



 **PAL Middle East PIR LLC**

**Contact PAL Middle East PIR LLC.**

**PO Box : 113826 Dubai, UAE**

**Tel : +971 4 258 26 40**

**Fax : +971 4 25826 41**

**E-mail: [palme@emirates.net.ae](mailto:palme@emirates.net.ae)**

α185+β<<<3468~qwer



## INTRODUCTION

The Heating, Ventilation and Air Conditioning (HVAC) industry is in the midst of a dynamic era. However, air sheet metal ducting, a critical component of HVAC systems, has remained virtually unchanged since the early 1900's. Several factors and recent innovations have introduced the need to revolutionize air ducting. Building materials and insulating products have dramatically improved. Requirements for clean air are becoming increasingly stringent. Energy costs have continued to escalate. Changing fire and smoke codes have raised the standards for compliance.

PAL International has been the pioneer in pre-insulated foam ducting. PAL was the first company in the world to introduce the innovative and revolutionary foam based pre-insulated ductwork as an alternative to sheet metal ductwork. It was invented by Claudio Ferraro of Bologna Italy in 1965. The PAL system incorporated a polyurethane panel with aluminium facing on both

sides. However, by the mid 70's the panel evolved to a polyisocyanurate construction due to increasingly stringent fire regulations.

In order to ensure the consistent high quality of ducting on a worldwide basis, all duct manufacturers using the PAL system and PAL products must attend a specialized, comprehensive training program. An official certificate of competency is awarded to all trainees who successfully complete this training program.

The PIR panel is manufactured of CFC free closed cell polyisocyanurate foam with an 80 micron aluminium foil facing on both sides, or a 80 micron facing on one side and 200 or 500 microns aluminium foil on the other. The panel thickness is 20mm or 30mm with foam density of 45-50kg/m<sup>3</sup> (2.8 - 3.0 lb/ft<sup>3</sup>) and thermal conductivity of 0.022 w/mC at 10 C (k = 0.153 BTU in ft<sup>2</sup>h F).





**PAL “complete system technology” approach to pre-insulated ductwork is the solution to today’s air distribution problems.**

**THE “PAL SYSTEM” OFFERS:**



- Complete line of components and accessories.
- Professional hand tools and automatic machinery.
- Specialized training programs for duct manufacturers.
- “Duct Design Software” to size the duct system and estimate the material needed.
- Technical Support.

α 1 8 5 + B « « « « 3 4 6 8 ≈ q w e r





- **Cleanable and hygienic,**
- **Environmentally Friendly, CFC, HCFC free.**
- **Clean Air: Contains no microfibres.**
- **Light Weight: Only 15% of sheet metal ducting**
- **Resistance to fungus growth.**
- **Space Saving: Flush fitting installation possible.**
- **Low Leakage: Fully sealed systems conforms to DW 144 Class C-high pressure**
- **low "U" value.**
- **Energy Savings: Up to 20% annually.**
- **Fast-Track Installation: Rapid erection combined with single fix installation.**
- **Site fabrication capability**
- **No limits to duct sizes**
- **Self Supporting**
- **High-Compressive strength,**
- **High rigidity / integrity, Self supporting ducts**
- **Base material is impermeable to moisture, insoluble.**

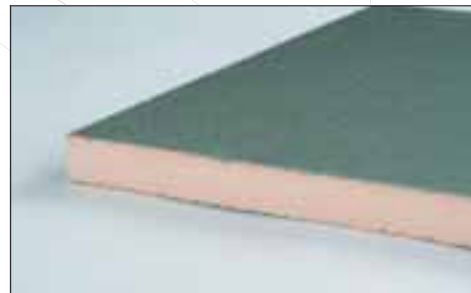


**PAL "PIR" Polyisocyanurate Foam Panel** 45/50Kg/m<sup>3</sup> density, 20mm/ 30mm thickness, CFC/ HCFC Free, and protected on both sides with 80, 200 or 500 microns aluminium facing, The embossed aluminium foil is lacquered with 3g/m<sup>2</sup> of corrosion resistant polyser varnish.

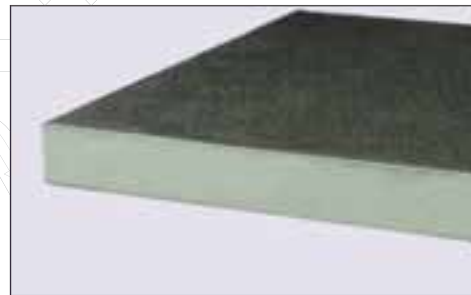
## PAL PIR PANELS APPLICATIONS

### Art P 80 Internal Use:

Thickness: 20mm / 30mm  
 Density: 45Kg/m<sup>3</sup> ± 3%  
 Panel Dia.: 4000mm x 1200mm  
 Thermal Conductivity: 0.022 W/MK  
 Alum. Foil: 80 microns both sides  
 Alum. Finish: Embossed / Embossed  
 Fire and smoke Classification: Class 'O' BS 476 Part 6, 7  
 Class 'A' ASTM E84.



20 P80



30 P80

### Art P 200 External Use:

Thickness: 20mm / 30mm  
 Density: 50Kg/m<sup>3</sup> ± 3%  
 Panel Dia.: 4000mm x 1200mm  
 Thermal Conductivity: 0.022 W/MK  
 Alum. Foil: 80/200 microns  
 Alum. Finish: Embossed / Embossed  
 Fire and smoke Classification: Class 'O' BS 476 Part 6, 7  
 Class 'A' ASTM E84.



20 P200



30 P200

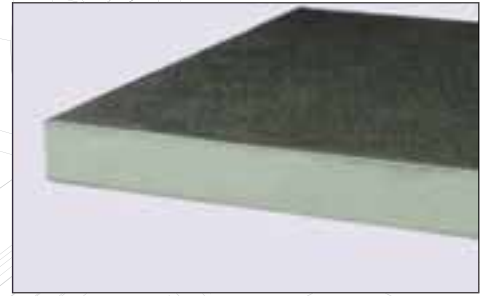
0  
1  
2  
3  
4  
5

α185+β<<<<3468≈qwer

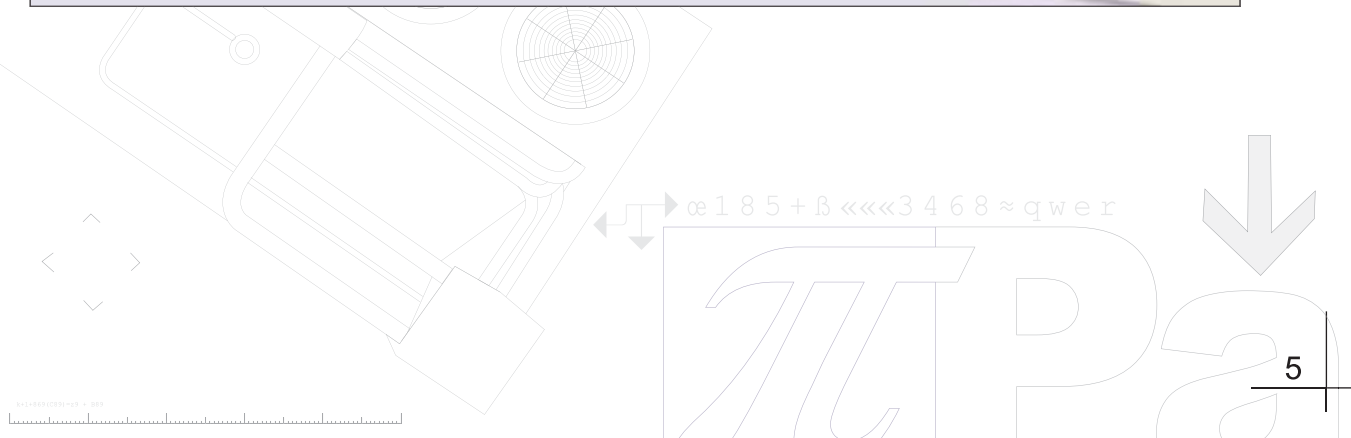
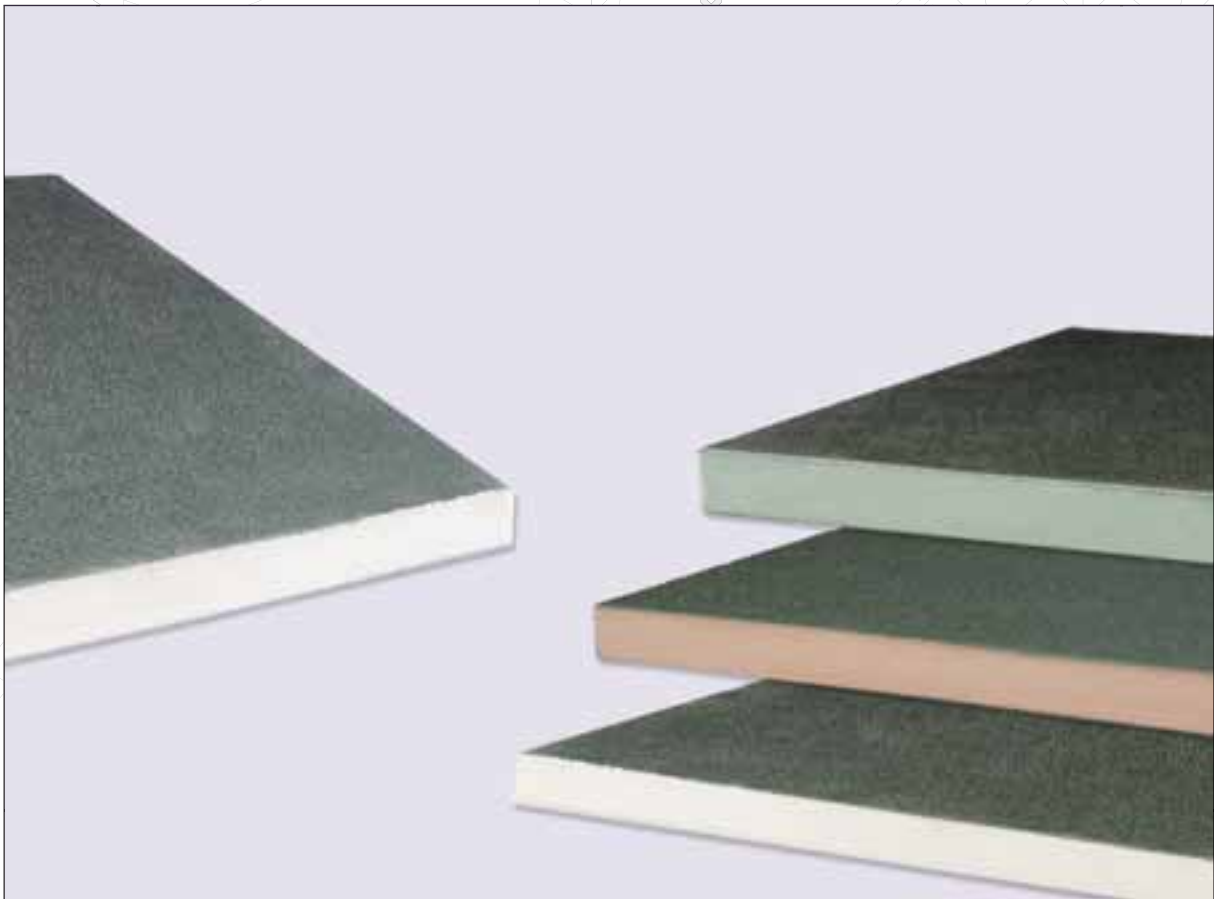


**Art P 500**  
**Special PIR Panel for External Use:**

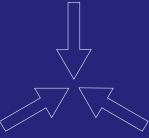
Thickness: 30mm  
Density: 50Kg/m<sup>3</sup> ± 3%  
Panel Dia.: 4000mm x 1200mm  
Thermal Conductivity: 0.022 W/MK  
Alum. Foil: 80/500 microns  
Alum. Finish: Embossed / Embossed  
Fire and smoke Classification: Class 'O' BS 476 Part 6, 7  
Class 'A' ASTM E84.



30 P500



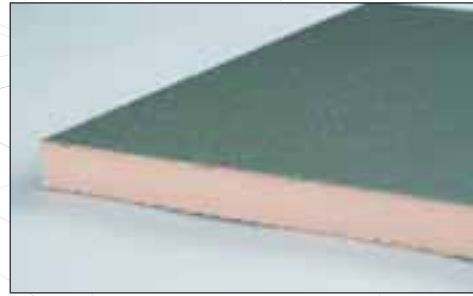
# PAL PANELS



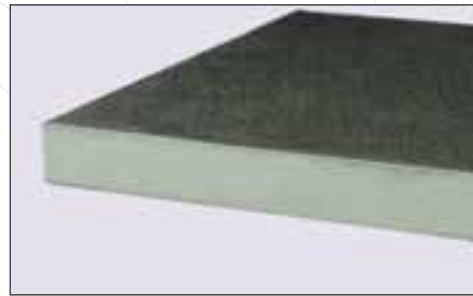
## PAL PUR PANELS

### Art PU 80 Internal Use:

Thickness: 20mm / 30mm  
Density: 45Kg/m<sup>3</sup> ± 3%  
Panel Dia.: 4000mm x 1200mm  
Thermal Conductivity: 0.022 W/MK  
Alum. Foil: 80 microns both sides  
Alum. Finish: Embossed / Embossed  
Fire and smoke Classification: Class 'O' BS 476 Part 6, 7  
Class 'A' ASTM E84.



20 PU 80



30 PU 80

### Art PU 200 External Use:

Thickness: 20mm / 30mm  
Density: 50Kg/m<sup>3</sup> ± 3%  
Panel Dia.: 4000mm x 1200mm  
Thermal Conductivity: 0.022 W/MK  
Alum. Foil: 80/200 microns  
Alum. Finish: Embossed / Embossed  
Fire and smoke Classification: Class 'O' BS 476 Part 6, 7  
Class 'A' ASTM E84.



20 PU 200



30 PU 200

α 185 + B <<<< 3 4 6 8 ≈ q w e r





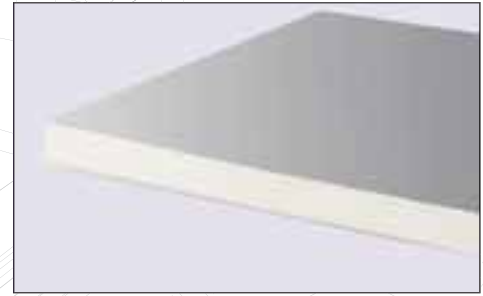
**Art PSS 80**

**Special PIR Panel for Hospital Use:**

**Art PUSS 80**

**Special PUR Panel for Hospital Use:**

|                                |   |
|--------------------------------|---|
| Thickness:                     | 20mm  |
| Density:                       | 45Kg/m <sup>3</sup> ± 3%                          |
| Panel Dia.:                    | 4000mm x 1200mm                                   |
| Thermal Conductivity:          | 0.022 W/MK  |
| Alum. Foil:                    | 80 microns one side                               |
| Alum. Finish:                  | Embossed  |
| Stainless Steel:               | 100 Micron one side                               |
| Stainless Steel Finish:        | Smooth  |
| Fire and smoke Classification: | Class 'O' BS 476 Part 6, 7<br>Class 'A' ASTM E84. |



20 PUSS 80 / 20 PSS 80

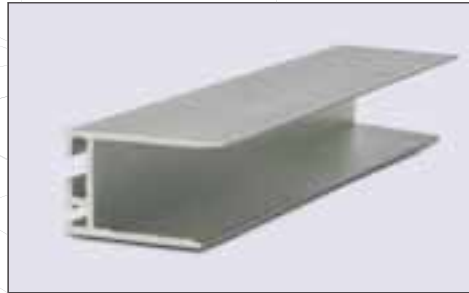


# PANEL ACCESSORIES



## Art AC 10 Polymer / Aluminium Invisible Profile Polymer / Aluminium Joint Flange 30mm

Length: 4mt  
Thickness: 20mm, 30mm  
Code: 20 AC 10,  
30 AC 10



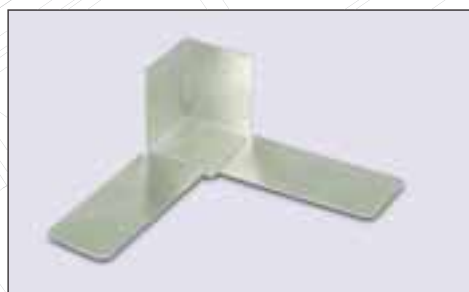
## Art AC 11 H Bayonet in Polymer Aluminium Channel

Length: 4mt  
Code: 20 AC 11  
30 AC 11



## Art AC 12 Corner Cover in Polymer Steel corner

Thickness: 20mm, 30mm  
Code: 20 AC 12  
30 AC 12



α 1 8 5 + B <<<< 3 4 6 8 ≈ q w e r

8

## Art AC 13 Corner Plate for Invisible Profile

Thickness: 20mm, 30mm  
Code: 20 AC 13



## Art AC 14 Aluminium U Profile

Length: 4mt  
Thickness: 20mm, 30mm  
Code: 20 AC 14  
30 AC 14



## Art AC 15 Aluminium Chair Profile

Length: 4mt  
Thickness: 20mm, 30mm  
Code: 20 AC 15  
30 AC 15



0  
1  
2  
3  
4  
5

# PANEL ACCESSORIES



## Art AC 16 Aluminium F Profile

Length: 4mt  
Thickness: 20mm, 30mm  
Code: 20 AC 16  
30 AC 16



## Art AC 17 Aluminium H Profile

Length: 4mt  
Thickness: 20mm, 30mm  
Code: 20 AC 17  
30 AC 17



## Art AC 18 Reinforcement Bar in Aluminium

Length: 4mt  
Thickness: 14mm  
Code: AC 18



α 1 8 5 + β <<<< 3 4 6 8 ≈ q w e r

10

**Art AC 19**  
**Reinforcement Disc**

Code: AC 19



**Art AC 20**  
**Duct Support**

Code: AC 20



**Art AC 21**  
**Tiger Connector**

Code: AC 21



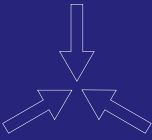
**Art AC 22**  
**Tiger Closure**

Code: AC 22





# ADHESIVE MATERIAL



0  
1  
2  
3  
4  
5

## Art M 23 PIR adhesive

Capacity: 15Kg / Tin  
5Kg / Tin  
Code: M 23



## Art M 24 Aluminium Tape

Width: 50mm for 20mm Panel  
Width: 75mm for 30mm Panel  
Code: 20 M 24  
30 M 24



## Art M 25 Silicon Sealant

Code: M 25



## Art M 26 Thermal Insulation Tape

Width: 100mm  
Code: M 26



## Art M 30 Gasket Self Adhesive

Code: M 30



α 1 8 5 + 8 « « « 3 4 6 8 ≈ q w e r

12

A complete set of professional hand tools have been specifically developed to enable efficient and economical fabrication of ductwork. Ease of portability provides the option for site base manufacturing.

A full line of automatic machinery is also available for high volume ductwork.



α185+β<<<<3468≈qwer



# MANUAL FABRICATION EQUIPMENT



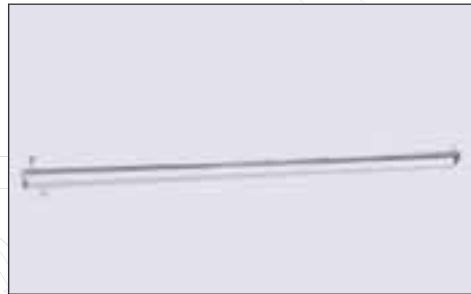
## Art EM 27 Portable fabrication Table

Size: 4mt x 1.2mt  
Code: EM 27



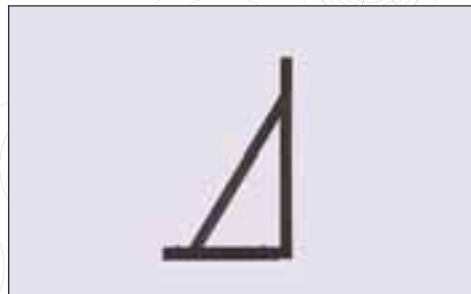
## Art EM 28 Art EM 29 Aluminium Clumping Ruler

Size: 4mt  
1.2mt  
Code: EM 28  
EM 29



## Art EM 30 Art EM 31 Square in Aluminium

Size: 1200mm  
700mm  
Code: EM 30  
EM 31



## Art EM 32 Compass

Code: EM 32



0  
1  
2  
3  
4  
5

α 1 8 5 + 5 « « « « 3 4 6 8 ≈ q w e r

14

### Art EM 33 Manual Bending Machine

Code: EM 33



### Art EM 34 Tool Box

Code: EM 34



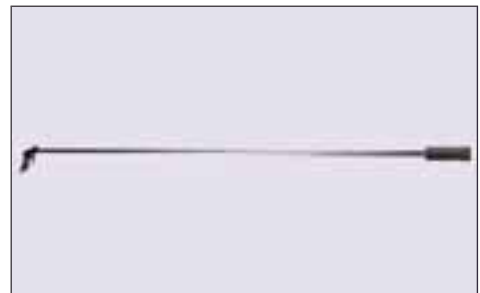
### Art EM 35 Pneumatic Glue Spreader

Code: EM 35



### Art EM 36 Pneumatic Extended Silicon Tool

Code: EM 36



### Art EM 37 Aluminium Profile Cutting Machine

Code: EM 37



0  
1  
2  
3  
4  
5

# AUTOMATIC FABRICATION EQUIPMENT



## Art EA 38 Straight Cutting Automatic Machine

Code: EA 38



## Art EA 39 Electric Bending Machine

Code: EA 39



## Art EA 40 Computer Cutting Machine

Code: EA 40



## Art EA 41 Plotter Machine

Code: EA 41



α 1 8 5 + β <<<< 3 4 6 8 ≈ q w e r





**Art ST 42**  
**Art ST 43**  
**Double Blade Cutter**

Size: 20mm, 30mm  
45°  
Code: ST 42 (20 mm)  
ST 43 (30 mm)



**Art ST 44**  
**Art ST 45**  
**Art ST 46**  
**Single Blade Cutter**

Size: 20mm, 30mm  
90°  
45° Left  
45° Right  
Code: ST 44 (90°)  
ST 45 (Left - 45°)  
ST 46 (Right - 45°)



0  
1  
2  
3  
4  
5

# SPARES TOOLS



**Art ST 47**  
**Marker**

Code: ST 47



**Art ST 48**  
**Stiff Spatula - Aluminium**

Code: ST 48



α 1 8 5

18

18/03/2019 14:58

**Art ST 49**  
**Glue Spreader -manual**

Code: ST 49



**Art ST 50**  
**Tape Marker**

Code: ST 50



**Art ST 60**  
**Soft - Spatula**

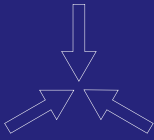
Code: ST 60



**Art ST 61**  
**Hammer**

Code: ST 61





## ORDER GUIDE FOR 20MM PANEL (Internal Use)

To produce 1,000m<sup>2</sup> of PAL Ducting System. The following is a list of material and accessories for a standard construction requirement:

| Code   | DESCRIPTION                        | U.M            | APPROX. QTY. |
|--------|------------------------------------|----------------|--------------|
| 20P80  | Panel 4000 x 1200mm                | M <sup>2</sup> | 1,100        |
| 20AC10 | Aluminium Invisible Profile        | MT             | 760          |
| 20AC11 | H Bayonet in Polymer               | MT             | 400          |
| 20AC12 | Corner Cover in Polymer            | PC             | 900          |
| 20AC13 | Corner Plate for Invisible Profile | PC             | 1,200        |
| 20AC14 | Aluminium U Profile                | MT             | 80           |
| 20AC15 | Aluminium Chair Profile            | MT             | 80           |
| 20AC16 | Aluminium F Profile                | MT             | 80           |
| M23    | PIR Adhesive                       | KG             | 90           |
| 20M24  | Aluminium Tape                     | ROLL           | 150          |
| M25    | Silicon Sealant                    | TUBE           | 90           |



## ORDER GUIDE FOR 30MM PANEL (External Use)

To produce 1,000m<sup>2</sup> of PAL Ducting System. The following is a list of material and accessories for a standard construction requirement:

| Code   | DESCRIPTION                    | U.M            | APPROX. QTY. |
|--------|--------------------------------|----------------|--------------|
| 30P80  | Panel 4000 x 1200mm            | M <sup>2</sup> | 1,100        |
| 30AC10 | Aluminium Joint Profile        | MT             | 760          |
| 30AC11 | Aluminium Channel              | MT             | 400          |
| 30AC12 | Steel Corner                   | PC             | 1500         |
| M30    | Gasket                         | PC             | 400          |
| 30AC14 | Aluminium U Profile            | MT             | 80           |
| 30AC15 | Aluminium Chair Profile        | MT             | 80           |
| 30AC16 | Aluminium F Profile            | MT             | 80           |
| M23    | PIR Adhesive                   | KG             | 90           |
| 30M24  | Aluminium Tape                 | ROLL           | 150          |
| M25    | Silicon Sealant                | TUBE           | 90           |
| M26    | Thermal Insulation Tape        | MT             | 300          |
| AC18   | Reinforcement Bar in Aluminium | MT             | 120          |
| AC19   | Reinforcement Disc             | PC             | 200          |





# CERTIFICATES



**Warringtonfire - mid-east**

**Warringtonfire Mid-East Listing No. 016  
Certificate of Factory Production Control**

Producer: PAL Middle East L.L.C.  
Product: PAL Panel, Aluminium Foil Faced Polyurethane Foam Board  
Factory Location: Shalkh Zayed Road, P.O. Box 1871, Al Ques Industrial Area, Dubai, UAE  
Date of Inspection: 28<sup>th</sup> September 2005

**This Document Certifies that:**  
The Factory Production Control (FPC) procedures/routines operated by PAL Middle East L.L.C. at the above address have been subject to FPC inspection and found to comply with the FPC requirements of the Warringtonfire Mid-East Listing Scheme, including sampling of products. Labels will be applied to unmodified products by PAL Middle East L.L.C. until such time as a printer can be used to print continuously onto the back of each panel.

This certificate is valid for a period of 1 year from date of issue provided that a routine surveillance visit is carried out once every 6 months from the previous visit, to check ongoing implementation of and compliance with the FPC assessed as acceptable.

**Note:**  
This certificate will become invalid if the manufacturer makes significant changes to the assessed as acceptable FPC system, (such as sub-contracting part of the manufacturing process which was previously all carried out in house or new production methods are implemented).

This certificate will become invalid if the manufacturer moves the manufacture of the product from the factory location identified above.

The Product Covered by this Certificate is:  
**PAL Panel, Aluminium Foil Faced Polyurethane Foam Board**

Signed:  
  
Janet Murrell  
Technical Manager  
Issue Date: 6<sup>th</sup> April 2006  
Valid to: 27<sup>th</sup> October 2006

Page 1 of 1

Warringtonfire, Harwood Road, Warrington, Cheshire, UK, W93 2DQ  
Tel: (+44) 01925 955110 • Fax: (+44) 01925 948616 • E-mail: technical@warringtonfire.co.uk

**Warringtonfire - mid-east**

**Summary of Listing for Warringtonfire - mid-east  
Listing No. 016  
PAL Middle East L.L.C. "PAL Panel, Aluminium Foil Faced Polyurethane Foam Board"**

**Scope of Assessment**  
This Assessment Summary has been prepared by Warringtonfire and is a summary of the Class 0 summary report referenced below. Full details of the product, justification for the conclusions given, along with validity statements are given in that report and the supporting test reports.

This summary sheet covers PAL Panel 100, incorporating a proprietary aluminium foil faced polyurethane foam board with warm coated embossed aluminium foil facings to both sides as previously fire tested and assessed by Warringtonfire to BS 476, Part 6: 1989 Method of test for fire propagation of products and BS 476, Part 7: 1997 Surface spread of flame test for materials.  
The aluminium faced polyurethane foam has been assessed as having a Class 0 performance.

Assessment Report Reference: WF Report Nos 149750 and 149751  
Period of Validity: Until 1<sup>st</sup> November 2010

**Table 1: Assessed PAL Panel**

**Aluminium Foil Faced Polyurethane Foam Panel**  
The product shall consist of a flame retardant grade polyurethane foam insulation board faced on both sides with a coated, decoratively embossed aluminium foil facing. The aluminium foil facing shall be coated with a clear UV protective polyester varnish and shall be 80 microns thick. In addition to the embossment, foil facing shall have areas of its surface that are not embossed forming the word "PAL" distributed at regular intervals over the surface of the facing. The foil facing shall be adhered to the polyurethane foam core using an adhesive for which WF have been provided with details. The foam shall be a "CFC" and "HCFC" free flame retardant grade polyurethane foam board. The foam shall be 31mm thick and have a density of 30 kg/m<sup>3</sup>.

**Table 2: Test Results from BS476 Parts 6 and 7**

| Test Method          | Classification Results          |
|----------------------|---------------------------------|
| BS 476: Part 6: 1989 | Fire propagation Index, I = 5.3 |
|                      | subindex, I <sub>1</sub> = 1.3  |
|                      | subindex, I <sub>2</sub> = 3.0  |
| BS 476: Part 7: 1997 | subindex, I <sub>1</sub> = 1.1  |
|                      | Class 1 surface spread of flame |

Page 1 of 2

**COMMERCIAL TESTING COMPANY**

1000

Warringtonfire, Harwood Road, Warrington, Cheshire, UK, W93 2DQ  
Tel: (+44) 01925 955110 • Fax: (+44) 01925 948616 • E-mail: technical@warringtonfire.co.uk

Test Report

Product Name: PAL Panel

Manufacturer: PAL Middle East L.L.C.

Tested at: Warringtonfire, Harwood Road, Warrington, Cheshire, UK, W93 2DQ

Tested on: 28<sup>th</sup> September 2005

Tested by: [Signature]

Test Report No: [Number]

**Warringtonfire - mid-east**

**Opinion**

We consider the results of the tests detailed above demonstrate that the product, PAL Panel, as tested, complies with the requirements for Class 0, as defined in paragraph A15(1) of Approved Document B, Fire Safety, to the Building Regulations 2000.

This Summary is based upon a Class 0 summary report, as referenced above, prepared by Warringtonfire. Full details of the panel construction and justification of the conclusions given, along with validity statements, are given in the Class 0 summary report.

This Summary has been compiled between Warringtonfire and PAL Middle East L.L.C. it is intended to provide a brief outline of the above report and not to replace it.

Full copies of the Class 0 summary report may be obtained from:  
PAL Middle East L.L.C.  
300, Shalkh Zayed Road  
Al Ques Area  
Dubai  
Tel: +971 4 3395580  
Fax: +971 4 3395045

Responsible Officer:  
J M Murrell - Technical Manager

Approved:  
C W Miles - Mid-East Product Listing Manager

\* For and on behalf of Warringtonfire.

Page 2 of 2

**Warringtonfire - mid-east**

Test Report

Product Name: PAL Panel

Manufacturer: PAL Middle East L.L.C.

Tested at: Warringtonfire, Harwood Road, Warrington, Cheshire, UK, W93 2DQ

Tested on: 28<sup>th</sup> September 2005

Tested by: [Signature]

Test Report No: [Number]

**Warringtonfire - mid-east**

**Opinion**

We consider the results of the tests detailed above demonstrate that the product, PAL Panel, as tested, complies with the requirements for Class 0, as defined in paragraph A15(1) of Approved Document B, Fire Safety, to the Building Regulations 2000.

This Summary is based upon a Class 0 summary report, as referenced above, prepared by Warringtonfire. Full details of the panel construction and justification of the conclusions given, along with validity statements, are given in the Class 0 summary report.

This Summary has been compiled between Warringtonfire and PAL Middle East L.L.C. it is intended to provide a brief outline of the above report and not to replace it.

Full copies of the Class 0 summary report may be obtained from:  
PAL Middle East L.L.C.  
300, Shalkh Zayed Road  
Al Ques Area  
Dubai  
Tel: +971 4 3395580  
Fax: +971 4 3395045

Responsible Officer:  
J M Murrell - Technical Manager

Approved:  
C W Miles - Mid-East Product Listing Manager

\* For and on behalf of Warringtonfire.

Page 2 of 2



