for the parameter fire.**

FOAMGLAS – Cellular Glass Insulation

FOAMGLAS®
Building

Marco has a degree as Architect and Executive Master Business Engineer from Switzerland.

With 20 years of consulting experience in the thermal insulation for building, his education as architect in building physics and technical design lets him understand the questions and needs from the consultants, architects and clients.

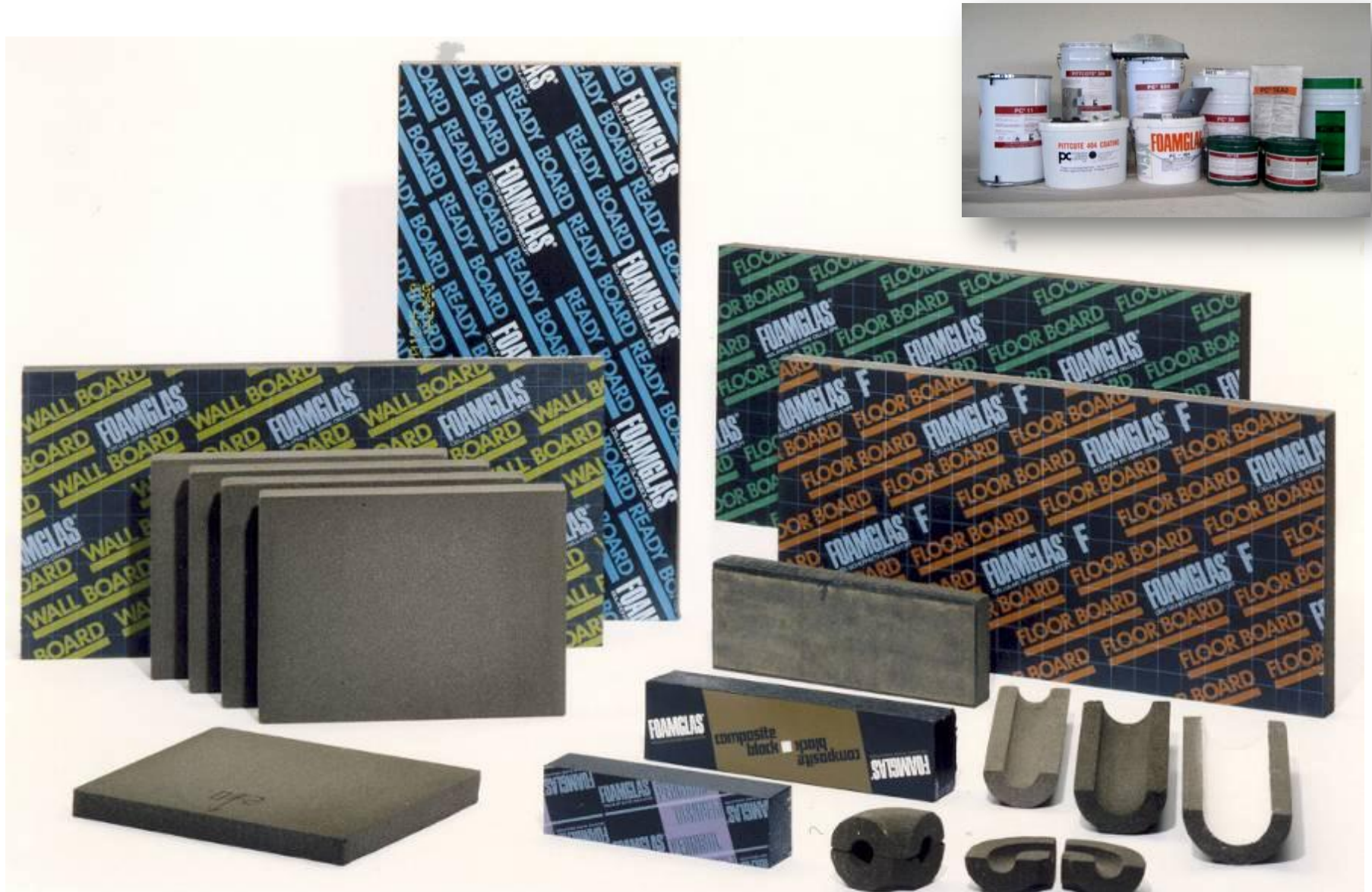
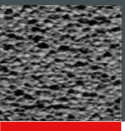
He is expert in thermal protection of the building envelope in regards to local conditions and leader of Pittsburgh Corning Middle East territory for building application.

Pittsburgh Corning is world leader in producing cellular glass thermal insulation with name FOAMGLAS used since over 50 years in building and industrial application.

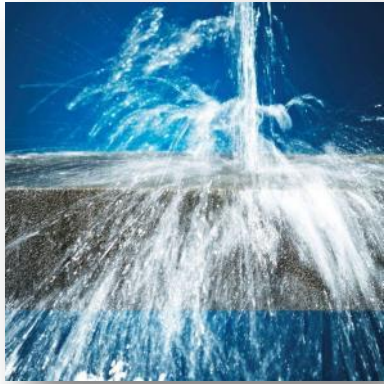
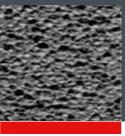
Marco Thomas Vincenz
General Manager, Architect
Pittsburgh Corning Middle East



Range of products



All properties



Water proof



Fire safe



Ecological



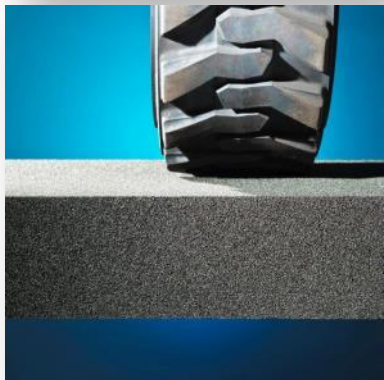
Vapor-tight



Keeps shape



Vermin proof



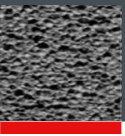
Rigid/strong



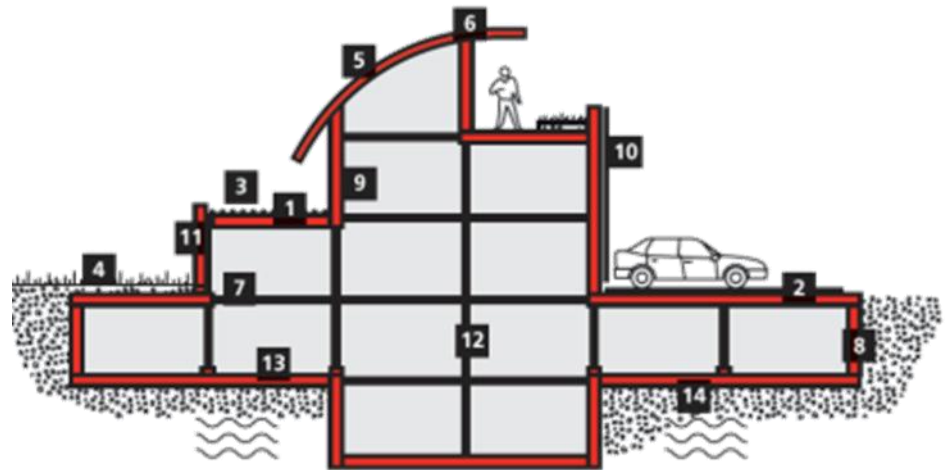
Acid resistant



Easy to cut

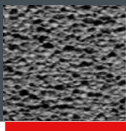


- Thermal conductivity coefficient (λ)
- Resistance to humidity or imperviousness to water vapour (μ)
- **Behaviour in fire**
- Dimensional stability and load bearing
- Price and long-term economy
- Sustainable

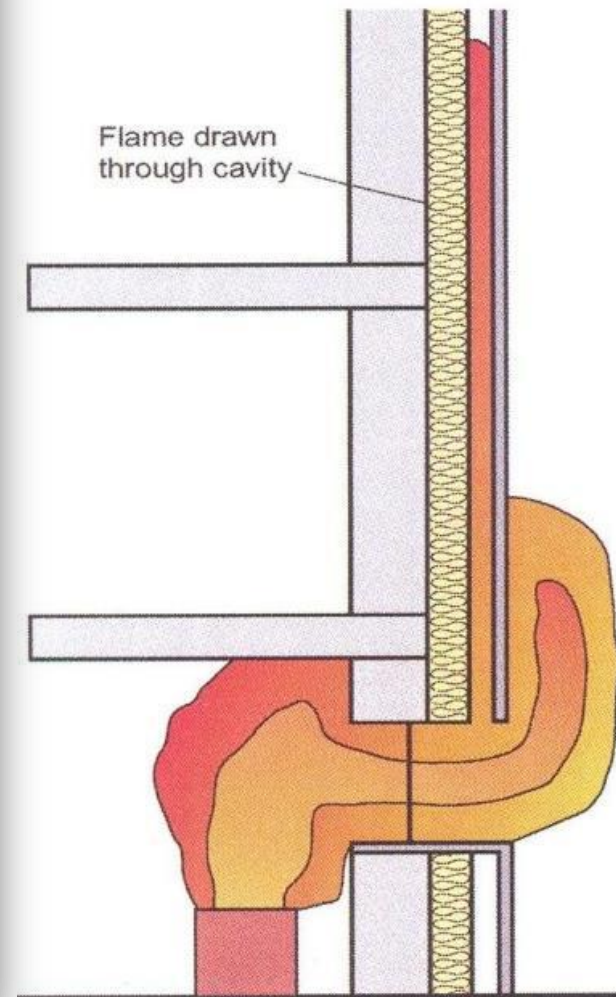




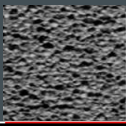
GCC fire incidence



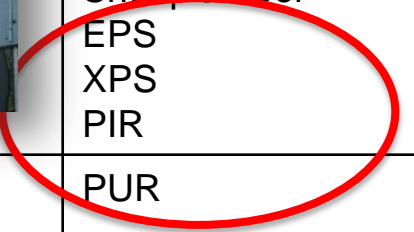
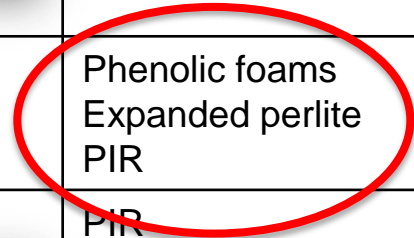
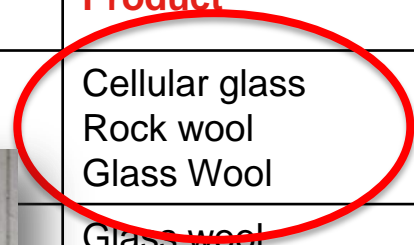
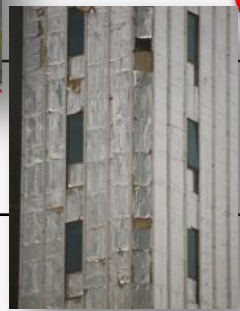
Fire extension over the façade (in the cavity)



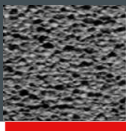
Euro classes and reaction to fire



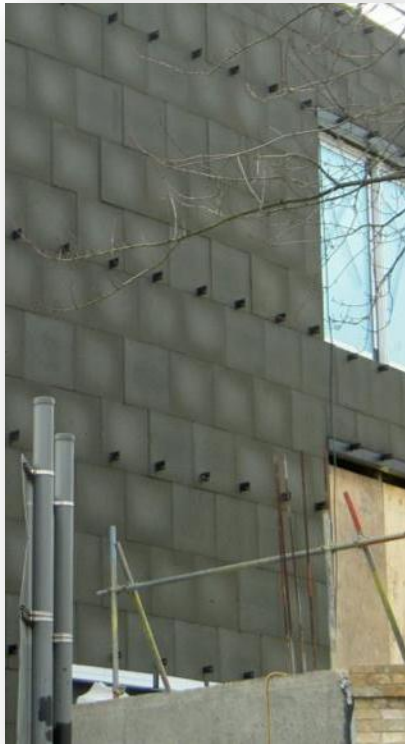
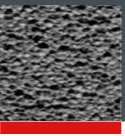
Euro classes	Testing methods	Classification	Product
Class A1	EN ISO 1182 EN ISO 1716	No contribution Non combustible No flashover	Cellular glass Rock wool Glass Wool
Class A2	EN ISO 1182 EN ISO 1716 EN 13823	Virtually no contribution Not very combustible No flashover	Glass wool
Class B	EN 13823 EN ISO 11925-2	Very limited combustion Very difficult combustible No flashover	
Class C	EN 13823	Important contribution Moderately combustible Flashover after 10 – 100 kw	Phenolic foams Expanded perlite PIR
Class D	EN 13823 EN ISO 11925-2	High contribution Easily combustible Flashover after 2 – 100 kw	PIR
Class E	EN ISO 11925-2	Very high contribution Highly combustible Immediate flashover	Cellulose fibres Sheep's wool EPS XPS PIR
Class F	Unclassified Or Unsuitable for other classes	Highly combustible products or products whose reaction to fire has not been assessed	PUR



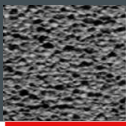
Dubai Marina - Right material for high rise facade?



Non-combustible façade, NY Dream Hotel



Cellular glass wall application - GCC projects



Composite
façade system,
mineral render

Qatar Convention Center and Tower, Doha

Architect Murphy / Jahn Inc, chicago/berlin/shanghai

Build Under construction 2012

FOAMGLAS® Application Façade insulation, about 6000 m², T4+ slabs, 80 mm thick, adhesively bonded and mechanically fixed to the structural wall

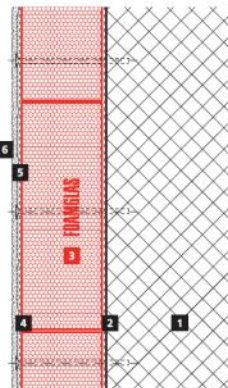
Finish Lime renders in thick layer

Qatar Convention Center and Tower have been designed by Murphy Jahn Inc. with a creative and inspirational power, just like other projects for which they are famous, be it Deutsche Post building in Bonn or the Sony Center in Berlin.

Qatar Convention Center and Tower will be iconic symbol for the Doha skyline – a 550 m high tapering obelisk, containing a total of 112 storeys. It will also comprise a 100,000 square metre convention center.

When architects are looking for aesthetic quality, it is the chance to explore new insulation system solutions for façades – systems which will have high impact resistance.

No maintenance, no degradation with-in time and, most important, fire safety – these substantial benefits are only possible due to the specific FOAMGLAS® insulation properties, providing high compressive strength, dimensional stability and non-combustibility.



Ecological and fire safe, a recommended building material
www.foamglas.ae

Render system

- 1 Concrete wall
- 2 Lime adhesive
- 3 FOAMGLAS® slabs, bonded and mechanically fixed
- 4 Reinforcing mesh
- 5 Lime render layer
- 6 Final layer of render



Ventilated
Facade

Intercontinental & Crown Plaza Hotel, Festival City, Dubai

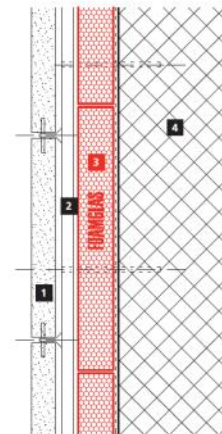
Client Al-Futtaim Group

Architect Cox Crone Architects

Construction 2003 – 2007

Application of FOAMGLAS® behind stone cladding facade 8000 m²

The Intercontinental and Crown Plaza Hotel are part of Festival City project which will be once finished one of the largest mixed-used development in Dubai. FOAMGLAS® is used behind the stone cladding because of the unique property of fully resistant to any kind of water and vapour and therefore can be applied on the wall structure without any additional protection against the high humidity. No additional foil for vapour protection is required through the closed cell structure of the material FOAMGLAS® itself. Result is the life time constant performance of the thermal insulation. Degradation through humidity abortion is the biggest problem in the Middle East for wall insulation next to fire issues. FOAMGLAS® is fully inorganic and will not support any fire. With no flame spread and no smoke development it provides specially in hotel project with towers the highest safety and ensures even in the building envelope the highest standard.



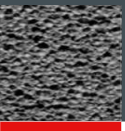
Long term investment in safety and durability
www.foamglas.com

Build-up

- 1 Stone cladding
- 2 Rail support system for cladding fixed in concrete
- 3 FOAMGLAS® mechanically fixed
- 4 Structural wall concrete



Wall application - GCC projects



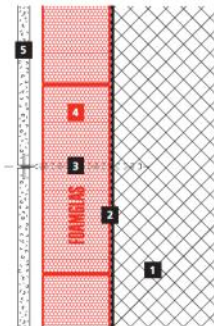
Ventilated rainscreen cladding

Museum of Islamic Art, Doha-Qatar

Architect I.M. Pei
Construction 2007

FOAMGLAS® application behind stone cladding facade mechanically fixed.
Total area of FOAMGLAS applied for facade and flat roof 22 000 m²

The Museum of Islamic Art is situated on the southern part of Doha's seafont on a manmade island about 60 meters off the coast of Doha. The external wall of the Museum is finished with 6,500 M3 of natural stone work. High temperature combined with high humidity and an open joint application of the facade was asking for a high quality of the structure below, specially the thermal protection because access to the ventilation space is not provided any more. The FOAMGLAS® cellular glass insulation with the closed cell structure guarantees a life term solution because it can never absorb any humidity neither from humid air nor from rain or condensation. The lifelong constant performance is ensured and any upgrading of HVAC equipment never required.



Stable value and out-standing service life using top-quality materials
www.foamglas.com

- Facade structure**
- 1 Solid wall (concrete/brickwork)
 - 2 Primer coat
 - 3 Resin anchor
 - 4 FOAMGLAS® slabs, bonded with PC*56
 - 5 Large format stone slab cladding



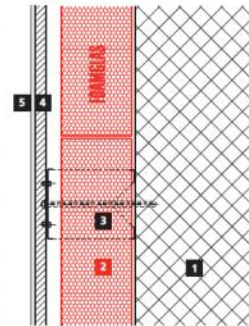
Rainscreen cladding, Cassette system

Tour des Tilleuls, Wattrelos (59), France

Architect VDDT Architectes Associés (59)
Client Vilogia
Contractor Coexia (59)
Construction 2009 (refurbishment)

As real estate owner Vilogia has key requirements for sustainability and energy efficiency. A priority for his restoration works is long term reliability and best cost efficiency. Constant thermal performance, i.e. an insulation system without thermal ageing during construction and after completion, was a decisive criteria for choosing FOAMGLAS® thermal insulation. The system resists to all weather conditions and has excellent vapour proofing capacities.

The use of innovative, U-shaped Foamfix fixing brackets to hold the subconstruction for the pre-formed coated steel cladding sheets was a contribution to improved and rational operations on the building site.

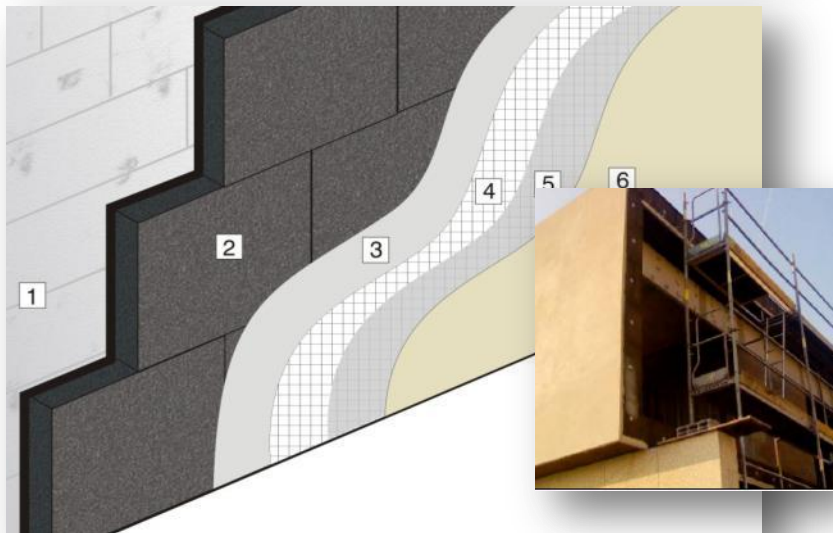
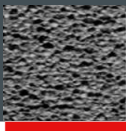


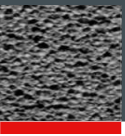
FOAMGLAS® – thermal insulation for long term reliability
www.foamglas.com

- 1** Structural wall
2 FOAMGLAS® W+F (100 mm thickness) bonded with PC*56 adhesive
3 U-shaped fixing bracket and spacer Foamfix
4 Subconstruction
5 Cassette cladding system, pre-formed interlocking steel panels

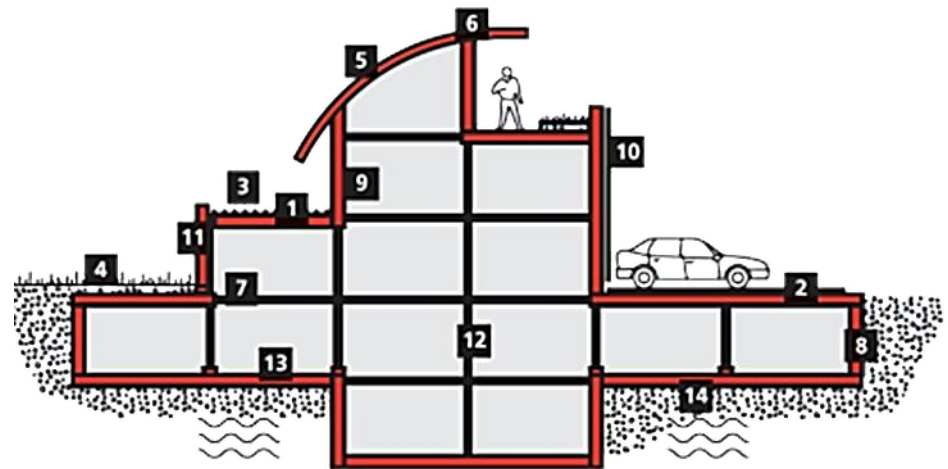


Some of the wall system

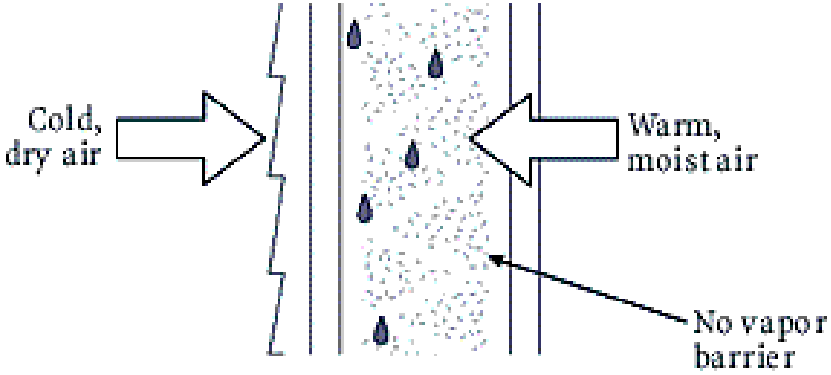
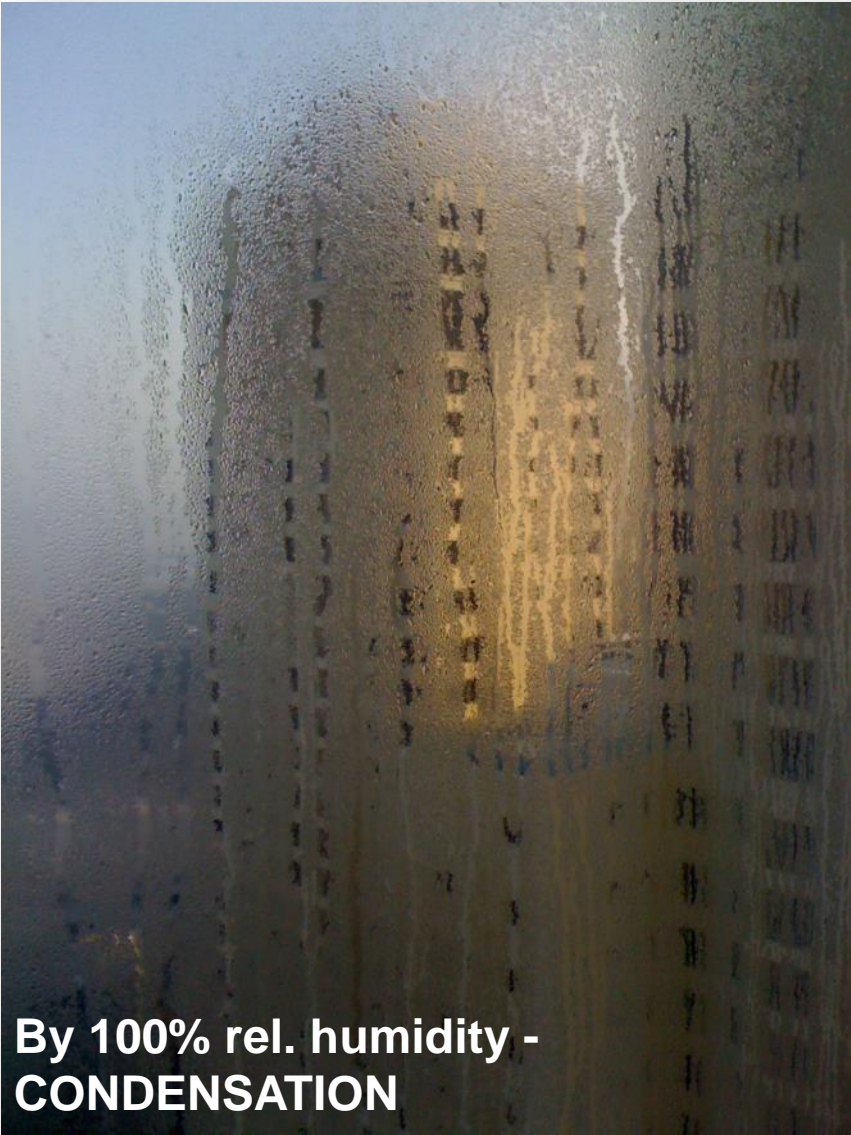
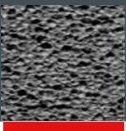




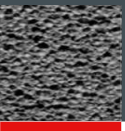
- Thermal conductivity coefficient (λ)
- Resistance to humidity or imperviousness to water vapour (μ)
- Behaviour in fire
- Dimensional stability and load bearing
- Price and long-term economy
- Sustainable



Humidity – Enemy No.1 for all thermal insulation

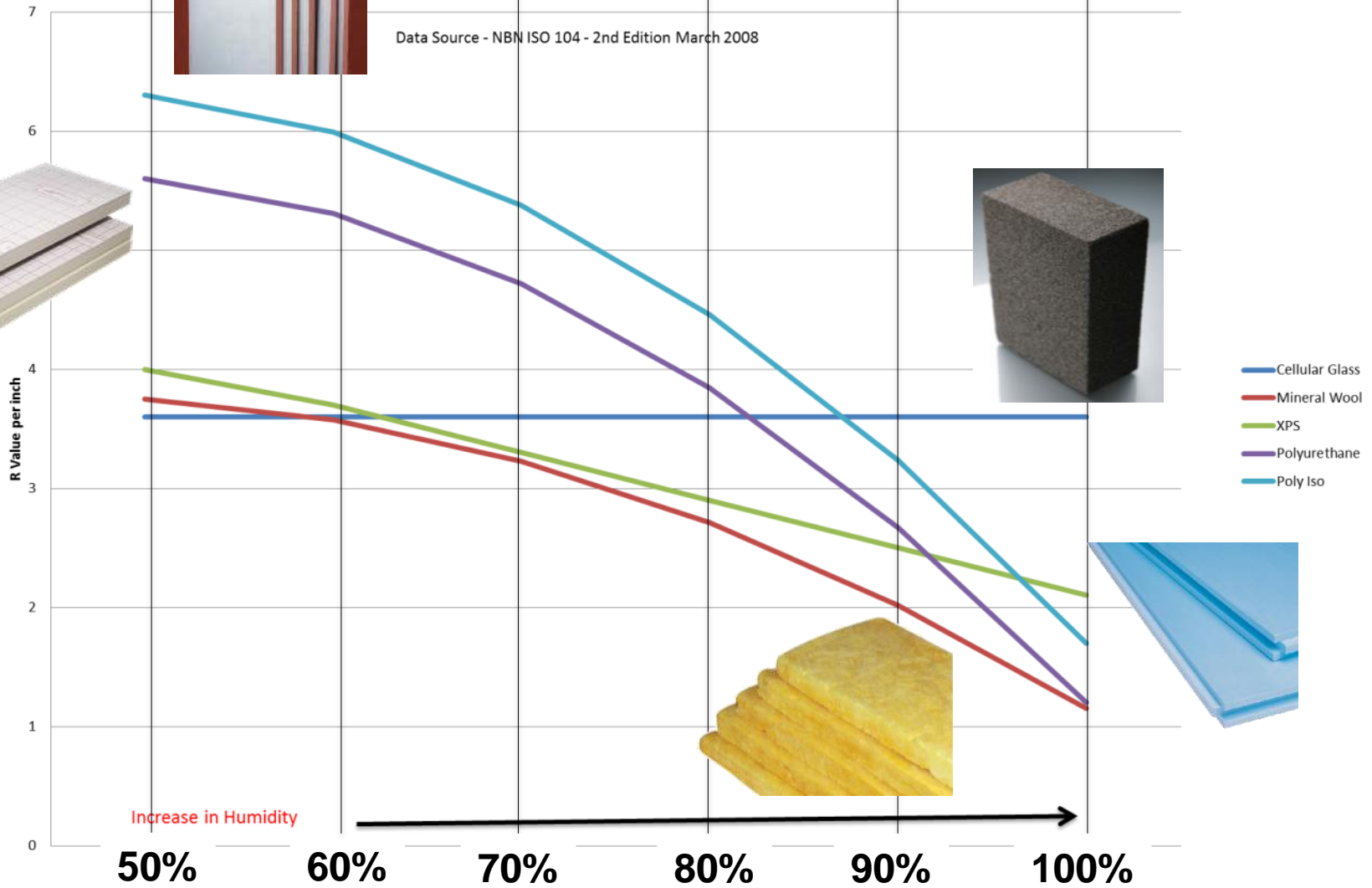


Decrease of the R value under the influence of humidity

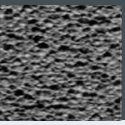


Change in R Value as Humidity increases
R - Value per inch is declared at 75 degF @ 50%RH

Data Source - NBN ISO 104 - 2nd Edition March 2008



Climate data Dubai Airport 2012



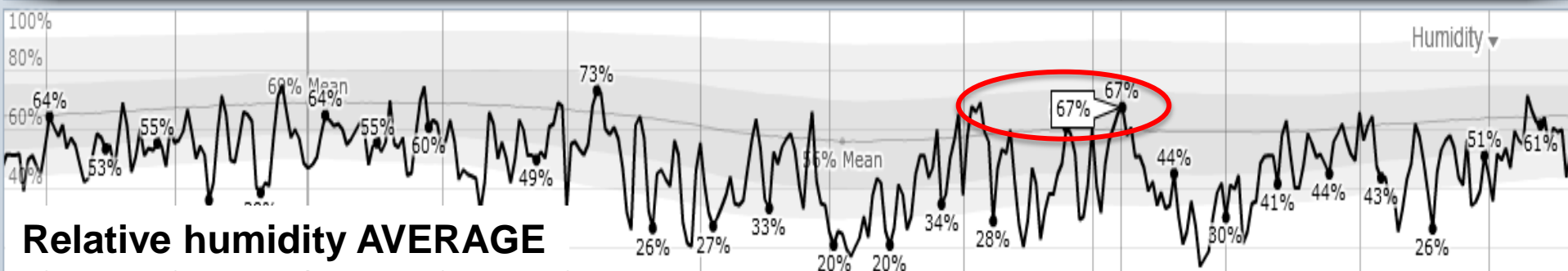
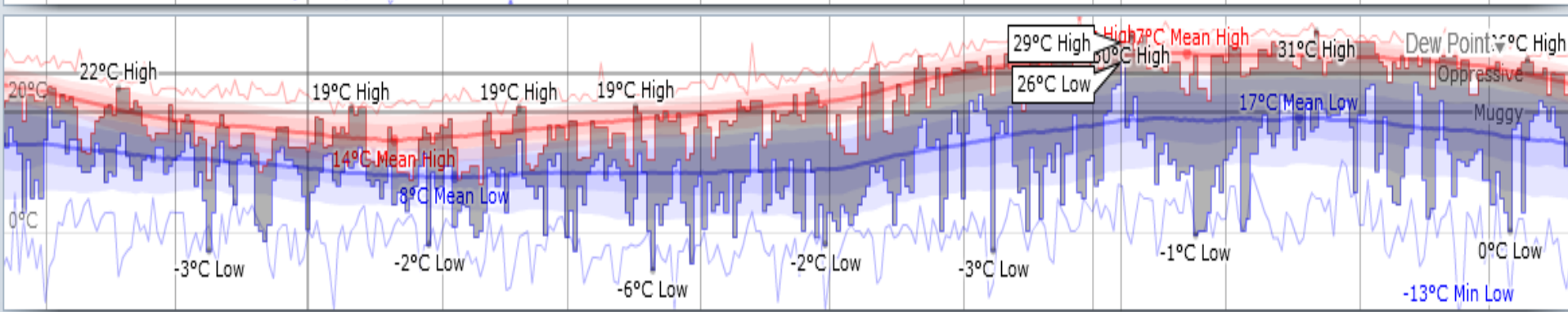
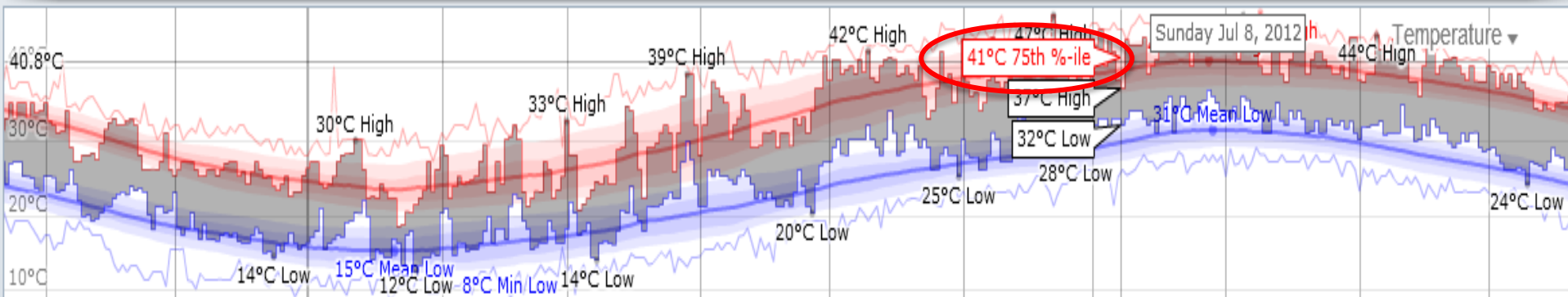
Dubai International Airport, United Arab Emirates

Forecast: met.no

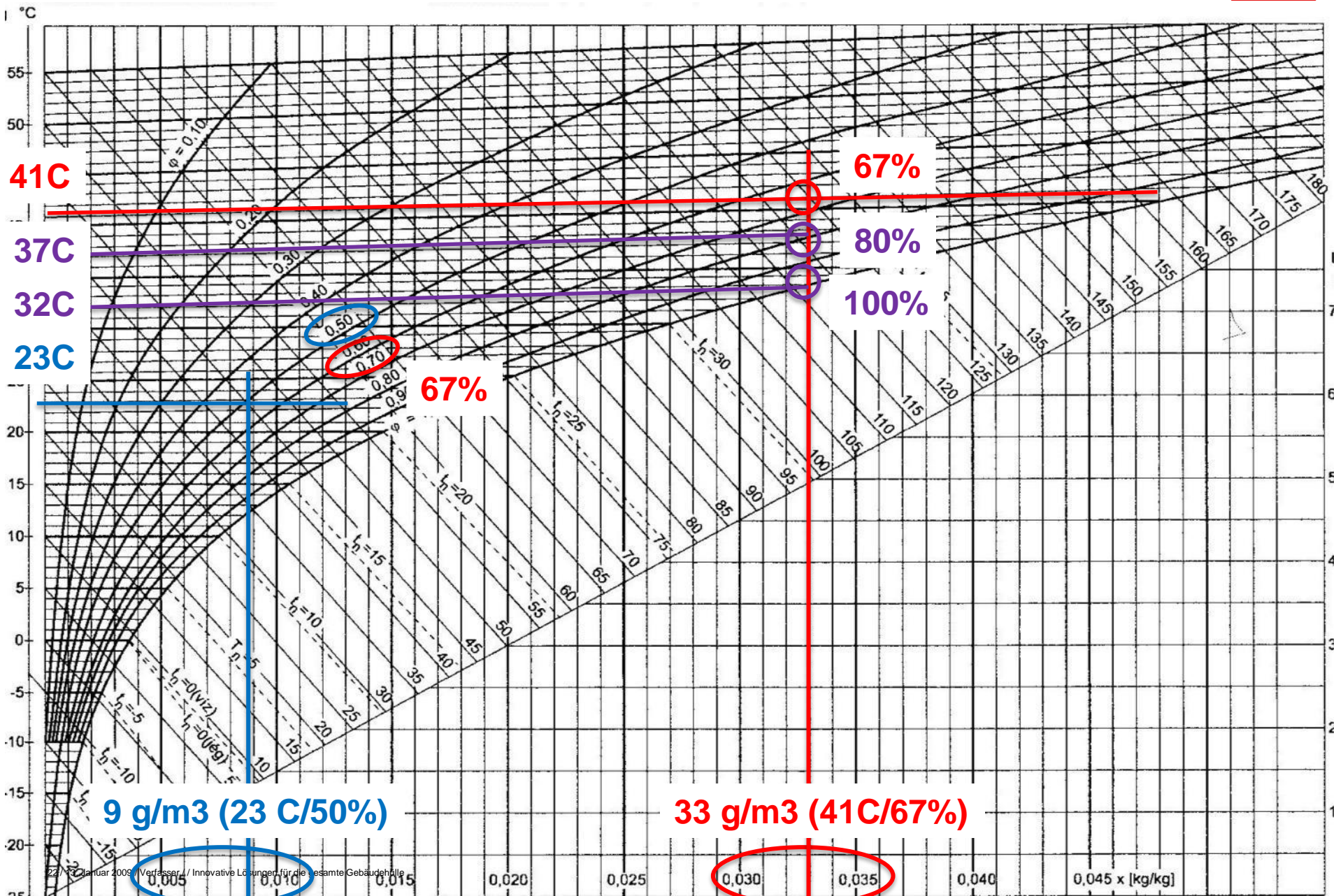
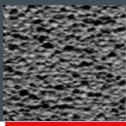
Forecast Daily 1 quarter 1 year Averages

Download Graphs

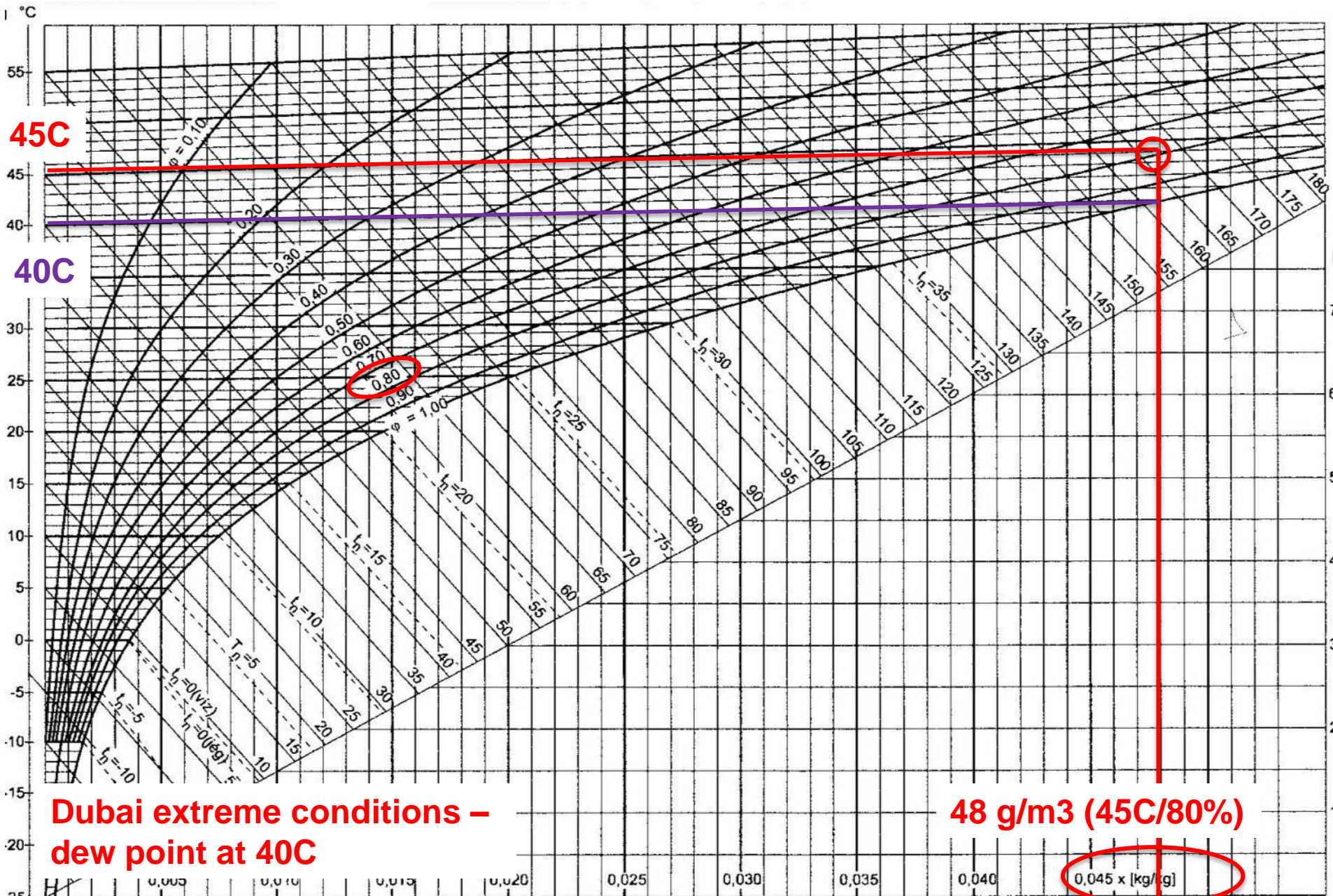
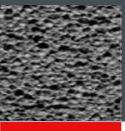
History



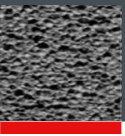
Mollier – hx diagram



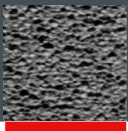
Mollier – hx diagramm



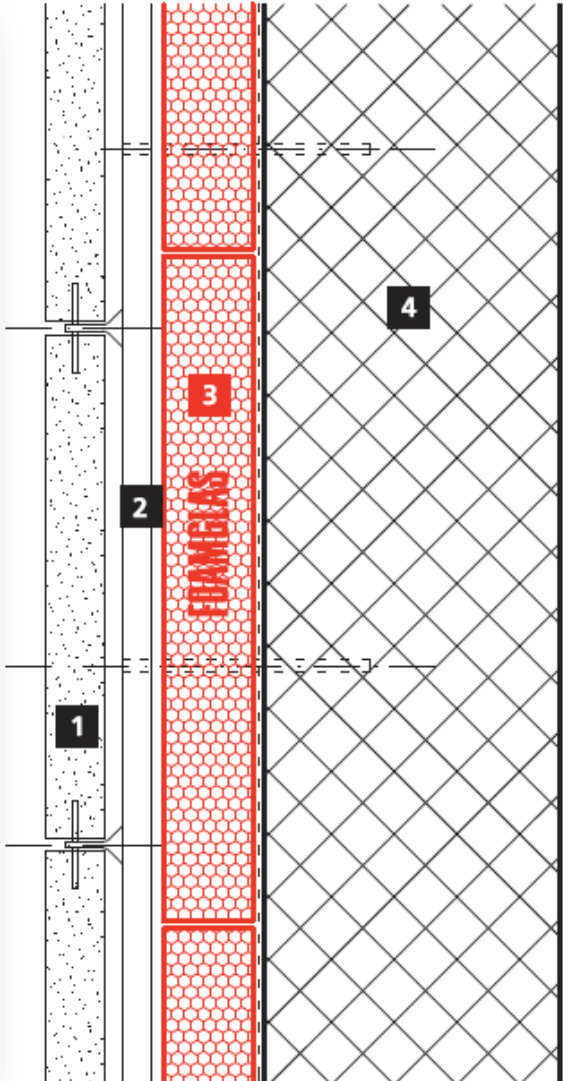
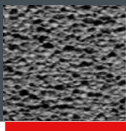
Mineralwool: Seamless vapour barrier is a must



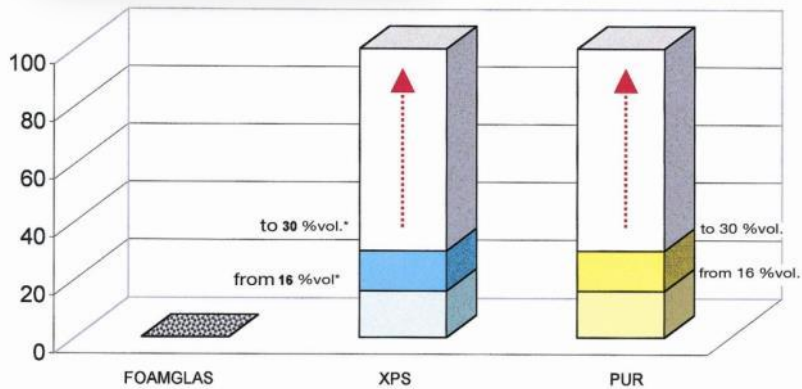
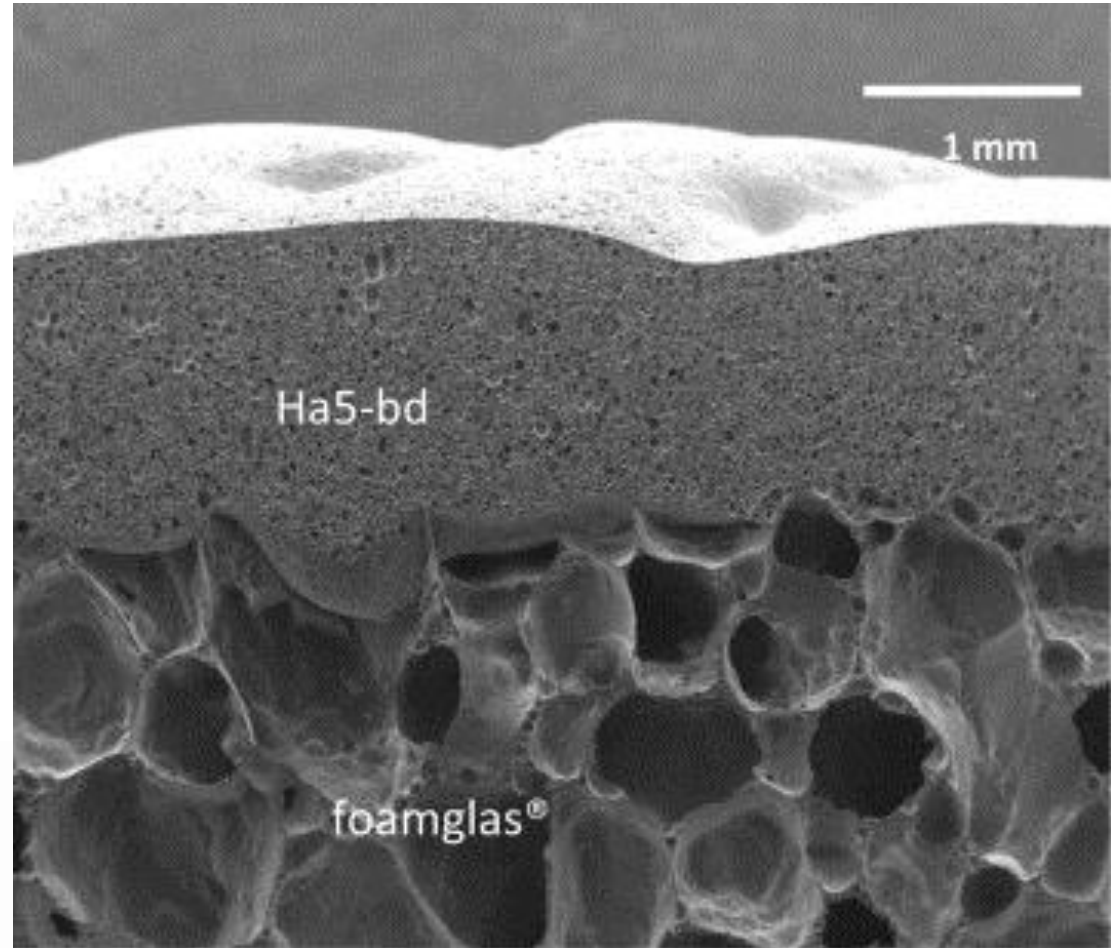
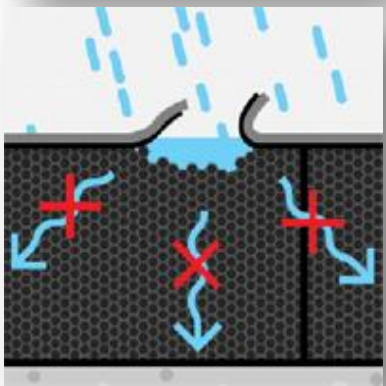
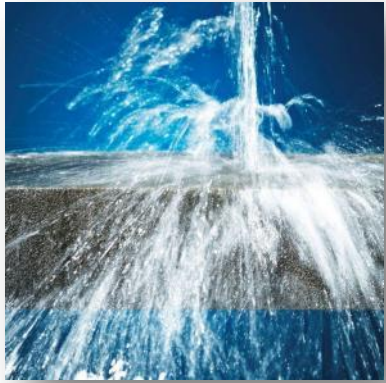
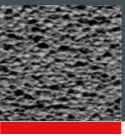
Mineralwool: Seamless vapour barrier is a must

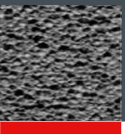


Cellular glass is a vapour tight material itself

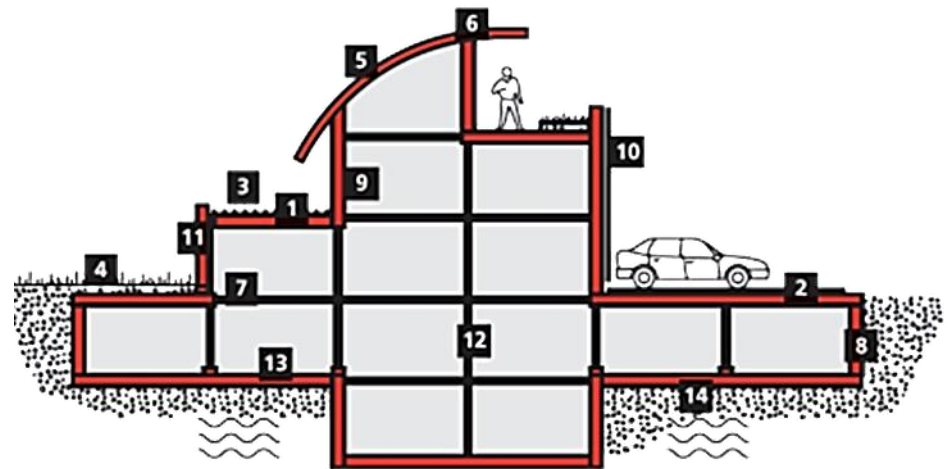


Vapour tight and Waterproof due to close cell structure

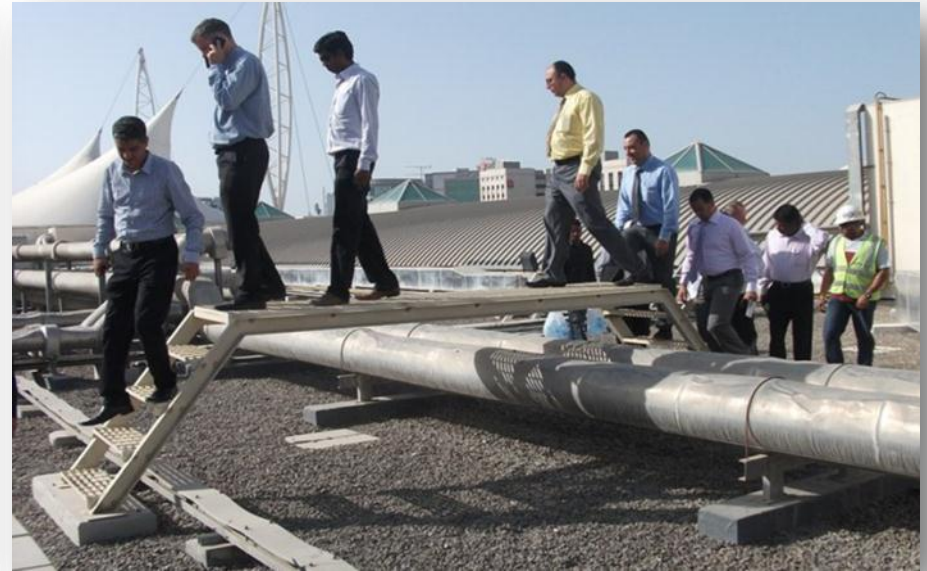
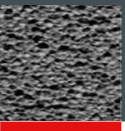




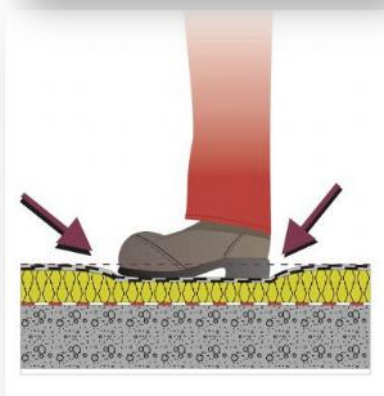
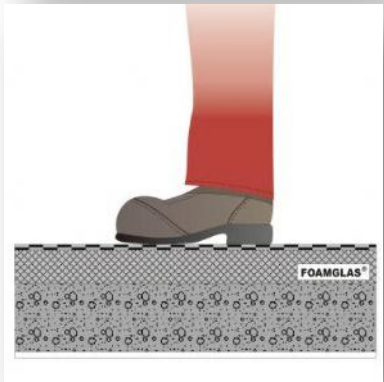
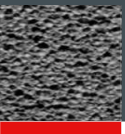
- Thermal conductivity coefficient (λ)
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- **Dimensional stability and load bearing**
- Price and long-term economy
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Cellular glass is rigid and strong



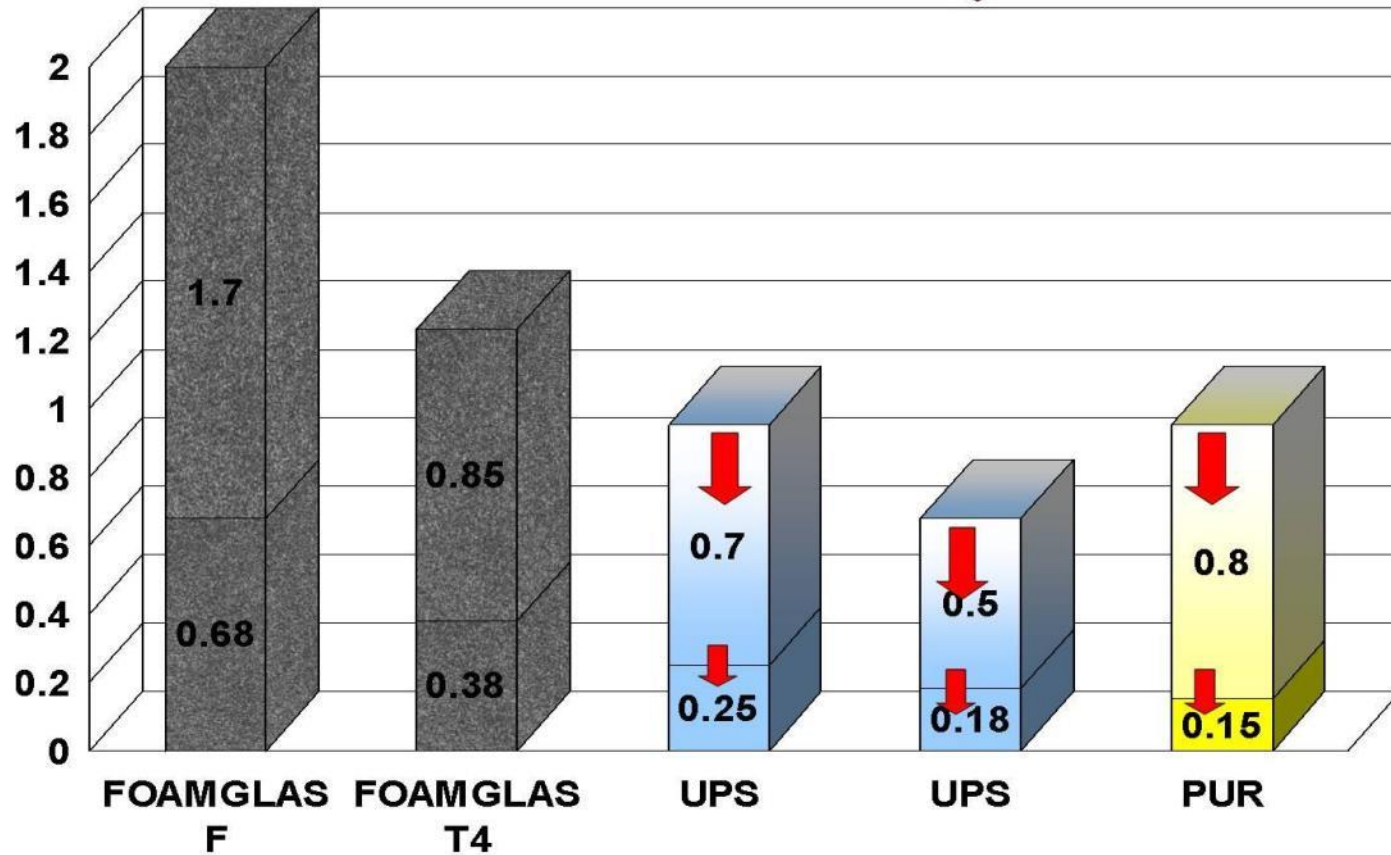
Cellular glass is rigid and stable



Compressive strength [N/mm²]

For traffic accessed surfaces, e.g. roof –top car park

Compression ↓



CG can carry 170 tonnes/m² - (1.7 N/mm²)

NO deformation, NO flexibility > solid sub ground

roof application - GCC projects



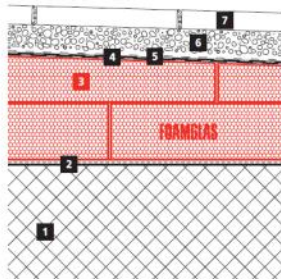
FOAMGLAS® tapered roof for all flat roofs and terraces

Arzanah Medical Complex, Abu Dhabi

Client Mubadala Development Company
Consultant HDP Overseas Limited, HDR
Location Abu Dhabi, UAE
Under construction and finish December 2011

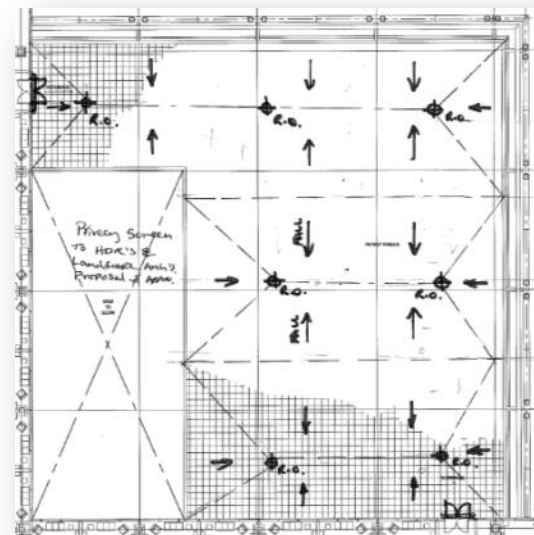
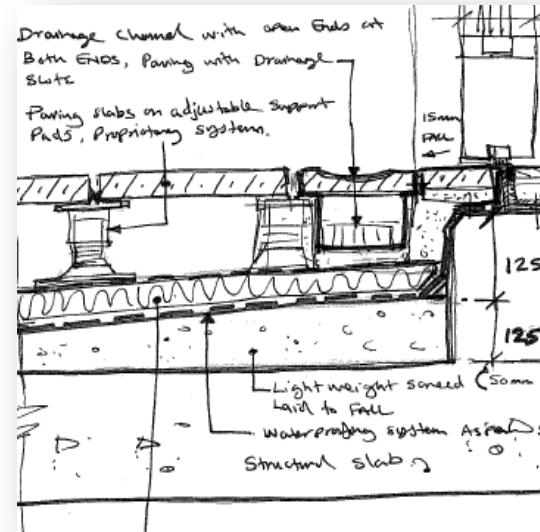
Just a few yards from the national soccer stadium, the Arzanah Sports Medical Center is prominently located within a new mixed-use community in Abu Dhabi, UAE. The project set out to design a sustainable building which responded to this very public site while balancing the need for a calming, healing environment and a facility organized to provide an integrated multi-disciplinary healthcare facility to serve the community and region. The new LEED Gold designed, 78-bed medical centre will form part of the US\$6 billion Arzanah development near Zayed Stadium on Abu Dhabi Island. As thermal insulation the consultant came to the decision to use FOAMGLAS® cellular glass insulation for roof and some wall application. FOAMGLAS® is produced by Pittsburgh Corning and free of any harmful blowing agent. It's well known for its extreme long durability and the highest resistance to any kind of moisture. Due to the 66% recycling content and use of only renewable energy in the production FOAMGLAS gets the highest

credits in all environment ratings and is supporting with LEED and Estidama credits. The high compressive strength without creeping and deforming makes it to the perfect solution especially in roof areas with garden and terraces.

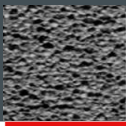


Highest durability and ecology provides best sustainability
www.foamglas.com

- Build-up**
- 1 Concrete roof deck
 - 2 Primer coat
 - 3 FOAMGLAS® TAPERED slabs (160 – 240 mm), laid in hot bitumen
 - 4 Two layers of bituminous waterproofing membranes
 - 5 Separating/protective layer
 - 6 Gravel
 - 7 Paving



roof application - GCC projects



Flat roof,
Terraces

3D Graphic, HDR San Francisco

Cleveland Clinic, Abu Dhabi – UAE

Owner Mubadala

Architect Aedas / HDR

Construction 2011 - 2012

FOAMGLAS® application FOAMGLAS® T4+ TAPERED ROOF; average thickness 280 mm, loose laid, inverted roof with single ply membrane (system for hot countries only), 8271 m²

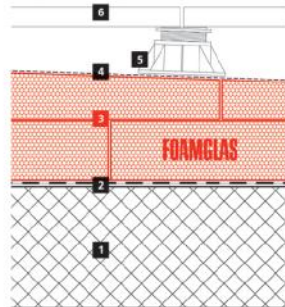
Finish layer Raised prefab tiles

Cleveland Clinic Abu Dhabi is part of Al Suwwa Island and owned by Mubadala. CCAD has the objective of bringing world-class healthcare to the region and will be organized into the five institutes of Digestive Disease, Eye, Heart and Vascular, Neurological, and Respiratory and Critical Care.

thermal bridges and the ability to include the slope into the thermal insulation. FOAMGLAS® is the decision for sustainability in regards to ecology and economy.

FOAMGLAS® is used as thermal insulation on the flat roof. It's never degrading properties, combined with highest ecological standard, was one reason for the consultant to go with the world leader in cellular glass insulation.

Additionally the choice is backed by the high compressive strength which enables any terrace build-up without



Sustainable in ecology and economy

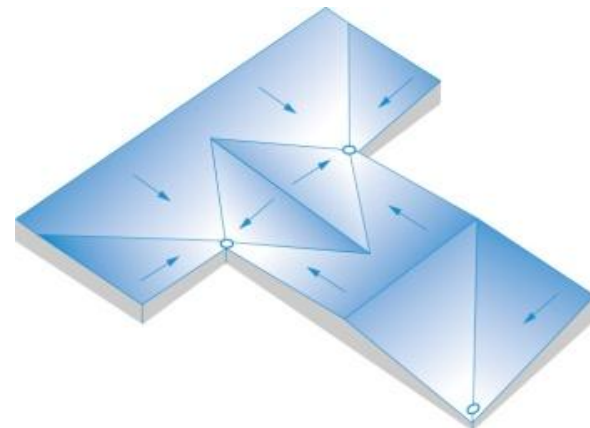
www.foamglas.ae

Roof structure

- 1 Concrete roof deck
- 2 Single ply waterproofing membrane
- 3 FOAMGLAS® T4+, TAPERED ROOF, double layer loose laid, average thickness 280 mm
- 4 Protective layer/geotextile
- 5 Single pedestal
- 6 Prefab tiles

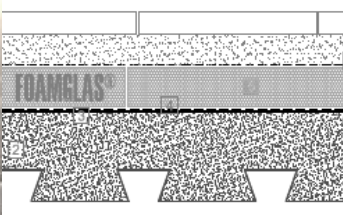
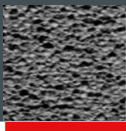


Job site picture during application

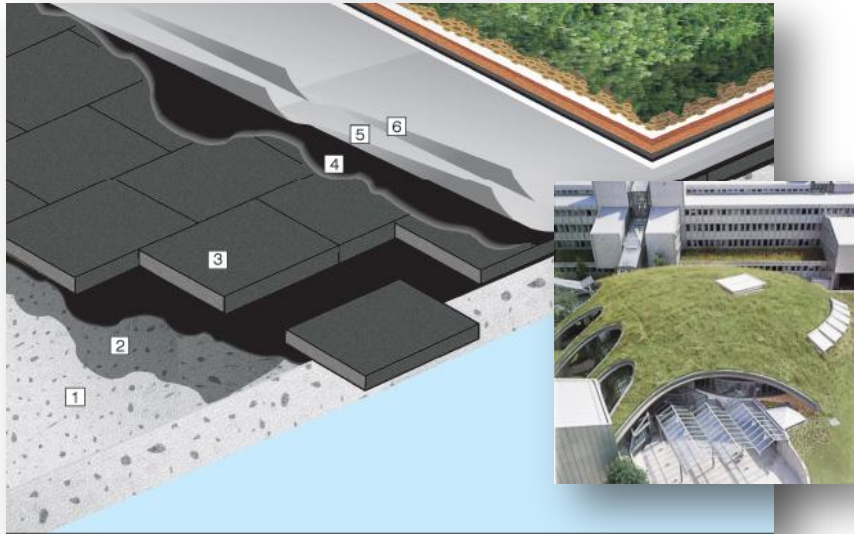


Cut to slop:
Tapered Roof System

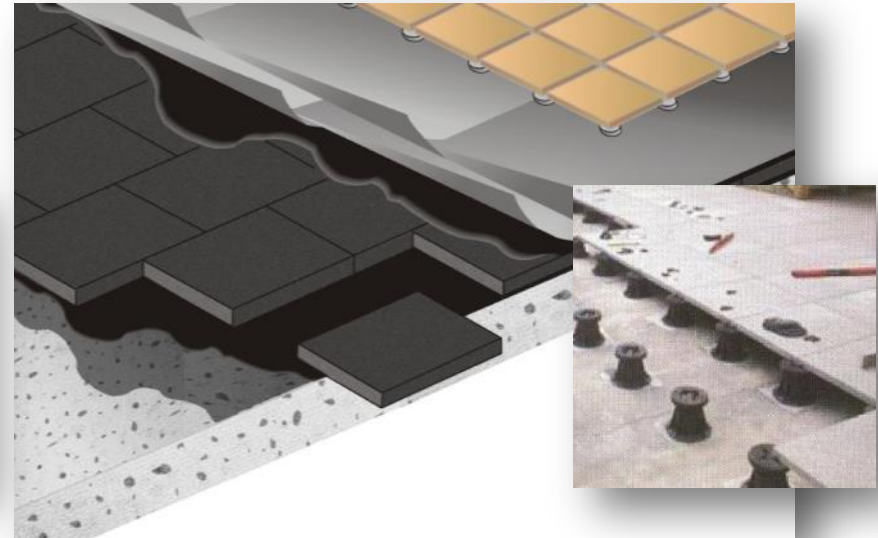
Future project: Extension of Masjid al-Haram – Mecca, KSA



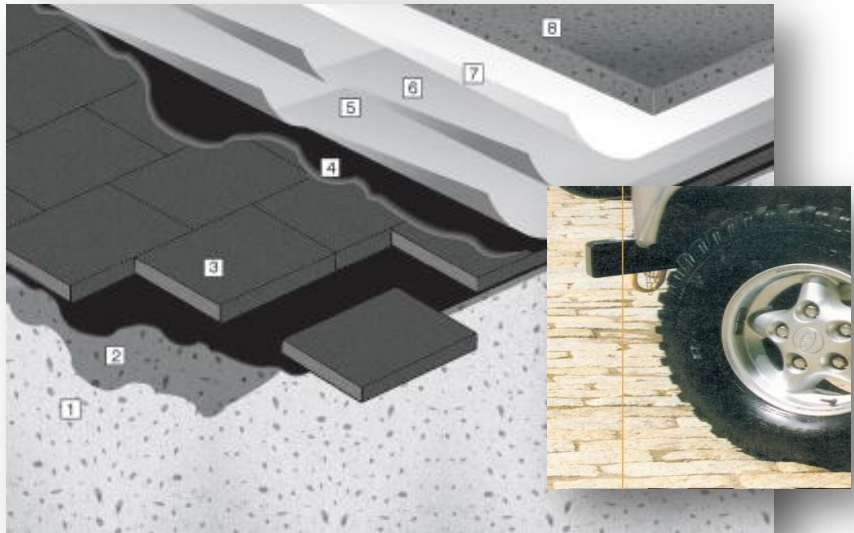
Some of the Roof system



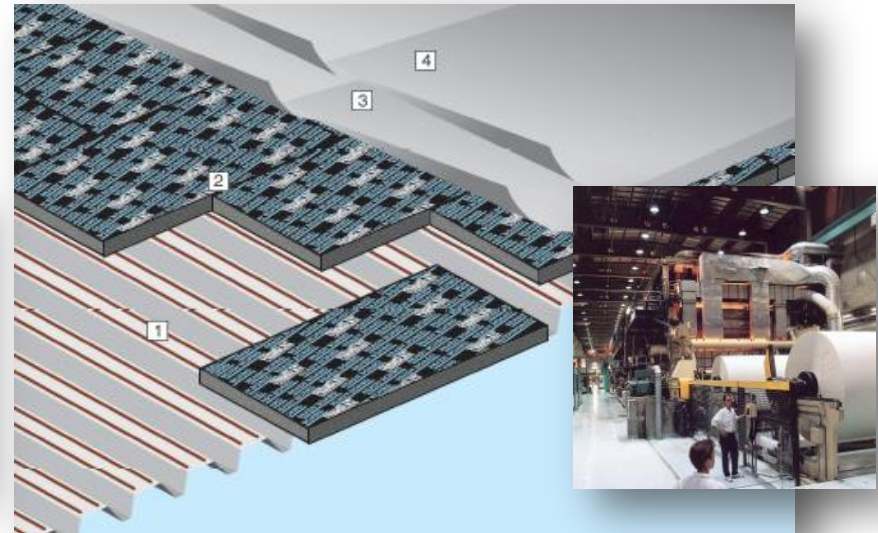
Green roof system



Terrace roof system with single pedestal



parking deck system for trafficable areas



factory roof system

The systems: Cellular Glass for building envelope

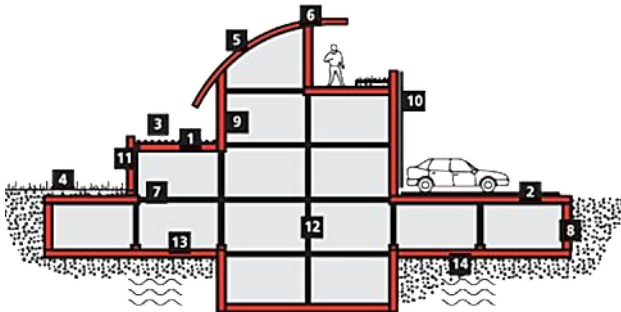
Underground wall & floor

Wall application for cavity & cladding

Flat roof application

Wall & roof with metal cladding

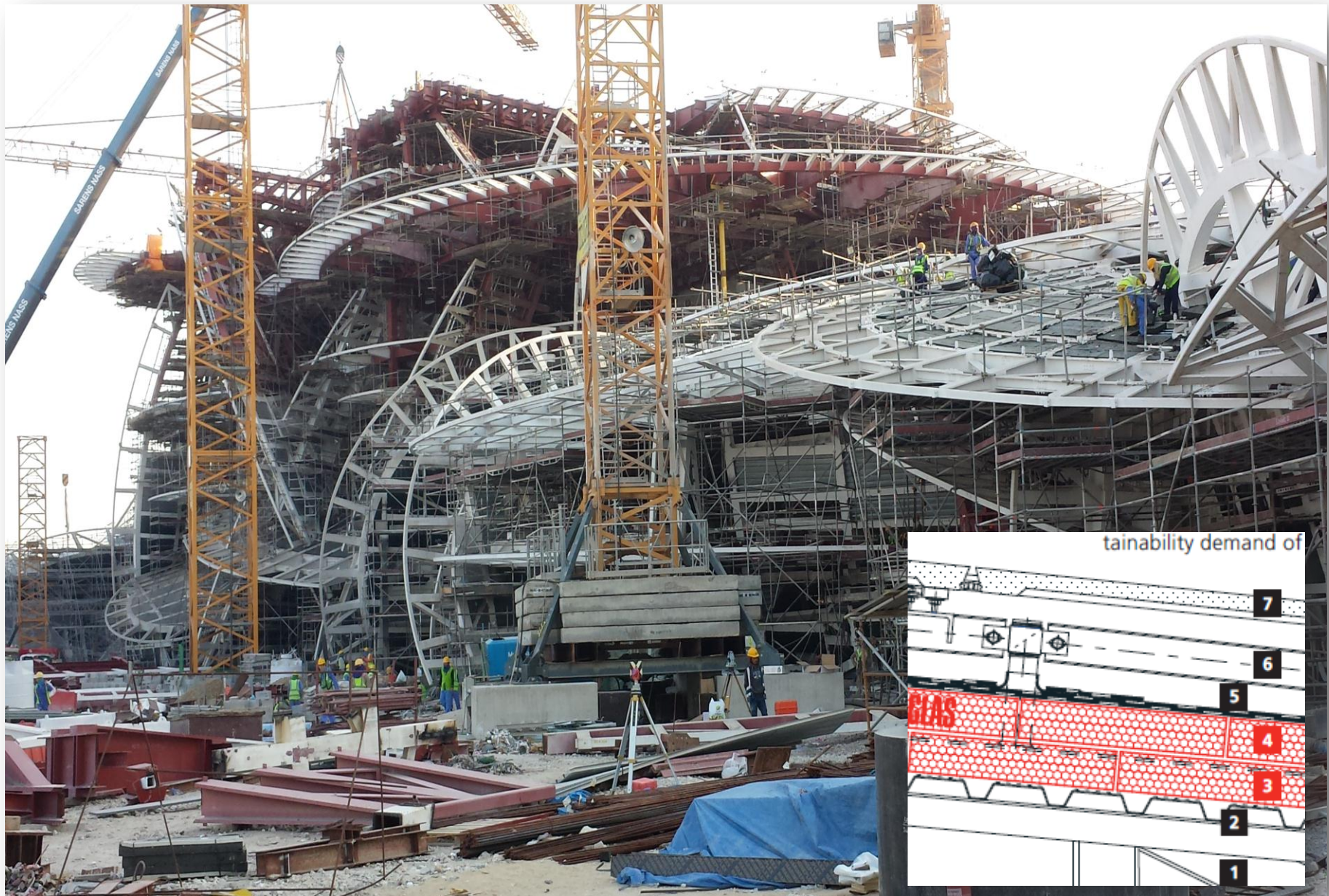
Interior insulation for wall, floor, soffit



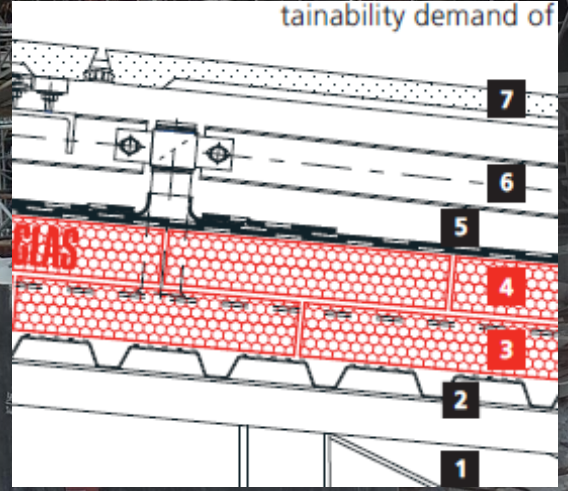
Qatar National Museum, Doha



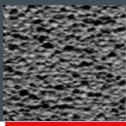
Qatar National Museum, Doha



tainability demand of



FOAMGLAS special roof application - GCC projects



Insulation of the building envelope below the cladding

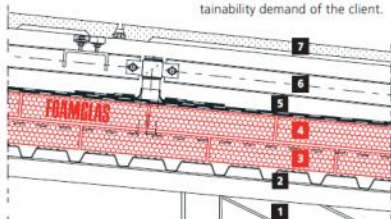
© Artefactory, Ateliers Jean Nouvel. Building details courtesy of Qatar Museum Authority

Qatar National Museum, Doha

Architect Ateliers Jean Nouvel, Paris; Pritzker-prize winning architect
Construction starting 2012, ongoing
Application FOAMGLAS® for the whole building envelope behind GRC cladding panels.
READY BOARD and **FLOOR BOARD T4+**, double layer: 2 x 100 mm, ca. 100,000 m³, bonded and partly mechanical fixation

The Architect's design is made up of a series of interlocking disks with cavities inside, buffered from the hot desert sun. The new museum will be built around a historic structure, the Fariq Al Salatah Palace, but will have new exhibitions about the life in the Gulf region. Outside will be a 1.2 million sq. foot park that interprets the Qatari desert landscape and is specifically designed for the hot desert sun. The entire complex will seek LEED Silver certification, relying mostly on traditional building practices to create

shady and cool areas with thermal buffer zones. Behind the GRC cladding, which are hollow core units, 200 mm FOAMGLAS® is used as thermal protection; it guarantees the inside's stable condition which is essential for the artworks. FOAMGLAS® cannot absorb any water due to the closed cell structure and builds a strong subground for the waterproofing membranes. The artwork and the building are protected from the desert heat at its best. The 60% of recycling material content of FOAMGLAS® is supporting the sustainability demand of the client.



Protecting the building

www.foamglas.com

Façade structure

- 1 Primary steel structure
- 2 Corrugated steel decking
- 3 FOAMGLAS®
- 4 FLOOR BOARD T4+, 100 mm
- 5 FOAMGLAS®
- 6 READY BOARD T4+, 100 mm
- 7 Double layer bituminous waterproofing
- 8 Secondary steel structure with brackets connection to the primary structure
- 9 GRC cladding panel



Ventilated rainscreen cladding

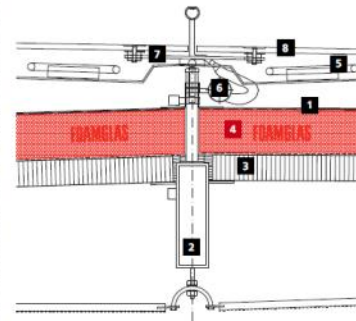
Art museum Kunsthhaus Graz ("Bubble", "Blue Bubble"), Graz (Austria)

Architect Peter Cook + Colin Fournier, London
Construction 2002/2003
FOAMGLAS® application Roof and façade insulation, special shaped roof, about 3670 m³, T4+ slabs, 160 mm thick, adhesively bonded, mechanically fixed in parts

Façade cladding Tinted and open-jointed acrylic panels, visible fixing points on the cladding elements

This special shaped building is a most demanding construction with a complex structure. On this imaginative structure, the external panels are of aesthetic value only; the open joints provide no protection against driving rain or environmental conditions. The layers beneath the panels must fulfil the function of both weather-tightness and insulation of the building. FOAMGLAS® applied below the membrane effectively meets both these demands and the clamping system ensures the minimum of cold bridging in the wall and roof constructions. Independent of the type and shape of load-bearing structure – concrete or steel deck, flat or curved – cellular glass insulation is easily cut to shape and will perfectly adhere, with a maximum

of contact surface, to the structural wall/roof. Proud edges on the insulation can easily be smoothed with a grinding tool. With FOAMGLAS® insulation all design options are possible.

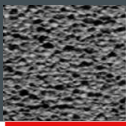


Imaginative structure – weathertight system
www.foamglas.com

- 1 Façade structure
Synthetic membrane (bitumen compatible waterproofing sheet)
- 2 Supporting framework, primary steel truss
- 3 Steel decking
- 4 FOAMGLAS® T4+ insulation, 160 mm thick
- 5 Under-façade B&K lightning
- 6 Sprinkler nozzle
- 7 Support for panels
- 8 Open-jointed acrylic panels



FOAMGLAS roof with metal roof and standing seam finish



Roof with metal covering

Armed Forces Officers Club Abu Dhabi, UAE

Architect Roger Taillibert, France

Execution refurbishment of roof build up 2006

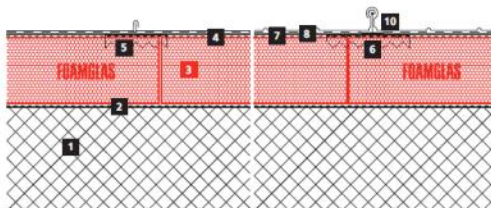
Application of FOAMGLAS® on concrete shell with metal covering 25000 m²

The Officers Club in Abu Dhabi built in the nineties as Hotel and conference centre is still a popular hotel in the modern Abu Dhabi with comfortable rooms and place for banquets and meetings. The project often is visited because of its interesting architecture designed from the France Architect Roger Taillibert in a remarkable concrete structure. End of the nineties the roof required a refurbishment of the initially use sprayed Polyurethane thermal Insulation and waterproofing which

failed already. The client followed the architect's recommendation and chooses the FOAMGLAS® compact roof build up with a metal roof covering. Because of the unique properties of the cellular glass insulation which can never absorb any moisture, is non-combustible, no degradation and the highest safety in long term, the building is now protected for the next decades!

Do it with FOAMGLAS® and you don't have to do it again
www.foamglas.com

- Build-up**
- 1 Concrete roof deck
 - 2 Primer coat
 - 3 FOAMGLAS® slabs, laid in hot bitumen
 - 4 Top coat of hot bitumen
 - 5 PC*metal fixing plate 150 x 150 mm
 - 6 PC*metal fixing plate 200 x 200 mm
 - 7 Bituminous waterproofing membrane
 - 8 Separating layer
 - 9 Standing seam metal sheet
 - 10 Profiled metal sheet



Mosque New building

DITIB-Merkez Mosque, Duisburg, Germany

Client DITIB-Begegnungsstätte Duisburg-Marxloh e.V., Duisburg

Architects, Engineering Ropertz & Partner Planungsgesellschaft mbH, Architekten und Ingenieure, Herrmann-Rinne-Straße 2, 47259 Duisburg

Contractor Schabos GmbH, Westring 10, 48356 Nordwalde

Construction 2007

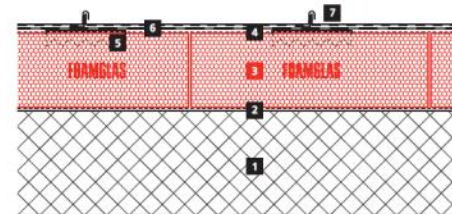
FOAMGLAS® Application

Compact roof

FOAMGLAS® segments, 1400 m², 70 mm

on domed concrete deck with zinc cladding

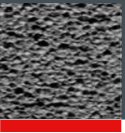
Sustainable insulation system
www.foamglas.de

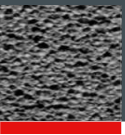


- Build-up**
- 1 Domed concrete deck
 - 2 Bituminous primer
 - 3 FOAMGLAS® T4+ segments, cold bitumen adhesive
 - 4 Cold bitumen coating
 - 5 PC* fixing plates
 - 6 Waterproofing, separating layer Bauder TEC KSA
 - 7 Metal cladding in zinc

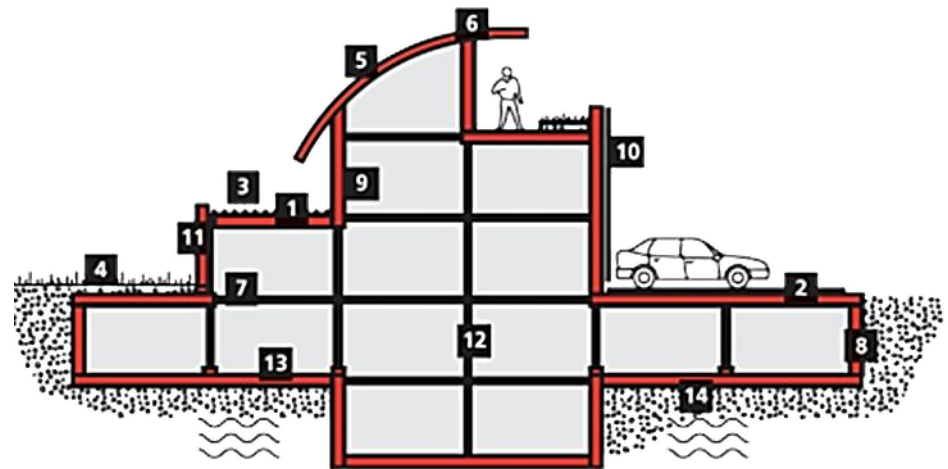


FOAMGLAS roof with metal roof and standing seam finish

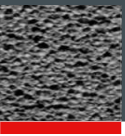




- Thermal conductivity coefficient (λ)
- Resistance to humidity or imperviousness to water vapour (μ)
- Behaviour in fire
- Dimensional stability and load bearing
- Price and long-term economy
- Sustainable



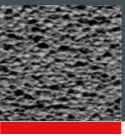
We all are aware about the problem!



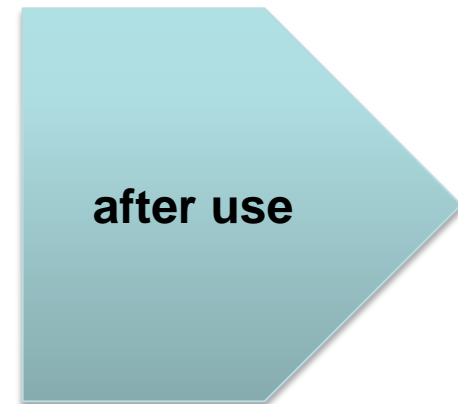
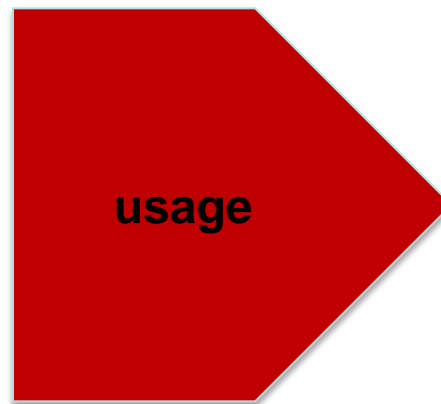
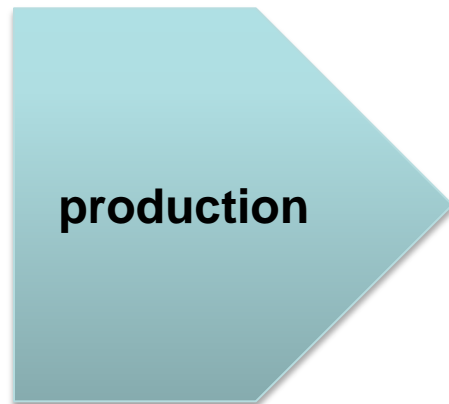
How important are the materials used for the Building Envelope?



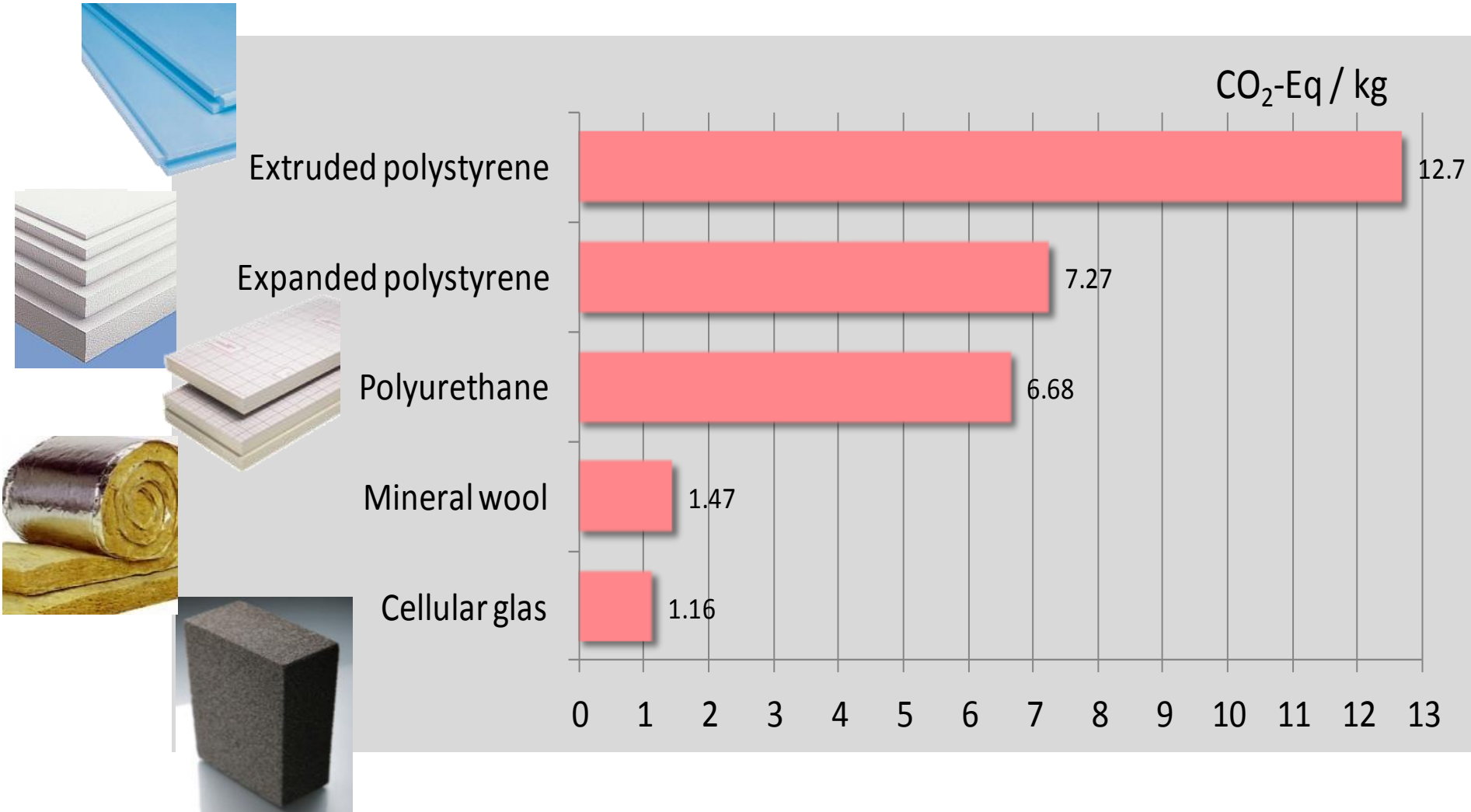
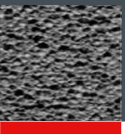
What is a sustainable product?



One broad definition of a 'sustainable product' is an item or service that minimises its impact on the environment at each phase of its life cycle.



Material comparison by CO2

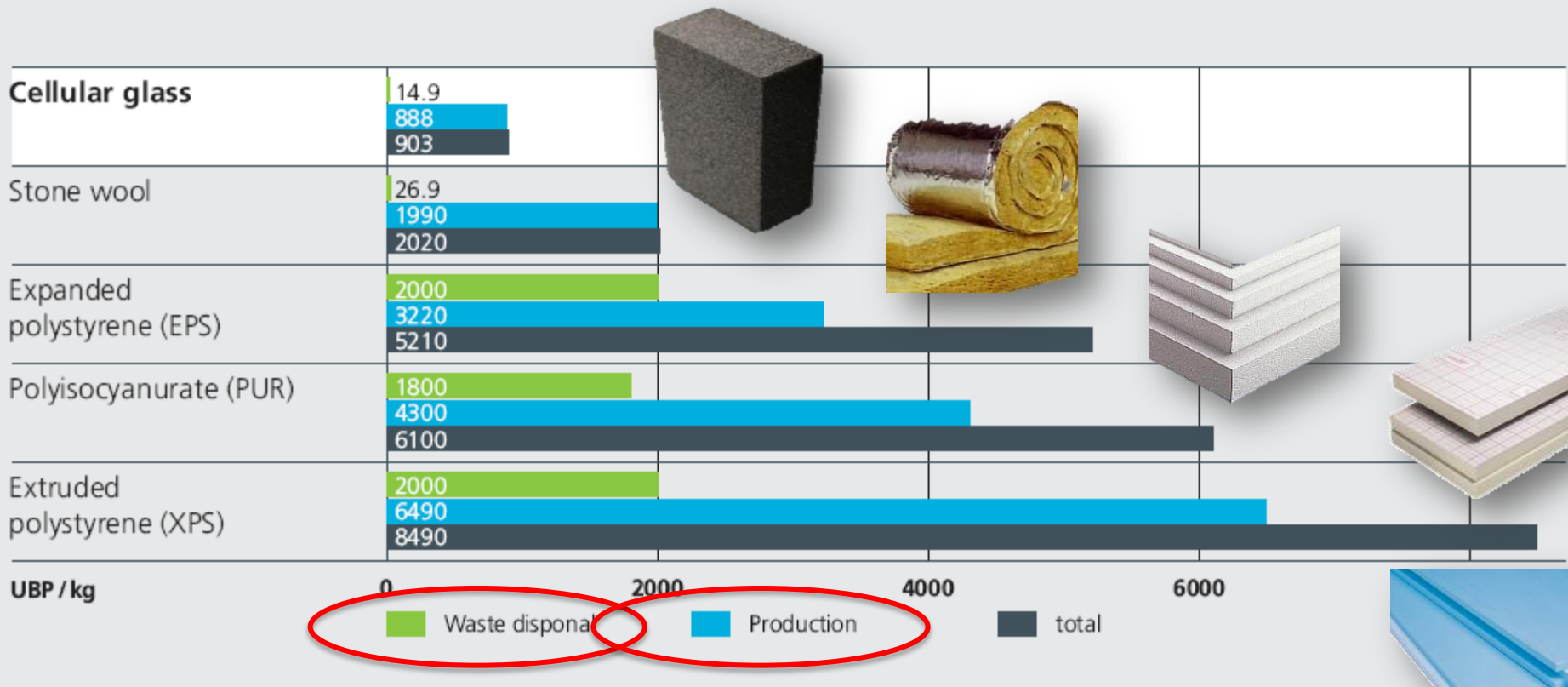


Database: Ecoinvent

LCA pollution score comparison

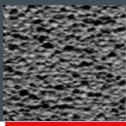
FOAMGLAS® stands comparison

The environmental pollution score (UBP 2006**) for the production and waste disposal of FOAMGLAS® is 903 points/kg (insulation). This puts FOAMGLAS® into the pole position in eco-balance. Other insulation products show points between 2020 (stone wool) and 8490 (Extruded polystyrene).



Source: ecoinvent > LCA

Cellular Glass is ecological and sustainable



breglobal THE GREEN GUIDE TO SPECIFICATION

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Search by element number

ENQ - The Green Guide

Building type > Commercial

Category > Steel/Alum.

Element type > Insulation

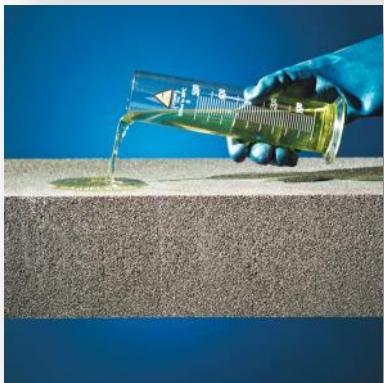
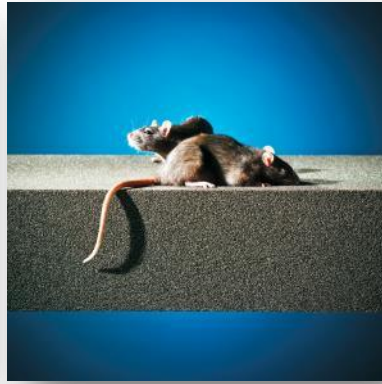
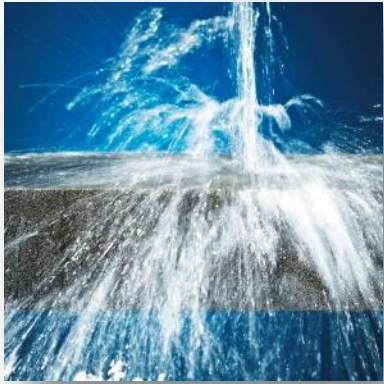
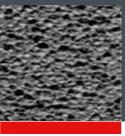
Element	Element Number	Cellular glass insulation - density 110 kg/m ³
Summary Rating		A
Climate Change		B
Water Extraction		A+
Mineral Resource Extraction		A
Stratospheric Ozone Depletion		A+
Human Toxicity		A+
Ecotoxicity to Freshwater		A+
Nuclear Waste (higher level)		A+
Toxicity to Land		B
Waste Disposal		A+
Fossil Fuel Depletion		A
Eutrophication		A+
Photochemical Ozone Creation		A
Acidification		A



Listed Green Material Manual

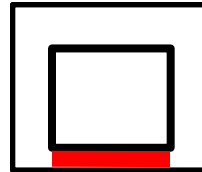


Cellular glass outstanding properties

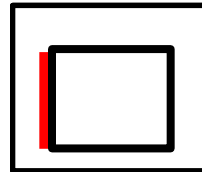


- Water proof
- Vermin proof
- Rigid and strong
- Non-combustible
- Vapour tight
- Keeps the shape
- Acid resistant
- Easy to cut
- Ecological

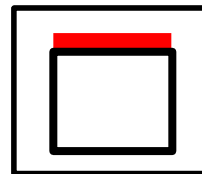
Any question?



Floor Application



Wall Application



Roof Application

Pittsburgh Corning Middle East , www.foamglas.ae

Dubai: Marco Vincenz, +971 50 4955 891

Riyadh: Hossam Abbady, +966 54 806 3479