PAL SYSTEM INTERNATIONAL FZCO
**Pre-Insulated Ducting Technology**

**P.O. Box: 113826 DUBAI, UAE**
**Tel +971 4 8105105 Fax +971 4 8105106**
**E-mail: info@palduct.com**
**Website: www.pal-me.net**

**Al Qusais 2, Dubai Office**
**Tel +971 4 2582640 Fax +971 4 2582641**

# PAL ECO SYSTEM DUCT SYSTEM

## LIST OF TEST REPORT & CERTIFICATE

| DESCRIPTION | TEST METHOD & STATEMENT | LABORATORY | CLASSIFICATION & RESULTS |
|---|---|---|---|
| Bacterial and Fungal Growth Resistance | ASTM G21 | Biosan Laboratories | Resistance to the following organisms:<br>• ***Aspergillus niger***<br>• ***Aureobasidium pullulans***<br>• ***Chaetomium globosum***<br>• ***Penicillium funiculosum***<br>• ***Trichoderma virens*** |
| Bacterial and Fungal Growth Resistance | ASTM G22 | Exova – Al Futtaim | No growth for the following organisms:<br>• ***Pseudomonas aeruginosa***<br>• ***Staphylococcus aureus*** |
| Bacterial Growth Resistance | ASTM E2180 | Biosan Laboratories | Resistance to ***Staphylococcus aureus*** |
| Fire Propagation Index | BS 476 Part 6 | Warringtonfire - UK | Class “0” |
| Surfaces Spread of Flame | BS 476 Part 7 | Warringtonfire - UK | Class “1” |
| Certification of Product Listing No. 016 | BS 476 Part 6, 7 | Warringtonfire – UK, Mideast Global Safety | Class “0” |
| Certificate of Factory Production Control and Product Labels | FPC Requirement Product Label<br><br>Certificate of Approval ME0016 | Warringtonfire – UK, Mideast Global Safety | |
| Flame Spread Index | ASTM E-84<br>NFPA 255<br>UL 723<br>NFPA 101 Life Safety Code | Commercial Testing Company - USA | Class “A” |

PAL SYSTEM INTERNATIONAL FZCO
**Pre-Insulated Ducting Technology**

**P.O. Box: 113826 DUBAI, UAE**
**Tel +971 4 8105105 Fax +971 4 8105106**
**E-mail: info@palduct.com**
**Website: www.pal-me.net**

**Al Qusais 2, Dubai Office**
**Tel +971 4 2582640 Fax +971 4 2582641**

| DESCRIPTION | TEST METHOD & STATEMENT | LABORATORY | CLASSIFICATION & RESULTS |
|---|---|---|---|
| Smoke Developed Index | ASTM E-84<br>NFPA 255<br>UL 723<br>NFPA 101 Life Safety Code | Commercial Testing Company - USA | Class "A" |
| Toxicity Index | NES – 713<br>IMO Resolution MSC 61 (67) | Warringtonfire UK<br>Warringtonfire UK | 5.7<br>Average S.O.D. <200 |
| Thermal Conductivity | ASTM C518 | Dubai Municipality Laboratory | 0.020 w/m.k.<br>0.169 Btu w/m.k. $ft^2$ |
| Compressive Strength | ASTM D1621 | Dubai Municipality Laboratory | 220.9 kpa |
| Flexural Strength | ASTM C203 | Dubai Municipality Laboratory | 1170 kpa |
| Panel Density | ASTM D1622 | Dubai Municipality Laboratory | 71.5 $kg/m^3$ |
| Water Absorption Level | ASTM C209 | Dubai Municipality Laboratory | 0.14%<br>(24 hours immersion) |
| Sound Attenuation Test | BS 2750 | Sound Research Laboratory Limited | Average SRI (100-3150 Hz) 14.1 |

**PAL MIDDLE EAST PIR LLC**
Pre-Insulated Ducting Technology

**P.O. Box: 113826, DUBAI, UAE**
**Tel.: +971 4 2582640 Fax: +971 4 2582641**
**E-mail: palme@emirates.net.ae**
**Website: www.pal-me.net**

# PAL PRE-INSULATED DUCT SYSTEM

## LIST OF TEST REPORT & CERTIFICATE

| DESCRIPTION | TEST METHOD & STATEMENT | LABORATORY | CLASSIFICATION & RESULTS |
|---|---|---|---|
| 1. Fire Propagation Index | BS 476 Part 6 | Warringtonfire - UK | Class "0" |
| 2. Surfaces Spread of Flame | BS 476 Part 7 | Warringtonfire - UK | Class "1" |
| 3. Certification of Product Listing No. 016 | BS 476 Part 6, 7 | Warringtonfire – UK, Mideast Global Safety | Class "0" |
| 4. Certificate of Factory Production Control and Product Labels | FPC Requirement Product Label<br><br>Certificate of Approval ME0016 | Warringtonfire – UK, Mideast Global Safety | |
| 5. Epiradiateur Test | NFP 92-501 | Warringtonfire – UK (Ministere de l'Industrie et de la Decentralisation) | M1 |
| 6. Flame Spread Index | ASTM E-84<br>NFPA 255<br>UL 723<br>NFPA 101 Life Safety Code | Commercial Testing Company - USA | Class "A" |
| 7. Smoke Developed Index | ASTM E-84<br>NFPA 255<br>UL 723<br>NFPA 101 Life Safety Code | Commercial Testing Company - USA | Class "A" |
| 8. Toxicity Index | NES – 713<br>IMO Resolution MSC 61 (67) | Warringtonfire UK<br>Warringtonfire UK | 5.7<br>Average S.O.D. <200 |

ISO 9001 BUREAU VERITAS Certification

warringtonfire - mideast global safety
Listing No. 016
PAL Panel Class O

ISO 14001 REGISTERED

CB-013

# PAL MIDDLE EAST PIR LLC

Pre-Insulated Ducting Technology

**P.O. Box: 113826, DUBAI, UAE**
**Tel.: +971 4 2582640 Fax: +971 4 2582641**
**E-mail: palme@emirates.net.ae**
**Website: www.pal-me.net**


| DESCRIPTION | TEST METHOD & STATEMENT | LABORATORY | CLASSIFICATION & RESULTS |
|---|---|---|---|
| 9. Thermal Conductivity | ASTM C518 | Dubai Municipality Laboratory | 0.020 w/m.k.<br>0.169 Btu w/m.k. $ft^2$ |
| 10. Compressive Strength | ASTM D1621 | Dubai Municipality Laboratory | 220.9 kpa |
| 11. Flexural Strength | ASTM C203 | Dubai Municipality Laboratory | 1170 kpa |
| 12. Panel Density | ASTM D1622 | Dubai Municipality Laboratory | 71.5 $kg/m^3$ |
| 13. Water Absorption Level | ASTM C209 | Dubai Municipality Laboratory | 0.14%<br>24 hours immersion |
| 14. Sound Attenuation Test | BS 2750 | Sound Research Laboratory Limited | Average SRI (100-3150 Hz) 14.1 |
| 15. Fungal Resistance Test | ASTM G21 | Biosan Laboratories - USA | No Fungal Growth |

| CLIENT INFORMATION | |
|---|---|
| Company Name | PAL SYSTEM |

SAMPLES:

Samples of rigid Pal Duct were submitted by the manufacturer for examination and test.

GENERAL:

Test results relate only to the below items tested.

The following tests were conducted on representative sizes and samples of Pal Duct in accordance with UL 181, Factory Made Air Ducts and Air Connectors, Eleventh Edition, dated July, 25, 2013.

| Tests | Section | Size Tested | Thickness Tested | Interior | Status |
|---|---|---|---|---|---|
| Surface Burning Characteristics | 7 | as required | 20 and 30 mm | Reinforced and non-reinforced | Passed |
| Flame Penetration | 10 | as required | 20 and 30 mm | Reinforced and non-reinforced | Passed |
| Burning | 11 | 500 by 500 mm; 300 by 300 mm | 20 mm | Non-reinforced | Passed |
| | | | | | |
| Mold Growth and Humidity – caulk and duct section | 13 | as required | 20 mm | Non-reinforced | Passed |
| Temperature (low) | 14 | as required | 20 mm | Non-reinforced | Passed |
| Temperature (high) | 14 | as required | 20 mm | Non-reinforced & Reinforced | Passed |
| Puncture | 15 | as required | 20 and 30 mm | Non-reinforced & Reinforced | Passed |
| Puncture after High Temp | 15 | as required | 20 mm | Non-reinforced & Reinforced | Passed |
| Static Load | 16 | 500 by 500 mm; 300 by 300 mm | 30 mm | Non-reinforced & Reinforced | Passed |
| Impact | 17 | 500 by 500 mm | 20 mm | Non - reinforced | Passed |

| | | | | | |
|---|---|---|---|---|---|
| Erosion | 18 | as required | 20 mm | Non-reinforced | Passed |
| Pressure | 19 | 500 by 500 mm; 300 by 300 mm | 30 mm | Non-reinforced | |
| Collapse | 20 | 500 by 500 mm; 300 by 300 mm | 20 mm | Non-reinforced | |
| | | | | | |
| | | | | | |

The following identification tests were also conducted:

Cone Calorimeter – Foam Core
Qualitative Infrared Analysis - Foam Core
Thermogravimetric Analysis - Foam Core

The materials used in this investigation were produced under the observation of a representative of UL LLC, in a ready-to-use form. The composition of the finished materials is of a proprietary nature. Data on the composition is on file at the Laboratories for use in the Follow-Up Service Program.

Test Record Summary:

The results of this investigation, including construction review and testing, indicate that the product evaluated complies with the applicable requirements in the Eleventh Edition of UL 181, Factory Made Air Ducts and Air Connectors, dated July 25, 2013 and therefore, such product is judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Erosion Test Method

Air is to be passed through the sample at test velocity with the collecting screen removed for a period of at least 1 hour and not more than 24 hours. **The collection screen then is to be placed in position.**

The test then is to proceed at test velocity and continued for a period of 4 hours. The collecting screen is to be examined for macroscopic particles at the end of each hour during the test period by taping the screen with the adhesive side of transparent tape, or tapes, in order to remove and record any eroded particles.

Manufacturer's Rated Velocity _20 m/sec = **3937** _ ft/min
Two and one-half times Rated Velocity _____ **9843** _____ ft/min
Test Velocity ____**9843**_____ ft/min (not < 2500 FPM)

RESULTS

Material for air ducts and air connectors did / did not break away, crack, peel, flake off, or show evidence of delamination or continued erosion when air is passed through typical sections at a velocity of two and one-half times the manufacturer's rated velocity, and not less than 2500 feet per minute (762 m/min). For the purpose of this requirement, continued erosion is identified to be either a constant or increasing rate of erosion.

Examinations at One-Hour Intervals

2nd Hour - ___0_____ Pieces of fiber collected
3rd Hour - ___0_____ Pieces of fiber collected
4th Hour - ___0_____ Pieces of fiber collected
5th Hour - ___0_____ Pieces of fiber collected

Observations

| | | |
|---|---|---|
| Breakage | _X__ No | ____ Yes |
| Cracking | _X__ No | ____ Yes |
| Peeling | _X__ No | ____ Yes |
| Flaking | _X__ No | ____ Yes |
| Evidence of Delamination | _X__ No | ____ Yes |

**X[**Pass**]** **[**Fail**]**

Project No. 13CA55647 File MH49717

Tested by: Craig Ebbeskotte Craig Ebbeskotte Date 4/22/2014
Printed Name Signature

TEST RECORD NO. 2

SAMPLES

At the request of the submitter, a pigment (0.9 Wt.% of overall formulation) was added to the foam core to change the color from pink to grey in Vol. 1, Sec.1 of File MH49717.

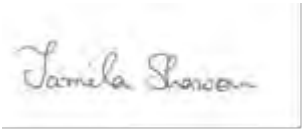
RESULT

Addition of a pigment of such a small Wt. % would not affect the test performance of the air duct in accordance with UL 181 Standard. Therefore, no testing was deemed necessary.

TEST RECORD No. 2 SUMMARY

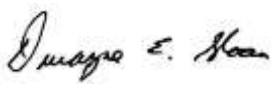
The results of this investigation, including construction review and testing, indicate that the product evaluated complies with the applicable requirements in the Eleventh Edition of UL 181, Factory Made Air Ducts and Air Connectors dated July 25, 2013 and therefore, such product is judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Very truly yours,



Jamila Shawon (Ext. 42607)
Senior Project Engineer
Fire Protection Division

Reviewed by,



Dwayne Sloan
Principal Engineer Manager

Any information and documentation provided to you involving UL Mark services are provided on behalf of UL LLC. (UL) or any authorized licensee of UL.

CONCLUSION:

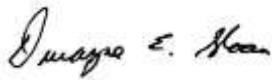
Samples of the product covered by this Report have been found to comply with the requirements covering the category and the product is found to comply with UL's applicable requirements. The description and test result in this Report are only applicable to the samples investigated by UL and does not signify UL certification or that the product described are covered under UL's Follow-Up Service Program. When covered under UL's Follow-Up Service Program, the manufacturer is authorized to use the UL Listing Mark on such products which comply with UL's Follow-Up Service Procedure and any other applicable requirements of UL LLC. The Listing Mark of UL LLC on the product, or the UL symbol on the product and the Listing Mark on the smallest unit container in which the product is packaged, is the only method to identify products investigated by UL to published requirements and manufactured under UL's Listing and Follow-Up Service.

This Report is intended solely for the use of UL LLC (UL) and the Applicant for establishment of UL certification coverage of the described product under UL's Follow-Up Service. UL retains all rights, title and interest (including exclusive ownership) in this Report and all copyright therein. The Applicant or its designated agent shall not disclose or otherwise distribute this Report or its contents to any third party, except as required for purposes of compliance with laws, regulations, or other existing agreements or schemes in which UL is currently a participant. Any other use of this Report including, without limitation, evaluation or certification by a party other than UL is prohibited and renders this Report null and void. UL shall not incur any obligation or liability for any loss, expense, or punitive damages, arising out of, or in connection with, the use or reliance upon the contents of this Report to anyone other than the Applicant as provided in the agreement between UL and Applicant. Any use or reference to UL's name or certification mark(s) by anyone other than the Applicant in accordance with the agreement is prohibited without the express written approval of UL. Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. UL shall not otherwise be responsible to anyone for the use of or reliance upon the contents of this Report.

Report by:

Jamila Shawon
Senior Project Engineer
Building Materials & Life Safety Technology

Reviewed by:



Dwayne Sloan
Principal Engineer
Building Materials & Life Safety Technology