



and Fire Resistant Insulation

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- Who are FM Global ?
- What do they offer?
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FM Global & Fire Resistant Insulation



Who are FM Global?

- FM Global is the largest commercial insurance company in the world.
- They specialize in loss prevention services primarily to large corporations in the Highly Protected Risk (HPR) property insurance market sector.
- FM's business approach is to adopt the belief that property losses can be prevented or mitigated.
- FM Global operates a non-traditional business model whereby risk and premiums are determined by **engineering analysis** as opposed to historically based **actuarial calculations**.

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FM Global & Fire Resistant Insulation



What do FM Global offer?

- Certification services to manufacturers of fire protection equipment, electrical equipment, hazardous location equipment, fire detection, signaling and other electrical equipment, **materials**, roofing products and smoke detection.
- Products that earn approval are listed in the Approval Guide.
- Products are tested according to global standards, making it easier and more cost-efficient for you to obtain international certification. i.e a European CE mark. The *CE mark* is a mandatory conformity mark on many products placed on the single market in the *European Economic Area*.

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What do FM Global offer? cont

- The FM Global Diamond



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What do FM Global offer? cont

- Obtaining Approval: The Process
 - Step 1: Manufacturer Request
 - Step 2: Proposal Issue and Manufacturer Authorization.
 - Step 3: Review, Testing and First Audit
 - Step 4: Report, FM APPROVED Mark and Listing
 - Step 5: Follow-Up Audits

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Case Study - Polyphen®

Obtaining FM 4880 Accreditation

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History

- FM 4880 Manufacturing Accreditation achieved in 2004 - First in Australia.
- Currently Polyphen® foam production facilities are located in Australia, South Africa, Germany, New Zealand and Papua New Guinea with manufacturing licences recently being granted in Uruguay, Brazil, Argentina, Paraguay and Chile.
- Polyphen® is currently manufactured in Australia by RMAX - Australia's largest rigid insulation producer.
- FM Approved Laminating lines are located at numerous facilities within licensed territories.

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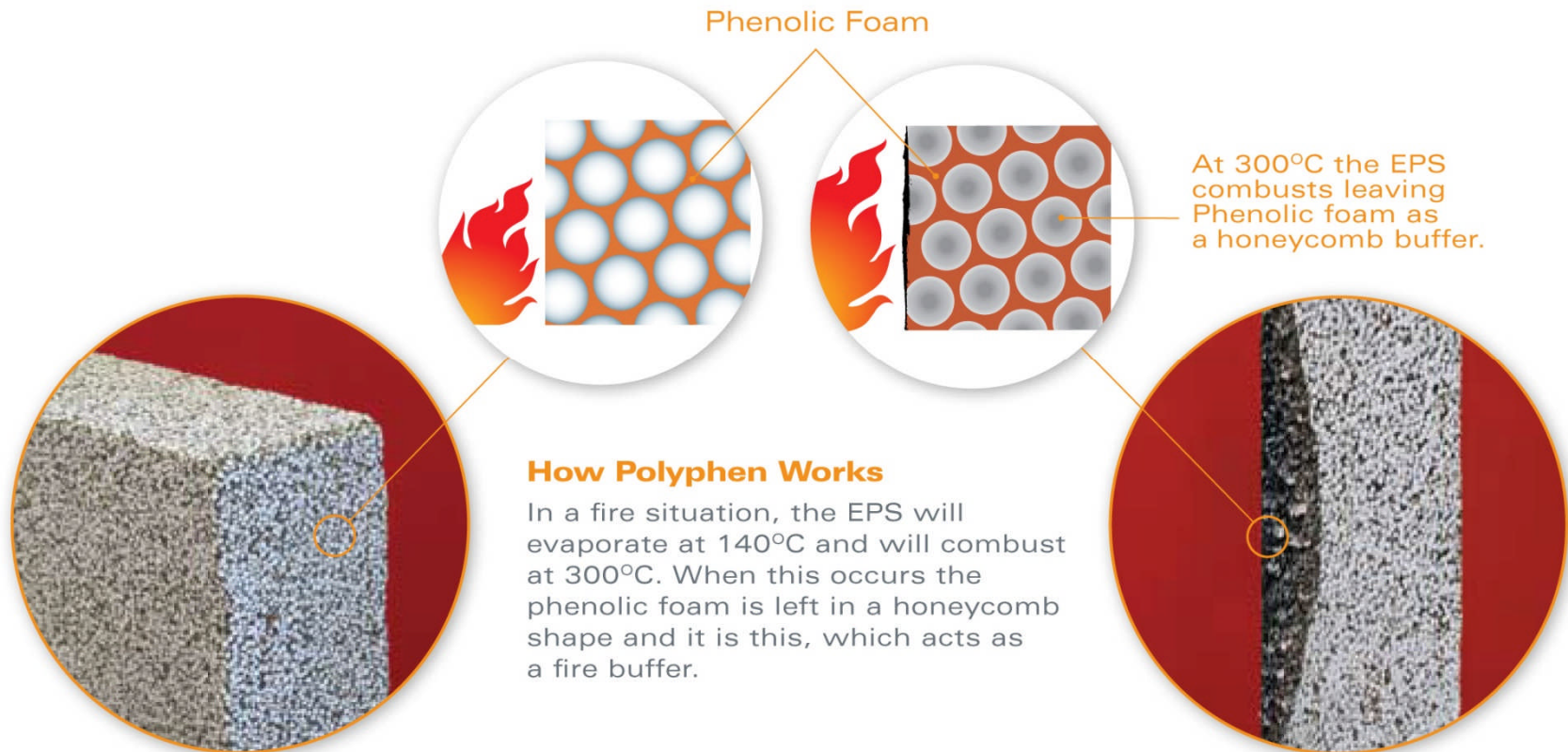


How does Polyphen® work?

- In a non-fire situation, the EPS and Phenolic matrix provides strength and insulation
- In a scenario where a fire is in close proximity to the Polyphen® foam the Phenolic part of the matrix does not burn and maintains its shape and structure, even when the EPS melts.

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How Polyphen works



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Fire Tests

- Fire rating to AS1530.4 (ASTM E 119, ISO834, BS476pt20-24)
- ISO 9705 Room Corner Test
- Factory Mutual UBC 26-3 Test Room Test)
- FM Global Class 1 Accreditation



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Polyphen® FM Global 4880 Fire Test



Figure 4. Polyphen™ steel clad sandwich panels showing tongue and groove joint

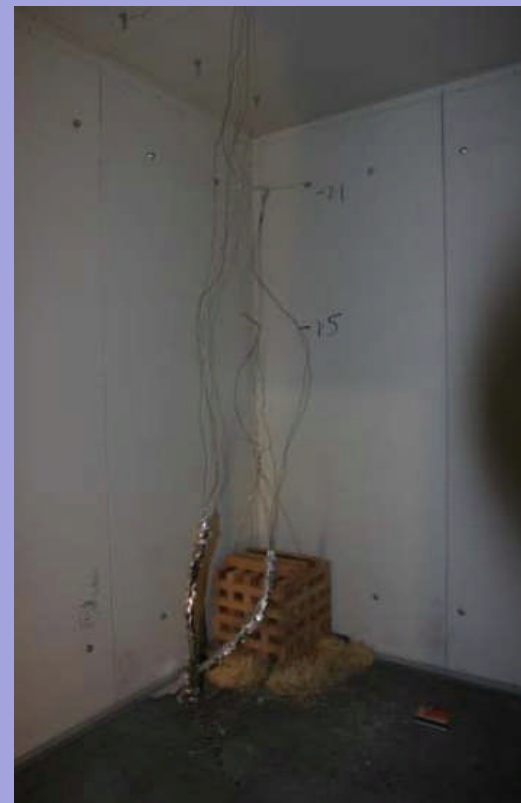


Figure 5. Specimens installed in UBC 26-3 test enclosure

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Polyphen® FM Global 4880

Fire Test cont.



Figure 6. Test in progress at 6 minutes.



Figure 7. Test end at 15 minutes.

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Polyphen® FM Global 4880

Fire Test cont.



Figure 9. Damage to corner specimens with skins and bolting in place.



Figure 10. Depth of char/discolouration in ceiling panel 8.

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Polyphen® FM Global 4880

Fire Test cont.



Figure 11. With skin removed charring of foam in region of direct flame contact



Figure 12. LHS wall panels with skin removed showing char depth on panels 4, 5 and 6.



Figure 13. Rear wall panels with skin removed showing char depth on panels 1, 2 and 3.

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Technical Information - Properties

- Physical properties of Polyphen® vary with the density of the foam. The following test results were obtained for a nominal 50kg/m³ (3lbs/cu ft) foam

Property	metric	imperial
Density	48-50kg/m ³	3lbs/cuft
Compressive Strength (AS 2498.3)	126kPa	18psi
Cross Breaking Strength (AS 2498.4)	248kPa	35psi
Shear Strength (ASTM C273)	104kPa	14.8psi
Tensile Strength (ASTM D1623)	238kPa	33.8psi
Thermal Conductivity		
at 25 degree	0.0368 W/m degrees C	.25 Btu in/ft ² h degrees F
Dimensional Stability (AS 2498.6)		
70 degrees C, 95% RH, 20 hours		Less than 0.5%
-10 degrees C, 20 hours		Less than 0.5%

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Technical Information – Properties cont.

Acoustics

- Polyphen® has good sound absorbing properties, competing with polyurethane and acoustic foams at lower cost while providing higher fire resistance. Eg. a 32 kg/m³ density Polyphen® foam was found to have a Noise Reduction Coefficient NRC=0.45 (250-2000 Hz, 30mm thickness).
- This means it can be used for acoustic applications e.g. ceiling tiles, wall linings and office partitions, to reduce disturbing echoes. Areas of potential use include restaurants, factories, call centres etc.

Biological Resistance






- Mould - Does not promote mould growth.
- Vermin -Offers no food value to insects or rodents.

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Fire Resistance

The following test results were obtained:

Physical Property	Units	PolyPhen®	Test Method
Flame propagation characteristics;			
• median flame duration, max.	SD	0	
• eight value, max.	SD	0	AS 2122.1
• median volume retained.	percent	96.4	
• eight value, min.	percent	96.2	
Fire Propagation and Smoke Release			
• Spread of Flame Index SFI		0	AS/NZS 1530
• Smoke Developed Index		3	Part 3
Surface Burning Characteristics			
• Flame Spread Index		20	 ASTM E84-05
• Smoke Developed Index		5	
Fire Rating - 200mm thick PolyPhen® sandwich panel with 0.6mm steel both sides (tested by Warrington Fire Research [BS476 Part24, ISO834, ASTM E119])		2 hour	 AS1530.4
ISO 9705 Room Corner Test - (Building Code of Australia)		Group 1 (no flashover)	 ISO 9705
Requirements for "fire-resisting materials" as defined in the Marine code MSC.90(71):			
• HRR not to exceed 100kW:		<50 kW	
• Max HRR 500kW over any 30 second period		<100kW	
• Av. smoke production rate not to exceed 1.4m ² /s		<1.0m ² /s	MSC.90(71)
• Max smoke production rate not to exceed 8.3m ² M/s		<2.0m ² /s	
• No flame spread on walls below 0.5m above floor		pass	
• No flaming drops or debris falling on the floor		pass	
Factory Mutual Room Corner Test			
FM Approvals Standard 4880 (1994) - (for sandwich panels up to 250 mm thick, 0.6 mm steel both sides with tongue-and-groove joints).		Class 1 Fire Rated to max. 30ft(9.1m)High	 FM Approvals Standard 4880 (1994)
European Single Burning Item Test			 DIN EN 13823 : 2002-06

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Manufacturing Process



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Technical information

Production Process - Panels

- Blocks of Polyphen® foam are cut to +/- .5mm on an abrasive wire cutting machine (e.g.. www.wintechint.com.au)
- Converts to steel clad panels cost-effectively, on existing continuous conveyor lines (e.g. www.panelmachines.com) that produce widely used EPS/steel panels



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Laminating Video



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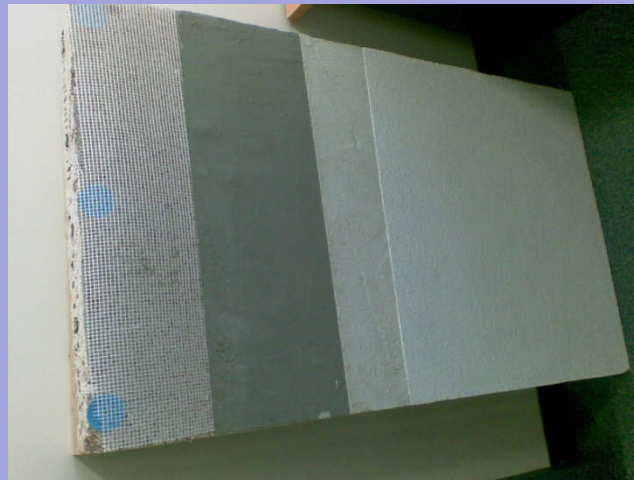
Continuous Line



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Rendered Polyphen® Images



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Rendered Wall



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Market Opportunities

Licensing Opportunities

Patent protected Licenses and sub-licenses are available in many countries of the world. If you are an experienced insulation manufacturer and would like to join with other Polyphen® manufacturers to produce our novel FM Global accredited insulation foam please make enquiries in the first instance to:

info@polyphen.com

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