



Bucknalls Lane, Garston
 Watford, Herts WD25 9BA
 Telephone: [REDACTED]
 Facsimile: [REDACTED]
 website: www.bbacerts.co.uk

UK Member of EOTA (European Organisation for Technical Approvals)
 UK Member of the UEAtc (European Union of Agrément)

Assessment of Production

Draft Quality Plan

for

Various Kingspan Insulation Boards
 (See page 2 for Product and Certificate details)

Revision No	Reason for re-issue	Date
<p>This document contains BBA requested details and made by BBA Inspection Services (A. Edwards) following a Certificate Surveillance Inspection carried out on the 12-12-2012</p> <p>The amendments, which are shown in Yellow highlighted text, will require examination and formal endorsement by BBA S2 Section and the client.</p>		

Document reference	94 2992 AQP Pembridge
Date of issue	4 July 2012
BBA Section responsible	Energy and Ventilation
BBA Project Manager	Gayetree Ramkorun
Other products covered by BBA Certificates manufactured on this site:	N / A

List of BBA Certificates and Kingspan products for this location:

08/4522 - Kooltherm K3

94/3061 - Kooltherm K7 Sarking Board

94/3047 - Kooltherm K8 Cavity Board

09/4675 - Kooltherm K10

08/4615 - Kooltherm K12

08/4582 - Kooltherm K15

10/4798 - Kooltherm K17 & K18

07/4450 - Kingspan Thermafloor TF70

01/3813 - Kingspan Thermafloor TF73

94/2992 - Kingspan Thermawall TW50

97/3366 - Kingspan Purlboard Plasterboard Laminate/Kingspan Thermawall TW52

08/4590 - Kingspan Thermawall TW55

95/3126 - Kingspan Thermapitch TP10 (Pitched Roof Insulation)

97/3364 - Kingspan TherमारooF TR20

06/4384 - Kingspan TherमारooF TR21

12/4921 - Kingspan TherमारooF TR26 / TT46

06/4372 - Kingspan TherमारooF TR27 / TT47

For information only: (Products made for other Certificate holders)

Kingspan Thermawall TW53 - supplied to holders of BBA Certificate for external wall insulation systems

Kooltherm K5 EWB – supplied to holders of various BBA certificates for external wall insulation systems

Product name:

Line 4 (OMS)

Kingspan Thermafloor TF70

Kingspan Thermafloor TF73

Kingspan Thermawall TW50 (Wall Insulation)

Kingspan Purlboard Plasterboard/Kingspan Thermawall TW52 (TR27 foam blanks for TW52)

Kingspan Thermawall TW53 (External wall insulation systems)

Kingspan Thermawall TW55 (Wall Insulation)

Kingspan Thermapitch TP10 (Pitched Roof Insulation)

Kingspan TherमारooF TR20

Kingspan Thermaroof TR21
 Kingspan Thermaroof TR26 / TT46
 Kingspan Thermaroof TR27 / TT47

Bonding line

Kingspan Purlboard Plasterboard Laminate / Kingspan Thermawall TW52

Line 3 (Phenolic)

Kooltherm K3 Floorboard
 Kooltherm K5 EWB External Wall Insulation Systems
 Kooltherm K7 Sarking Boards
 Kooltherm K8 Partial Fill Cavity Wall Insulation Boards
 Kooltherm K10 Soffit Insulation
 Kooltherm K12 Framing Board Insulation
 Kooltherm K15 Rainscreen Insulation Board
 Kooltherm K17 Insulated Dry Lining Boards
 Kooltherm K18 Insulated Dry Lining Boards

Product range:

Products comprise a pale yellow rigid PIR core of density > 27.0 kgm⁻³ with plain edges and triply foil facings

PIR Line 4 (OMS)

Name	Certificate	Application	Facing	Length (mm)	Width (mm)	Thickness (mm)
TW50	94/2992	A partial fill cavity wall insulation board	Trilaminate foil	450 600	1200	15 to 150
TP10	95/3126	A sarking insulation board for pitched roofs.	Trilaminate foil	2400	1200	25 to 150
TW52	97/3366	TR27 foam blank for bonding to plasterboard – insulated dry lining	Coated Glass facing	2400	1200	25 to 150
Therमारooof TR27 LPC/FM	06/4372	Insulation for flat roofs	Coated glass facing	2400 600	1200	25 to 120
Therमारooof TT47 LPC/FM				1200		25 to 145
Therमारooof TR21	06/4384	Insulation for flat roofs	Glass Reinforced Facing	2400 600	1200	25 to 150
TF70	07/4450	Insulation for floors	Trilaminate foil	2400	1200	20 to 150
TW55	08/4590	A walling insulation board for use between timber studs or a san insulation sheathing on timber studs	Trilaminate foil	2400	1200	25 to 150
Therमारooof TR26 LPC/FM	12/4921	Insulation for flat roofs	Trilaminate foil	2400	1200	45 to 160
Therमारooof TT46 LPC/FM				1200		

Name	Certificate	Application	Facing	Length (mm)	Width (mm)	Thickness (mm)
Themarroof TR20	97/3364	Insulation for flat roofs	Bitumen coated tissue	1200	600	25 to 140

Bonding Line

Name	Certificate	Application	Components	Length (mm)	Width (mm)	Thickness (mm)
Thermawall TW52	97/3366	An insulating plasterboard laminate	TR27 polyurethane foam blank	2400	1200	25, 30, 35, 40, 45, 50
			TK80 polyurethane foam blank			15, 20
			Plasterboard, Type 1			9.5, 12.5
Thermafloor TF73	01/3813	A floor insulation	Extruded polystyrene >300 kPa compressive strength an 0.029 Wm ⁻¹ K ⁻¹ thermal conductivity	2400	600	25, 30, 40, 50, 60, 80
			Type P5 moisture resistant chipboard with tongue-and-grooved edges			18
Thermawall TW53 ⁽¹⁾	N/A	Tissue faced external wall insulation board	Appledorn glass tissue facing to both sides	1200	600	20-150

Line 3 (Phenolic)

Medium to high density phenolic foam core faced with tissue or foam

Name	Certificate	Application	Components	Length (mm)	Width (mm)	Thickness (mm)
K8	94/3047	A foil-faced phenolic foam core board for cavity wall insulation	International Converters composite foil facing on both sides >65mm Lamtec reinforced foil facing on both sides.	1200	450	20-140
K7	94/3061	A foil-faced phenolic foam core sarking board	International Converters composite foil facing on both sides >65mm Lamtec reinforced foil facing on both sides.	600	1200	20-140
				600	2400	(in 1 mm increments)
				1200	2400	
Kooltherm K3 Floorboard	08/4522	Glass-tissue faced floor insulation	Appledorn glass tissue facing to both sides	2400	1200	20-140
Kooltherm K15	08/4582	Foil faced rain screen cladding insulation	Lamtec reinforced foil facing to both sides.	1200	600	20-140
Kooltherm K12	08/4615	Foil faced timber/steel framing board	International Converters composite foil facing on both sides	2400	1200	20-140
Kooltherm K10	09/4675	Tissue / foil faced soffit insulation	Lamtec reinforced foil facing on one side and Appledorn glass-tissue to the other	2400	1200	25-140
K17	10/4798	A glass-tissue facer phenolic foam for plaster dab bonding	Blank is K9 bonded to 12.5mm plasterboard and to glass-tissue facing	2400	1200	20-140

K18	10/4798	An exposed foil facer for mechanically fixed plaster board	Blank is K9 bonded to 12.5mm plasterboard and to foil facing	2400	1200	20-140
Kooltherm K5 EWB ⁽¹⁾	n/a ⁽¹⁾	Tissue faced external wall insulation board	Appledorn glass tissue facing to both sides	1200	600	20-140

⁽¹⁾ supplied as component in various external wall insulation systems

Production location:

Produced by: Kingspan Insulation Limited

Address: Pembridge
Leominster
Herefordshire

Postcode: HR6 9LA

Telephone: [REDACTED]

Fax: [REDACTED]

Contact: Doug Lloyd

Title: Quality Assurance Manager

E-mail: doug.lloyd@insulation.kingspan.com

Gwyn Davies

Technical Manager

gwyn.davies@insulation.kingspan.com

Is the above production site covered by ISO 9001 : 2008 Registration? **YES**

If YES, Registration No: **388**

Assessed by (organisation): **The Loss Prevention Certification Board (LPCB)**

Scope of assessment: **Design and manufacture of insulated and fire rated flat and tapered rigid polyurethane, polyisocyanurate and phenolic thermal insulation boards. Design, manufacture and sales of pre-mitred tapered roof systems.**

Purchasing data & receiving inspection and testing:

All materials are purchased to agreed specifications. For each delivery of bulk chemicals, ie Polyol, MDI and blowing agent, a Certificate of Analysis is also provided. Other materials are visually checked and processed in accordance with Works Procedure No 4 latest version and similar Certificates are received on a random basis. If a delivery of any material does not appear to meet the specification set out in the Raw Material Database, then a concession is raised and authorised by the Production Manager.

Incoming product, raw materials and Components	Identification (type, class, grade, specification, etc)	Original supplier	Acceptance limits
Polyol	Terate 2541V	Invista	Spec No 263
	PS2412 PS 1812	Stepan	Spec No 256 Spec No 532
	Daltolac R585	Huntsman	Spec No 90
	T7541L	Invista	Spec No 433
MDI	Desmodur 44V70L	Bayer	Spec No 136
	M647	Dow Chemicals	Spec No 264
	Suprasec 2085 M70R	Huntsman BASF	Spec No 109 Spec No 175
Blowing Agents	Cyclo/iso IP85/15 Pentane	BOC Gases Haltermann	Spec No 291 Spec No 292
	V156	BOC Gases	Spec No 291
	Isopropyl-chloride	Sasol Solvents	Spec No 506
	Iso Pentane	BOC	Spec No 507
Surfactant	Tegostab B8871	Goldschmidt	Spec No 458
Catalyst	Toyocat - DT	Tosoh Corp	Spec No 108
	Polycat 5	Air Products	Spec No 108
	Polycat 8	Air Products	Spec No 10
	Catalyst LB	Huntsman	Spec No 14
	K-Zero 3000	Momentive	Spec No 523
Flame Retardant	TMCP (antiblaze) – V172	Albemarle	Spec No 277
Facing :	Hennecke/OMS products	Triply (TP10) Triply (TR26 / TT46)	International Converter Spec No 246 Spec No 255
	TR27 / TT47	Coated Glass Facing	Atlas Roofing Spec No 348

Incoming product, raw materials and Components		Identification (type, class, grade, specification, etc)	Original supplier	Acceptance limits
	TR20	Bitumen Glass facing V70	Silcart roofing company	Spec No 275
		Bitumenised felt glass facer	ESHA	Spec No 355
	TR21	Glass Reinforced Facing	Atlas Roofing	Spec No 260
Foam blanks ⁽¹⁾		TK80 ≤ 20 mm thick	Kingspan Insulation Ltd (Castleblayney)	As specification
		TR27 > 20 mm thick	In-house	
Plasterboard ⁽¹⁾		9.5mm Square edge 9.5mm Tapered edge 12.5mm Square edge 12.5mm Tapered edge	British Gypsum	Spec No 40 :of 1/7/96 Spec No 37: of 1/7/96 Spec No 35: of 1/7/96 Spec No 33: of 1/7/96
Adhesive (dry lining) ⁽¹⁾		A9368	Apollo Chemicals	Spec No 474
Hot melt glue		774	Henkel	Spec No 453
Phenolic resin ⁽¹⁾		J6014-L	Momentive	Spec No 386
Phenolic resin ⁽²⁾		R330UF-1	Momentive	Spec No 550
Extruded polystyrene ⁽¹⁾		700-4 Styrofoam H300	DOW	Spec 539
		Glascofoam IV	Poliglas SA	
Chipboard ⁽¹⁾		Kitemarked Type P5 -to BS 7916 : 1998, BS EN 312-1 : 1997 and BS EN 312-5 : 1997	Sonae 18mm TandG	Spec No 406
Adhesive (floor laminate) ⁽¹⁾		XP2337	CAS	Spec No 461
		A9368	Apollo Chemicals	Spec No 474
Acid ⁽³⁾		E398	Cromogena	Spec No 372
Acid ⁽³⁾		NAXCAT MOD-35	NEASE CORP	Spec No 524
Aluminium foil facing ⁽⁵⁾		Lamtec Reinforced Foil Facer	Lamtec	Spec No 466 Spec No 469
		ICC Foil / Kraft	International Converters	Spec No 465
Tissue facing ⁽⁵⁾		OCF Glass Veil	Owens Corning	Spec No 349

(1) The raw materials are checked before offloading as per Works Procedure QP 03.

(2) Phenolic resin is delivered and put into bulk tank. Each batch is accompanied by a Certificate of Analysis.

(3) Acid is delivered by bulk tanker and transferred into the acid bulk store. Each delivery the C of A is checked for conformance which is retained on file.

(4) Pentane is delivered in bulk. Deliveries are accompanied by a Certificate of Analysis that are checked for conformance, which is retained on file.

(5) RM codes for the facing materials are held on file and have the basic information in them about the various materials. The specifications for these and all materials are agreed with the suppliers. This is normally done by Head Office with the agreement of the technical and Plant Manager.

Details of incoming bulk raw materials are recorded on internal document on QAPF01 and SAP

Details of incoming facings are recorded in SAP

Product identification and traceability:

Every order that is placed is given an unique SAP Order Number. The Production Programmes for Line 3 and the Line 4 high speed laminator are generated in SAP, then formulated to incorporate all the necessary orders, quoting the respective Order Numbers.

Product identification and traceability: Line 4

The Order Number is itself used to identify the boards. The Raw Material Goods Issue Usage Transaction Sheet SAP Based MIGO Sheet and Works Order Report can be used to identify which consignment of chemicals was used to produce each board.

All blank boards are inkjet printed on one face with the date and time of manufacture. This allows traceability to the production records for that board through the Production Program held in SAP System. Ref. ZWL_PIR for PIR Boards and ZWL_PHL for Phenolic Boards.

Product identification and traceability: Bonding Line

All blank boards that are made in house are inkjet printed on the edge with product type, date and time of manufacture. This allows traceability to the production records for that board.

Product identification and traceability: Line3

A run number is issued to cover production. This is a cumulative number issued by the production department. Each pack is also marked with a relevant pallet number which indicates the time of production. A daily production diary also records the products manufactured under that number.

Method of production and process control:**PIR*****Polyol blend***

Bulk ingredients (ie pure polyols, MDI) are pumped from their respective storage tanks to the day tanks on the Line 4. These polyols are then metered to the dynamic mixer.

Line 4 high speed laminator

Additives are transferred to designated run tanks (RT) from which the required output is pumped directly into a dynamic mixer where the other additives and blowing agent Pentane and polyols are fed.

The resulting emulsion is fed to the high pressure pumps. The above operation is computer controlled by the OMS computer software.

The polyol blend is injected under high pressure with MDI at the correct output (defined by the SOP) and ratio in accordance with the line speed to produce the specified product.

Bonding Line

Plasterboard/chipboard is lifted with suction pads and placed onto the horizontal conveyor. From the loading station, the board is conveyed into a laydown area where the prescribed amount of single part moisture cured adhesive and hot melt adhesive is applied to the substrate. Insulation panels are manually placed onto the adhesive coated plasterboard/chipboard. These composite boards pass through a mechanical press, at a defined line speed. The boards then enter the pick and place area where they are automatically placed onto a pallet according to the packing sheet.

Line 3

Board Production: Before use, phenolic resin is taken from the bulk tank and pumped into the resin day tank. The acid, blowing agent and resin are pumped at a pre-set rate to the mixing head. When a stable flow is achieved the machine goes from recirculation to dispense and foam exits the dispense nozzles onto the base substrate. The top layer of substrate is also supplied from a roller at the rear of the lay down. This layer is applied to form the top of the substrate. The whole of the 'wet end' is controlled by a fully automated system

The board then passes into a fixed gap conveyor contained within an oven between 50 and 75°C (depending on thickness). The partially cured board then passes through a second oven to complete curing.

After packing/wrapping, the stacked boards are placed in temperature controlled curing chambers and left to condition for a minimum period of 48 hours a representative sample is placed with each produced product.

Process Control:

4 PIR high speed laminators

Line 4 laminator is fully computerised control device which governs speed, output, and formulation (as laid out in the SOP).

The chemicals are injected using high pressure dosing machine. The chemical is laid down using three heads, each having a number of individual streams. The chemicals react and rise with the top facer being introduced on entrance to the conveyor. It is the height of the gap in the conveyor that determines thickness of the resulting board. The additives can be changed on the run by manual control. The continuous board moves at high speed to the trim saws and then the cross cut saws, the boards are then printed with the ink-jet printer. The boards are then stacked and sent down to the band saw to be cut to the desired length. Each production run has a specific works order number. This number is used on all paperwork for full traceability. The machine operators are given a standard operating procedure to run the machine. The machine operators set the machine conditions and chemical outputs using this information.

A computer record complete with (SAP Based Production Program viewed in QA 33) is given and every 30 minutes checks are carried out to determine dimensions and density. Values are recorded on the computerised record.

The OMS software will highlight if control inverters are >1% from and will fault out if >2% the norm on input. A computer print-out of polyol blend (material yield) and line conditions can be raised.

Respective blend recipe (SAP controlled document) is made available for reference. Prescribed ingredient proportions are controlled by weight, and are entered into the Line 4 computers by the Laydown Operative.

Line 3

The production line is set-up in accordance the Line 3 Machine SOP latest issue (SAP controlled) and the relevant Work Instructions detail the initial process settings for the production line which are used as standards for all products. These settings are only varied to optimise production and any changes made are recorded on the process control sheet. Process data is recorded in SAP and the Line 3 Process Sheet (used as a reference by production operatives) for each product and thickness.

Production line controls:

Bonding Line

The process is fully described in Works Procedure QP04 Latest Issue.

Line 3

Board Cutting: The boards ex cure tunnel are cut to the required dimensions by a two-stage operation:

- (1) Side trimming: by use of a hogging cutter in conjunction with a scoring blade. The unit is adjusted manually to achieve the correct width.
- (2) Cut to length: by use of a traversing cross cut saw which moves in relation to the board. control of the unit is via a digital meter which the operator sets to the required length

In-process inspection and testing:

As per QMS Procedure QP04.

Results are recorded on form - SAP based PI Sheet viewed through SAP QA33 format.

Property measured	Method used	Frequency	Acceptance limits	Action upon rejection
Density	Line side weigh scale	Every 30 minutes	35-44 kgm ⁻² (Line 3) 27-33 kgm ⁻² (Lines 2 and 4)	Inform Team Leader
Width	Steel Tape		As detailed in relevant SAP based PI Sheet within each Master Recipe /QC11 form	
Length				
Squareness				
Thickness	Vernier			
Visual Quality	Visual inspection	100% but recorded every 30 minutes.		
Compression	Instron	Hourly		

Machine cut length and width slightly bigger than required to allow for shrinkage during curing.

Laminated Board Inspection and Testing online.

All boards are cut by an automatic saw and are simply monitored. The thickness adjusted by a mixture of the flow rates and the line speed. The rise height is partially limited by the height of the top belt of the line. Checks on the end of the line are instantaneous. The cut boards are measured with a vernier calliper and, if results are outside of the warning limits, wet end operators are informed immediately. When necessary, process notes are recorded on the back of the production paperwork.

Bonding Line

Property measured	Method used	Frequency	Acceptance limits	Action on rejection
Adhesive coating Weight	Line side weigh scale	At start up and hourly	50-60gsm (nominal for TW52) 60-80gsm (nominal for TF73)	Inform Team Leader
Width	Steel tape	Every 30 minutes	600 ± 3 mm 1200 ± 3mm	
Length			2400 ± 5mm	

Alignment	Visual inspection	Continuous	Visual	
Interlaminare Strength	Tensile test	1 per shift	No set pass/fail criteria.	

Acceptance limits are also specified in forms QC11 and SAP based In Line Inspection & QC Lab based Quality Plans.

Final inspection and testing:

Line 4

The methods of test are described in Works QMS Procedure QP06. Test results are entered onto the computer database. Samples from each blend are taken and tested usually off line for the following tests.

Property measured	Method used	Frequency (minimum)	Acceptance limits	Action upon out of spec
Compressive Strength	Hounsfield compressive machine		>140kPa (TP10, TW50, TW55, TF70) >150kPa (all others PIR products)	
Dimensional Stability	Humidity chamber		< 1.5% for 24 hr @ 70 °C 95% RH	
	Freezer		Visually acceptable	
Thermal Conductivity $Wm^{-1}K^{-1}$ @ 10°C mean temp (before ageing) Calculated $\lambda_{90/90}$ * (EN 13165 and EN 13166) @ 10°C mean temperature *: (90/90 calculation needs to be checked every three months)	FOX 314	1 IN 4 - Per Thickness Range or Facing Type	Initial k-value TF70, TW50, TW55, TP10, TR26 & TT46: < 0.0210, with monthly mean value less than 0.0190 W/mK. TW53, TR21, TR27 & TT47: <0.0218 W/mK Declared k-value TF70, TW50, TW55, TP10, TR26 & TT46: $\lambda_{90/90}$ < 0.022 TW53, TR21, TR27 & TT47: For t < 80 mm: $\lambda_{90/90}$ < 0.026 For 80 mm ≤ t < 120 mm: $\lambda_{90/90}$ < 0.025 For t ≥ 120 mm: $\lambda_{90/90}$ < 0.024	Either reject or concess
Water Submersion test ⁽¹⁾	Water bath	Once per run	No delamination of foil based boards	Reject

(1) All foil faced products
 ** as per existing Certificates.

Further tests are carried out on an infrequent basis such as freezer stability, bitumen stability.

Line 3

Property measured	Works procedure	Frequency (minimum)	Acceptance limits	Action upon rejection
Thermal conductivity taken from the production line	SAP Based	One per production run	K3, K5 EWB, K7, K8, K10, K12, K15, K17 & K18 (i.e. K9 blank). Max 0.0195 Wm ⁻¹ K ⁻¹ (before ageing) Declared k-value t < 25mm: λ _{90/90} < 0.023 25 ≥ t < 45 mm: λ _{90/90} < 0.021 T ≥ 45 mm : λ _{90/90} < 0.020	Board rejected
Compressive strength			K3 & K5 EWB ≥120 kPa K7 ≥125 kPa K8, K9, K10, K12, & K15 ≥100 kPa	
Density			None (result recorded)	Board downgraded

For example:

For the determination of compressive strength of K7, the following arrangements currently apply:

Samples are taken directly from the production line at a frequency of 1 per batch of material made (or works order).

Calibration:

Calibration procedures are described in QMS Procedure QP08 Calibration of Equipment.

Packaging:

Boards are automatically stacked and polyethylene shrink-wrapped. Each pack bears a label showing relevant information regarding product description and traceability; including works order number, and bearing the appropriate BBA identification mark (where applicable). Phenolic boards packed with corner protectors.

Bonding Line

Number of laminates per stack is in accordance with Works Procedure No 9 Latest Issue. Each palletised stack employs cardboard corner protectors, polythene shrink wrapping and a label which bears manufacturers name, dimensions and date of manufacture.

Line 3

SAP based PI Sheet within each Master Recipe

Labelling:

Packs are labelled with a product identification label showing the following information:

- Thickness of product
- Product name
- Board dimensions
- No of boards per pack
- Batch No
- Production date ⁽¹⁾

⁽¹⁾ Lamination date where applicable

Use of the BBA symbol:

On marketing literature and labels.

Training:

Training procedures are described in IMS 07 Competancy Training Procedures.

Complaints:

Complaints procedures are described in QMS Procedure QP09 Customer Complaints.

Quality policy: We undertake to have the product produced and placed on the market as described above. We will advise the BBA of any changes and receive agreement from the BBA before the changes are implemented.

Signed

Dated

Title

End of Quality Plan

For BBA internal use only	
BBA Cert(s):	08/4522, 94/3061 94/3047, 09/4675 08/4615, 08/4582 10/4798, 07/4450 01/3813, 94/2992 97/3366, 08/4590 95/3126, 97/3364 06/4384, 12/4921 06/4372
Approved by:	Date: