



ETA-Danmark A/S
Kollegievej 6
DK-2920 Charlottenlund
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

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MEMBER OF EOTA



European Technical Assessment ETA-13/1077 of 2014-01-29

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

REDAir/REDAir FLEX ventilated facade system

Product family to which the above construction product belongs:

EC PAC 9: Kits for external wall cladding (ventilated façade system using a wood sub-construction)

Manufacturer:

Rockwool International A/S
Hovedgaden 584
DK-2640 Hedehusene
Tel. +45 46 56 03 00
Fax +45 46 56 22 11
Internet www.rockwool.com

Manufacturing plant:

Rockwool International A/S
Hovedgaden 584
DK-2640 Hedehusene

This European Technical Assessment contains:

18 pages including 9 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:

Guideline for European Technical Approval (ETAG) No. 034: Kits for external wall claddings. Part 2: Cladding kits comprising cladding components, associated fixings, sub-frame and possible insulation layer, edition April 2012, used as European Assessment Document (EAD).

This version replaces:

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Technical description of the product

“REDAir FLEX” is a kit for a ventilated façade construction for application on new and existing (refurbishment) external walls. The system is designed to reduce thermal bridges across the external insulation layer. REDAir insulation BATT has mechanical properties which enable it to carry the weight of cladding & sub-construction without need of mounting brackets which typically act as thermal bridges.

REDAir FLEX is comprised of the following components (see Appendix1):

- Batts: Rockwool Group manufactured stone wool insulation in various format sizes
- LVL: Laminated Veneer Lumber boards that act as a sub-construction to hold insulation to the wall, and to carry the chosen cladding material
- Anchor Screws: screws that fasten the LVL to the supporting wall
- Friction plates: plates with “teeth” that mount to the LVL board to prevent slip between insulation and LVL
- Friction plate screws
- Cladding as per design intent. The applicable cladding elements and their fixings are indicated in appendix 3 of this ETA.

This kit is classified as family A, according to the ETA Guideline no. 034: Kits for external wall claddings. Part 1: Ventilated cladding kits comprising cladding components and associated fixings and Part 2: Cladding kits comprising cladding components, associated fixings, subframe and possible insulation layer, edition April 2012 and comprises the components specified in Appendix 1, which are factory produced by the ETA holder or a supplier.

2 Specification of the intended use in accordance with the applicable EAD

REDAir FLEX is intended for use on both new and existing (refurbishment) external walls in particular where thermal renovation or low energy requirements are valued. The system has been designed to accommodate a variety of claddings (weights) and anchorage to a variety of substrate walls for up to 30 meters in building height.

REDAir FLEX is a non-load-bearing system. It does not contribute to the stability of the wall on which it is installed, neither to ensure the air tightness of the building structure. It can contribute to the thermal performance of the building and provide enhanced protection from the effect of weathering.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the post bases of 25 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

The identification tests and the assessment for the intended use of this kit for ventilated external wall claddings according to the Essential Requirements were carried out in compliance with the ETAG 034. The characteristics of the components shall correspond to the respective values laid down in the technical documentation of this ETA, checked by ETA Danmark.

3.1 Mechanical resistance and stability (BR1)

Requirements with respect to the mechanical resistance and stability of non-load bearing parts of the works are not included in this Essential Requirement but are treated under the Essential Requirement: Safety in use (See section 3.4)

3.2 Safety in case of fire (BR2)

3.2.1 Reaction to fire

The components have the following classifications:

Component	Classification	Reference Standard
Stone wool	A1	Euro class 13501-1: 2007 + A1:2010
LVL	D-s2, d0	Acc. to CWFT decision
Screws & friction plate	A1	EN 1350-1 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
Cladding (ROCKPANEL)		see table of claddings (Appendix 3)*

* The reaction to fire classification and field of application appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3.

3.2.2 Reaction to fire on back side

Cladding which is homogeneous or symmetric in construction layers should have same reaction at rear of cladding (in ventilated cavity) as section 3.2.1 whereby no performance is required. Other claddings either

have no performance determined (NPD) or are listed in (Appendix 3).

3.3 Hygiene, health and the environment (BR3)

3.3.1 Watertightness of joints

Openings between cladding panels “joints” may allow some percentage of driven rainwater to penetrate the rain screen where droplets may collect on the insulation layer or flow down the surface. Installation of batts without gaps between joints will improve the water tightness of joints between batts. According to standard EN 12865:2001, Hygrothermal Performance of Building Elements, Resistance of Exterior Walls to Driving Rain under Pulsating Pressure, Procedure A up to 300 Pa, the maximum pressure reached before leakage was 150 Pa at 65 minutes. This result was achieved for a sample without a cladding element. The water absorption of the insulation according to EN 1609 for short exposure period is $WS \leq 1\text{kg/m}^2$.

3.3.2 Water permeability and Water vapour permeability

These performances are not relevant for external wall cladding kits with ventilated air space.

REDAir insulation BATT has a diffusion rate of 0.14 $\text{kg/m}^2\cdot\text{s}\cdot\text{GPa}$ and has no capillary suction effect 0.0 $\text{kg/m}^2\cdot\text{s}\cdot\text{GPa}$.

3.3.3 Drainability

On the basis of the standard construction details (see Appendix 9) and the installation criteria of this kit and the technical knowledge and experience, it may be said the water which penetrates into the air space or the condensation water can be drained out from the cladding without accumulation or moisture damage into the substrate.

3.3.4 Release of dangerous substances

Rockwool mineral wool does not contain substances of very high concern that are listed by the European Chemicals Agency. Rockwool mineral wool carries the EUCEB label. For complete details of REDAir FLEX environmental impact, see the Life Cycle Assessment based on EN 15804.

The LVL boards are impregnated with flame retardant. Additionally the LVL boards are treated with two biocides. Both biocides are approved in accordance with Directive 98/8/EC (The Biocidal Products Directive) and Regulation (EU) No 528/2012 (The Biocidal Products Regulation). This is covered by the Declaration of Performance from the LVL supplier.

3.4 Safety in use (BR4)

3.4.1 Wind load resistance

Wind load resistance has been determined taking into account the mechanical resistance of components (see section 3.4.2) and the wind suction test.

The test set-up was designed to simulate “worst case scenario” by maximizing suction forces acting on the construction under the following conditions:

- No open joints in the cladding to transfer maximum force to construction
- Supporting wall material (OSB) was chosen with low coefficient of friction ($c_f = 0.77$). (see implications under section 3.4.2.2. and Appendix 4)
- Anchor screw centers at maximum specified distance of 750 mm
- The test sample was 1.4x1.6m (2,24 m²) maximized to the size of the vacuum chamber.

After successive load steps to maximum load of 3000 Pa, the corresponding displacement under maximum load was 2.5mm.

3.4.2 Mechanical Resistance

3.4.2.1 Pull-through resistance of cladding element

Refer to table of cladding materials (Appendix 3).

The type of fixings and related provisions appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3.

3.4.2.2 Pull-through resistance under shear load

Refer to table of cladding materials (Appendix 3).

The type of fixings and related provisions appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3.

Shear load also is acting at interfaces; between the supporting wall and stone wool, between layers of stone wool, and between the LVL and stone wool. Pressure (screw force), counter pressure (e-modulus of stone wool) and friction are required to prevent slip due to shear forces at the interfaces.

Coefficients of friction between interfaces (including various supporting wall materials) are given in Appendix 4. The worst case design scenario is hard

smooth surfaces like OSB or cast concrete elements. These conditions have therefore been simulated in the testing under section 3.4.2.3

Pull-through under tension load of the anchor screw through the LVL can be calculated based on material properties of the LVL.

Pull-through strength under tension load of the anchor at the wall depends on the wall material & condition. Appendix 6 includes a table of characteristic pull-out values. These values are based on sample references for indicative purposes. The actual pull-out values of a specific wall application should be verified with pull-out test.

3.4.2.3 Load bearing capacity of the brackets

The bracket design of Annex E was modelled as follows (see Appendix 7):

- 2 anchor bolts were included at maximum design centers of 750mm vertical displacement.
- The LVL board total length was 750mm plus cantilever of 325mm at each end
- 1 LVL is specified every 600mm in horizontal displacement.
- Overall test sample therefore was 1500mm height x 600mm wide (exception to precast concrete with 428mm centers: overall test sample was 856mm x 600mm)

See table next page.

	Anchor centers	1 mm deflection			3 mm deflection			5 mm deflection		
		F _{m,u}	F _{c,u}	char. weight /m ²	F _{m,u}	F _{c,u}	char. weight /m ²	F _{m,u}	F _{c,u}	char. weight /m ²
Light Conc.	750mm	0.29kN	0.21kN	24	0.61kN	0.45kN	51	0.78kN	0.55kN	62
Pre-cast Concrete	750mm	0.29kN	0.22kN	25	0.59kN	0.38kN	43	0.68kN	0.41kN	46
	428mm	0.24kN	0.17kN	34	0.50kN	0.35kN	69	0.60kN	0.39kN	77
Brick	750mm	0.33kN	0.26kN	29	0.76kN	0.58kN	66	1.04kN	0.74kN	84
OSB	750mm	0.44kN	0.37kN	42	0.91kN	0.56kN	63	1.09kN	0.57kN	65

ROCKWOOL will permit a design limit tolerance of 3 mm vertical deflection. At this limit, most supporting wall surfaces will accommodate cladding up to 50kg/m² at 750mm screw centers. Smooth pre-cast concrete will support 40Kg/ m² at 750mm screw centers, and 50kg/m² at 428mm b/w screw centers

3.4.3 Resistance to horizontal point loads

This performance has not been determined (NPD).

3.4.4 Impact resistance

Refer to table of cladding materials Appendix 3.

The impact resistance for the individual cladding elements and related provisions appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3

3.4.5 Resistance to seismic actions

This performance has not been determined (NPD).

3.4.6 Hygrothermal behaviour

Refer to table of cladding materials Appendix 3.

The impact resistance for the individual cladding elements and related provisions appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3

3.5 Protection against noise (BR5)

This performance has not been determined (NPD).

3.6 Energy economy and heat retention (BR6)

Thermal conductivity of REDAir insulation BATT according to EN 13162: $\lambda_D = 33 \text{ mW/mK}$

Heat resistance of REDAir insulation BATT according to EN 12667:

mm	100	150	200	250
m ² K/W	3,03	4,55	6,06	7,58

Further calculation of U-values based on system construction found in Appendix 8.

3.7 Sustainable use of natural resources (BR7)

This performance has not been determined (NPD).

3.8 Aspects of durability and serviceability

Aspects of durability & serviceability relate primarily to cladding performances. Refer to table of cladding materials (Appendix 3) for section 3.8. See Appendix 2 for material properties and corrosion protection of the kit components other than cladding.

The aspects of durability and serviceability for the individual cladding elements and related provisions appear from the relevant ETA from appendix 3. Hence, this ETA should always be read in conjunction with the applicable ETA from appendix 3

3.9 General aspects related to the fitness for use of the product

The actual construction design & material specification must be based on project specific parameters. ROCKWOOL offers a country specific online calculator (<http://redair.rockwool.com>) for specification guidance purposes (in countries where REDAir FLEX is available for sale) which is based on the values provided in the ETA. However, ROCKWOOL recognizes the combined effects of wind, weight, pull-out strength, surface friction, and national safety factors require additional safety factors to be used in some design cases. The online calculator

may recommend more conservative design specifications based on these input parameters.

Further design consideration should be given to following factors:

- The mechanical characteristic values of the kit components (panels, cladding fixings and subframe) in order to resist the actions applying on the specific work.
- National safety factor must be used.
- The substrate material to define the suitable anchorages.
- The possible movements of the substrate and the position of the building expansion joints.
- The possible dilation of the kit components and of the panels.
- The category of corrosivity of the atmosphere of the works.
- The standards construction details indicated in Appendix 9.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 2003/640/EC of the European Commission, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) applicable to “REDAir FLEX” kit for external wall claddings is System 1, considering the Class B-s2, d0 (with testing) for the reaction to fire of the kit.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

5.1 Tasks of the manufacturer

5.1.1 Factory production control

The manufacturer has a factory production control system in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Assessment.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan¹. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials, such as sheet metal, shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. chemical composition, mechanical properties.

The manufactured components are checked visually and for dimensions.

The control plan, which is part of the technical documentation of this European Technical Assessment, includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control and has been agreed between the assessment holder and ETA-Danmark.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- Designation of the product, basic material and components;
- Type of control or testing;
- Date of manufacture of the product and date of testing of the product or basic material and components;
- Result of control and testing and, if appropriate, comparison with requirements;
- Signature of person responsible for factory production control.

The records shall be presented to ETA Danmark on request.

5.2. Tasks of notified bodies

5.2.2 Initial type testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary initial type testing has to be agreed between ETA-Danmark and the notified body.

5.2.2 Initial inspection of factory and of factory production control

The Notified body shall ascertain that, in accordance with the control plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the anchor according to the specifications mentioned in 2.1 as well as to the Annexes to the European Technical Assessment.

5.2.3 Continuous surveillance

The Notified body shall visit the factory at least once a year for regular inspection. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the control plan.

Continuous surveillance and assessment of factory production control have to be performed according to the control plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body or inspection body, respectively, to ETA-Danmark. In cases where the provisions of the European Technical Assessment and the control plan are no longer fulfilled the conformity certificate shall be withdrawn.

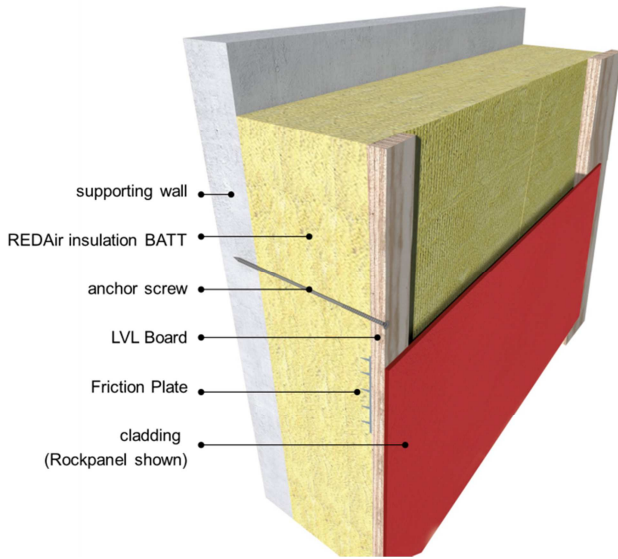
¹ The control plan has been deposited at ETA-Danmark and is only made available to the approved bodies involved in the AVCP procedure.

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A handwritten signature in blue ink, appearing to read 'Thomas Bruun', is positioned above the printed name.

Thomas Bruun
Managing Director, ETA-Danmark

Appendix 1



Component	Variations
Supporting wall	see appendix 2
REDAir insulation BATT	Single layer: 100/150/ 200/ 250mm Double layer: 150+150=300mm 200+150=350mm
anchor screw	Wood: W100, W150, W200, W250, W300, W350 mm Light Concrete: LC100, LC150, LC200, LC250 mm Concrete: C100, C150, C200, C250 C300, C350 mm
LVL board	27mm x 97mm x 3m
Friction Plate	84mm x 96mm x 1.5mm
Cladding	Up to 50kg/m ² (see Appendix 3)

REDAir FLEX is a ventilated façade system using a wood sub-construction. The design is based on minimizing thermal bridges across the insulation layer.

Insulation: ROCKWOOL REDAir BATTs are made from stonewool with A1 fire rating, Lambda 33 and 75-80 kg/m³ density. This combination provides a semi-rigid BATT which maintains dimensional stability under shear and compression forces.

Anchor Screws: Purpose is to compress the REDAir BATTs and hold LVL boards in position to withstand wind and dead weight forces. Center distances shall be determined to project constraints. Use ROCKWOOL online calculator for guidance <http://redair.rockwool.com> not to exceed limits of 3.4.2.3 Load bearing capacity of the brackets.

Ø7,5mm (concrete) or Ø8mm (wood & light concrete) are available in dimensions specific to the insulation thickness. Installation is perpendicular to surface. Concrete requires pre-drilling but no plastic anchor plugs are needed because the screw is self-tapping. Screws are double threaded to improve pull-out strength in LVL.

LVL board (laminated veneer lumber): layers of pine with alternating grain direction bonded with adhesive to assure dimensional stability and increased pull-out strength. 1 profile designed for adequate ventilation cavity and surface area to receive cladding. The boards shall be treated with solutions for fire resistance and mold resistance.

Friction Plate: steel plate with corrosion layer. Purpose is to increase friction and prevent slip between the LVL and stone wool.

Cladding: REDAir FLEX is suitable for a wide range of cladding materials. See Appendix 3 for ETA listings.

Appendix 2: Tables of material properties: stone wool

Insulation: REDAir BATT						
EN 13162		CE 1073-CPD-137				
Unique product code: MW-EN13162-T3-DS(TH)-WS-MU1				DOP-000501-01		
<u>Key Parameter</u>	<u>Description</u>					<u>Standard</u>
Heat conductivity	$\lambda_D = 33 \text{ mW/mK}$					EN 13162
Heat resistance	mm	100	150	200	250	EN 12667
	$\text{m}^2\text{K/W}$	3,03	4,55	6,06	7,58	
Fire classification	Euroclasse A1					EN 13501-1
Moisture	Diffusion rate = 0.14 $\text{kg/m}^2\text{s}^2\text{GPa}$					
	Capillary suction = 0 $\text{kg/m}^2\text{s}^2\text{GPa}$					
Water absorption	Short term, $WS \leq 1 \text{ kg/m}^2$					EN 1609

LVL: Ultralam R, Characteristic design values when forces acting as panel (not beam)		
EN 14374 CE 0672-CPD-I		
<u>Key Parameter</u>	<u>Notation</u>	<u>Values</u>
Bending strength	$f_{m,0,k}$	50.0 MPa
Tension strength	$f_{t,0,k}$	36.0 MPa
Compr. strength parallel to grain	$f_{c,0,k}$	40.0 MPa
Compr. strength perpendicular to grain	$f_{c,90,k}$	3.8 MPa
Shear strength	$f_{v,k}$	3.2 MPa
Modulus of elasticity	$E_{0,mean}$	14,000 MPa
Shear modulus	G_{mean}	500 MPa
Density	ρ	480 kg/m^3

Anchor screws		
<u>Application</u>	<u>Description</u>	<u>ETA reference</u>
Wood & Light Concrete	Carbon steel Ø7.5mm screw. Torx head, double threaded, variable length dimensions.	ETA-12/0132 2012-05-21
	The axial withdraw capacity for screws fastened in a wood based member with density $350 \text{ kg/m}^3 = 10.5\text{N/mm}^2$	ETA-12/0132 Annex A1.3.1
Concrete	Carbon steel Ø8 mm screw. Torx head, double threaded, variable length dimensions.	ETA 05/0010 2010-11-21

Friction Plate		
EN 14545 CE 0402-CPD-SC0950-09		
<u>Property</u>	<u>Description</u>	<u>Reference</u>
Material	Metal S350GD+Z275	EN10346:
Coating	Z275 Hot-dip zinc (service class 4)	EN 1995-1-1

Appendix 3

ETAG 34 wind suction testing was performed with ROCKPANEL Xtreme 8mm cladding board for the purpose of generating the worst case load scenario on the system. As a system, cladding materials listed in below table should result in equal or better performance:

Cladding Material	Manufacturer	Product	ETA #
ROCKPANEL (compressed stone fibers)	ROCKPANEL	Durable 6 mm finish Colours / Rockclad	ETA-08/0343
		Durable Colours 8 mm and ROCKPANEL Durable Anti Graffiti 8mm	ETA-07/0141
		Natural Durable 8 and 10 mm / ROCKPANEL Natural Xtreme 8 and 10 mm	ETA- 13/0648
		Xtreme 8 mm finish Colours/Rockclad and ROCKPANEL Xtreme 8 mm finish ProtectPlus	ETA-12/0054
		ROCKPANEL PLY 6 mm, 8 mm and 10 mm	ETA-13/0019
		Lines ² , 8 mm and 10 mm tongue and groove panels finish Colours/Rockclad	ETA-03/0204

Note. Some of the above mentioned ETA's covers fixing of the cladding elements to steel or aluminium substrates or cladding elements which are purely bonded to the substrate. Assessment of these substrates and of purely bonded cladding elements are not covered by this ETA

Appendix 4

Table of characteristic friction values: REDAir BATTs against various supporting wall materials.

Supporting wall material	μ characteristic
OSB (18mm DS/EN 300)	0.77
Lightweight Concrete (aerated blocks 3 MPa min)	1.06
Masonry (brick & mortar) 20MPa min	0.87
Concrete C20/25 (smooth surface of casting form)	0.69
Concrete C20/25 (rough surface by gravity leveling)	0.83

Appendix 5

Overview of Characteristic Design Values

Punching shear strength of screws, Characteristic design values, $F_{t,k}$		
Material	Limit(s) [-]	Char. design value, $F_{t,k}$ [kN]
Screws in LVL	STEICO Ultramlam R, $t \geq 27mm$	2.92

Rockwool insulation, moduls of elasticity E	
Lower limit	$E = 118kPa = 0,118MPa$
Upper limit	$E = 186kPa = 0,186MPa$

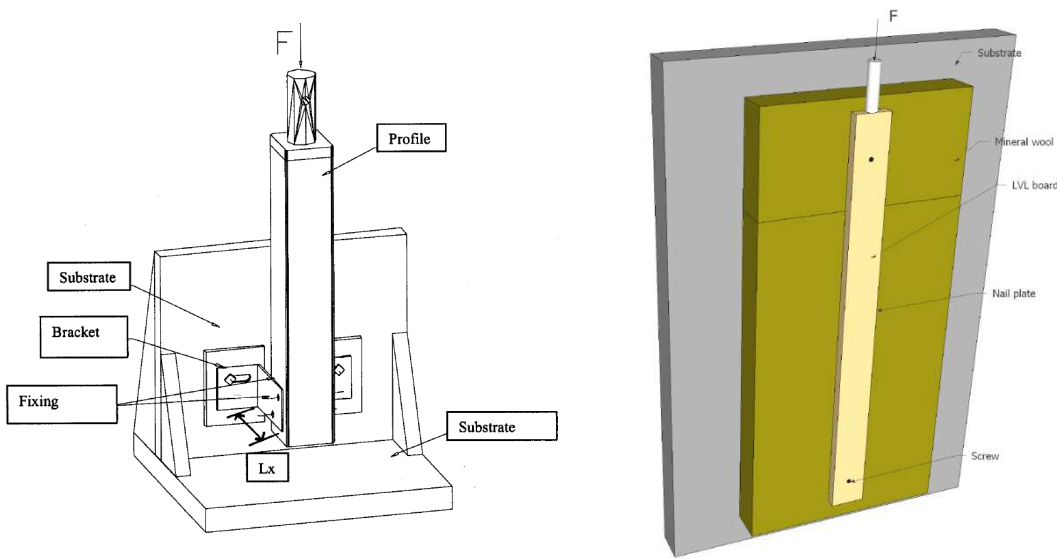
Appendix 6

Table of pull-out forces for various wall materials

Supporting wall pull out strength, Characteristic design values, $F_{t,k}$		
Material	Limit(s)[-]	Char. design value, $F_{t,k}$ [kN]
Plywood P30	$t \geq 15mm$	0,99
OSB/3	$t \geq 18mm$	1,12
Solid wood	$C18, t \geq 32mm$	2,50
LAC	$f_c \geq 3.0MPa$	1.92
AAC	$f_c \geq 4.5MPa$	1.67
Concrete, cracked	$f_c \geq 20MPa$	5.00
Concrete, uncracked	$f_c \geq 20MPa$	7.50

Appendix 7

Test set-up for mechanical resistance of wall bracket



The example of test device according to ETAG 034 Annex E (left), was replicated as near as possible with REDAir FLEX solution. The LVL board acted as the “profile”. The combination of friction late + insulation BATT + anchor screws act as the “bracket”. 2 anchor screws are required. The “worst case” scenario was defined with maximum allowable screw spacing of 750mm which created a test sample size of 1500mm x 600mm . Insulation was in 2 layers as per following table:

OSB		Light Concrete		Precast Concrete		Masonry	
Layer 1	Layer 2	Layer 1	Layer 2	Layer 1	Layer 2	Layer 1	Layer 2
100 mm	150 mm	100 mm	150 mm	150 mm	150 mm	150 mm	150mm



OSB test setup



Pre-cast concrete test setup

Appendix 8 Table of calculated U values for various construction types:

Table of thermal resistance (R) in m ² ·K/W anchor screw diameter 7,5 mm (concrete screw)						
c/c anchor screws (mm)	750	600	500	430	375	335
Insulation thickness (mm)						
350	9,48	9,23	9,00	8,78	8,57	8,37
300	8,13	7,91	7,72	7,52	7,34	7,17
250	6,77	6,59	6,43	6,27	6,12	5,98
200	5,42	5,28	5,14	5,02	4,89	4,78
150	4,06	3,96	3,86	3,76	3,67	3,59
100	2,71	2,64	2,57	2,51	2,45	2,39

Table of thermal resistance (R) in m ² ·K/W anchor screw diameter 8,0 mm (wood & light concrete screw)						
c/c anchor screws (mm)	750	600	500	430	375	335
Insulation thickness (mm)						
350	9,34	9,07	8,82	8,57	8,34	8,13
300	8,01	7,77	7,56	7,35	7,15	6,97
250	6,67	6,48	6,30	6,12	5,96	5,81
200	5,34	5,18	5,04	4,90	4,77	4,65
150	4,00	3,89	3,78	3,67	3,58	3,48
100	2,67	2,59	2,52	2,45	2,38	2,32

Assumptions:

- Calculation based on tabulated values
- Calculation boundaries are across the insulation inclusive thermal bridges (screws). LVL and cladding outside the ventilated cavity are not relevant.
- Heat resistance outside insulation layer is not taken into account. In case we do so the Uf value and the U values will be reduced and R value will be higher.

Materials:

- Insulation: DOP-000501-01; 0,033 W/mK
- Screws: carbon steel; 50 W/mK

Appendix 9

Complete drawing database (country specific) available at www.redair.rockwool.com

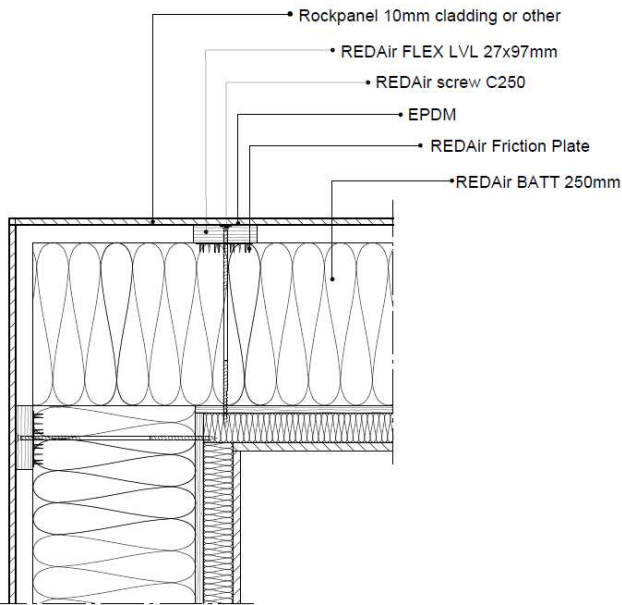


Figure 1) Top view corner installation

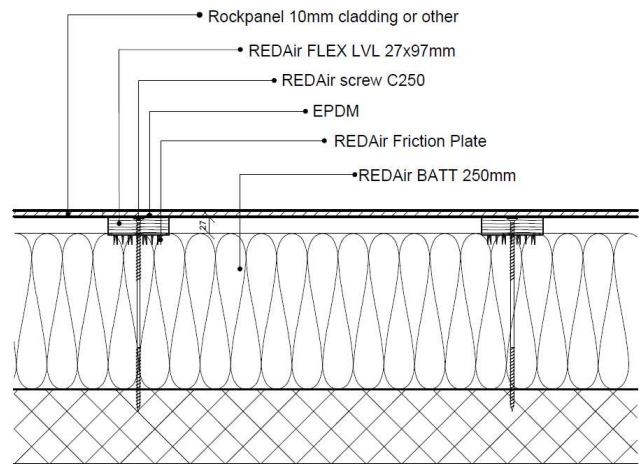


Figure 2) Top view installation

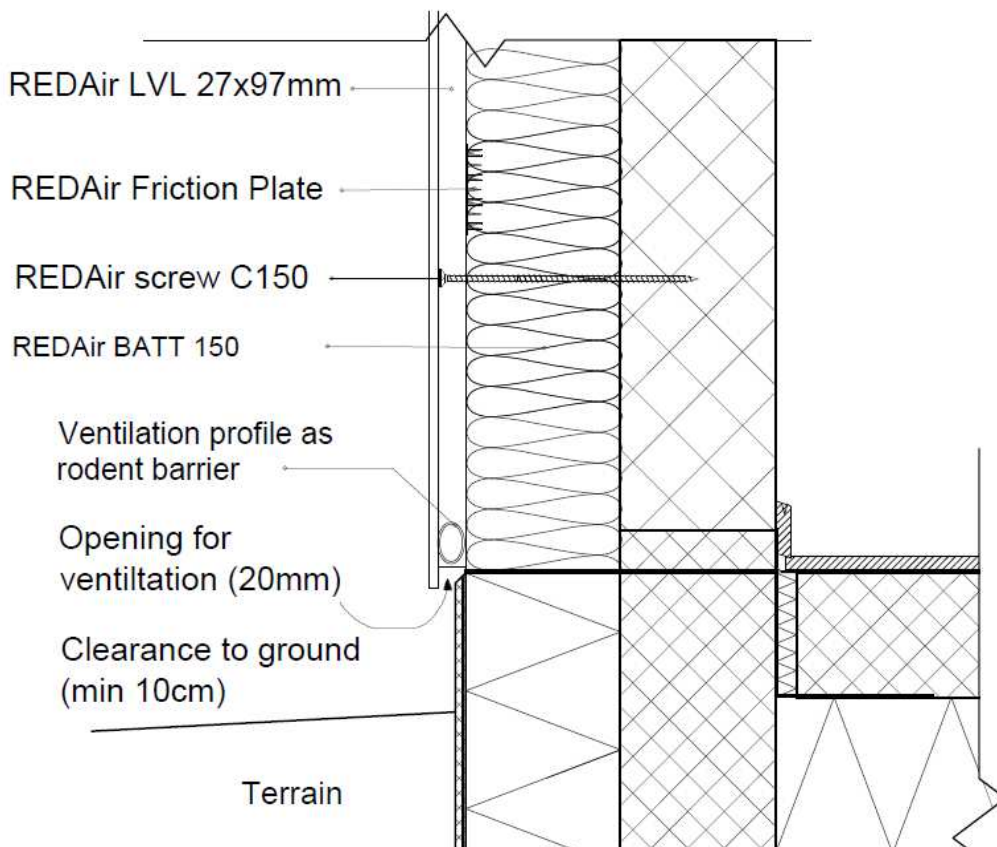


Figure 3) Side view - drainage