



Exterior Ceiling Systems

Knauf Exterior Wall with AQUAPANEL® Technology Inside

Be certain,
choose **AQUAPANEL®**

AQUAPANEL®

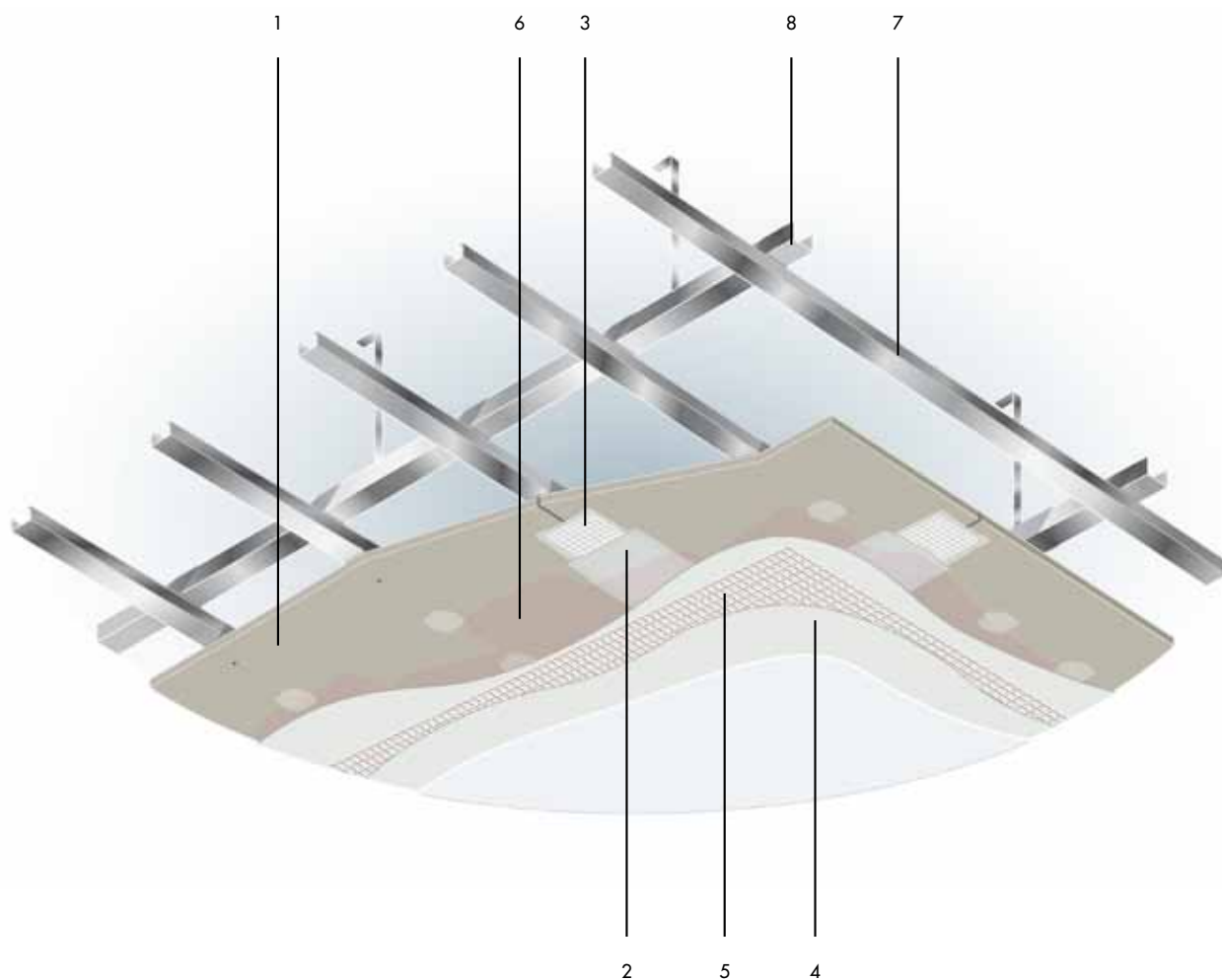
Physical properties

AQUAPANEL® Cement Board Outdoor

Material Properties	
according to ETA-07/0173	
Min. bending radius for 900/1250 mm wide board (m)	3
Min. bending radius for 300/1250 mm wide strip (m)	1
Dry bulk density (kg/m ³) acc. to EN 12467	approx. 1150
Bending strength (MPa) acc. to EN 12467	7
Shearing strength (N) acc. to EN 520	607
pH - value	12
Modulus of elasticity (N/mm ²)	approx. 4000 - 7000
Thermal conductivity (W/mK) acc. to EN ISO 10456	0.35
Thermal expansion (10 ⁻⁴ K)	7
Water vapour diffusion resistance μ (-) acc. to EN ISO 12572	66
Length variation 65% - 85% humidity (mm/m) acc. to EN 318	0.23
Thickness variation 65% - 85% humidity (mm/m) acc. to EN 318	0.2
Building material class acc. to EN 13501	A1, non-combustible

Exterior Ceilings

The system



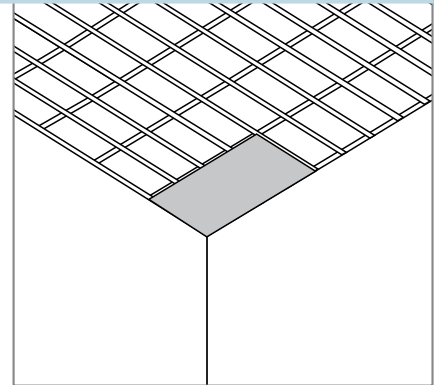
Key

- 1 AQUAPANEL® Cement Board Outdoor
- 2 AQUAPANEL® Joint Filler – grey
- 3 AQUAPANEL® Tape (10 cm)
- 4 AQUAPANEL® Joint Filler and Skim Coating – white
- 5 AQUAPANEL® Reinforcing Mesh
- 6 AQUAPANEL® Board Primer
- 7 Supporting profile
- 8 Base profile

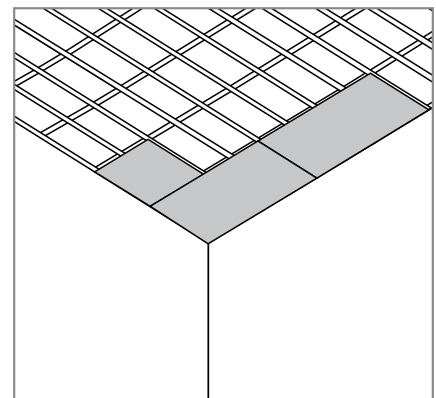
Exterior Ceilings

Installation

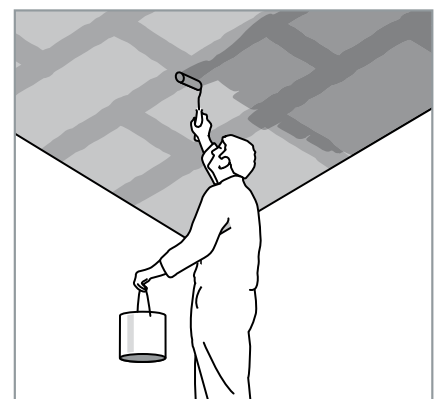
Align the first AQUAPANEL® Cement Board Outdoor panel carefully, perpendicular to the supporting profile. Screw the panel to the framework with AQUAPANEL® Maxi Screws using 25 pieces per m². The distance between the supporting profiles is a maximum of 312.5 mm (300 mm). As appropriate, use AQUAPANEL® Rustproofed Screws for attaching the boards to a timber framework.



Leave a gap between joints of at least 3-5 mm. Make sure all joints are staggered. Cross joints are not permitted. After installation, fill in all joints with AQUAPANEL® Joint Filler – grey and embed the AQUAPANEL® Tape (10 cm) into the filler. Fill all screw heads.



Prime the surface all over using AQUAPANEL® Board Primer (primer/water 1:2).



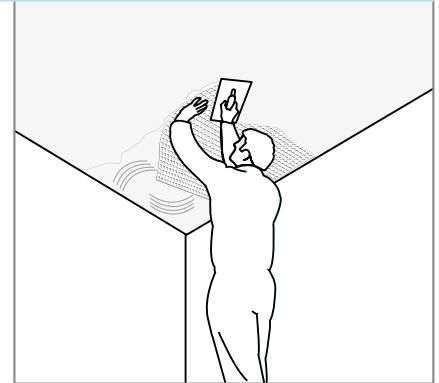
Apply AQUAPANEL® Joint Filler and Skim Coating – white over the entire area to coat the panels with a minimal thickness of 4 mm. Embed the AQUAPANEL® Reinforcing Mesh into the entire surface, pushing the mesh in to about a third of the depth of the AQUAPANEL® Joint Filler and Skim Coating – white.

Substructure:

The hangers of the ceiling construction must be stiffened and, where required in individual cases, they should be secured against buckling by sufficient design measures. The anchoring of hangers to the primary construction must be done using sufficient suitable ceiling pins according to the relevant base. Use ceiling pins approved by your local building authority for this purpose.

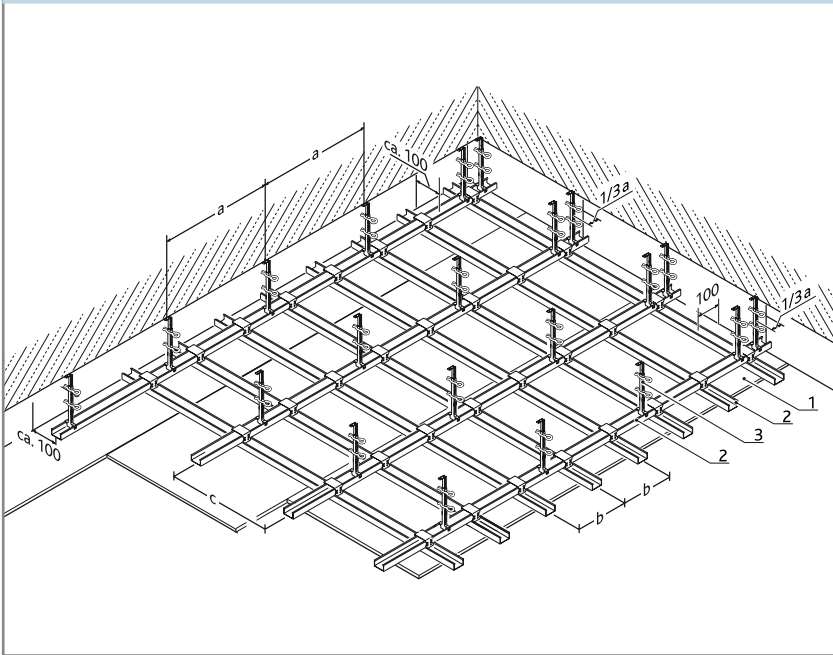
Expansion Joints:

We recommend that expansion joints are included in 15 m intervals. The result is a maximum jointless area of 15 m x 15 m. Special ceiling geometries, e.g. highly angled ceiling surfaces, may, in individual cases, require a narrower arrangement of expansion joints.



Exterior ceilings and soffits

Exterior ceilings – metal framework



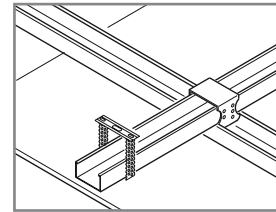
Suspension using Nonius hangers

Abbreviations

- a Spacing of the vernier gauge or direct ceiling hangers (mm)
- b Spacing (mm) of the supporting sections (C ceiling section 60/27/0.6)
- c Spacing (mm) of the base sections

Description of the material

- 1 AQUAPANEL® Cement Board Outdoor
- 2 C ceiling section
- 3 Nonius hanger with universal bracket or direct suspension hangers



Alternative suspension using direct hanger

Distance between suspension profiles and suspension points

Layer option	Ceiling Weight	Hangers	Distance (mm)
1) AQUAPANEL® Cement Board Outdoor (1 x 12.5 mm)	ca. 20 kg/m ²	0.4 kN	a: 750 b: 312.5 (300) c: 1000

Fire grading period during fire load from the underneath

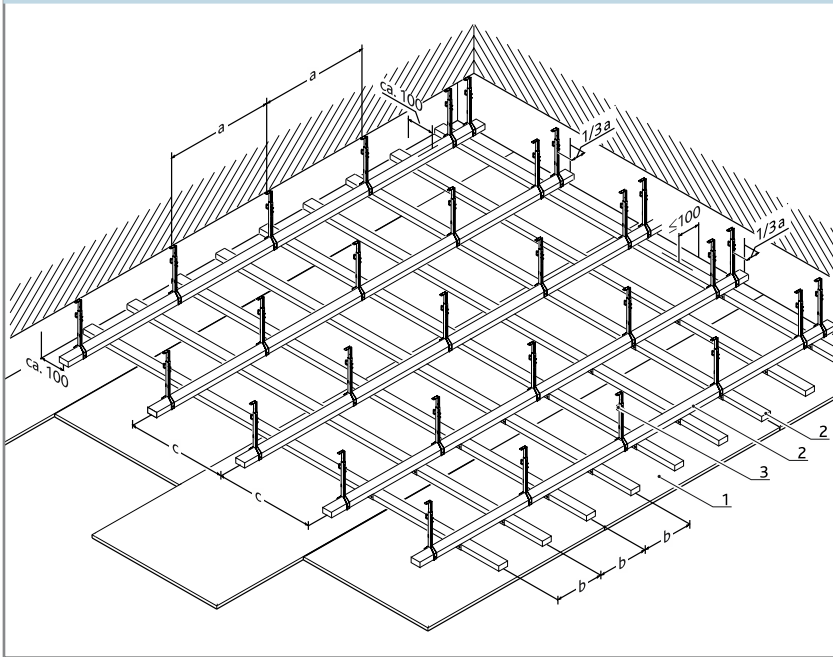
Layer option	Mineral wool (A1, Melting point >1000°C)		Fire resistance class	Test certificate
	Minimum thickness (mm)	Gross density (kg/m ³)		
1) 1 x 12.5 mm AQUAPANEL® Cement Board Outdoor + 1 x 12.5 mm fire-rated gypsum board - impregnated	–	–	F 30 - A	3461/7923-Mer
2) 2 x 12.5 mm AQUAPANEL® Cement Board Outdoor	2 x 40	50	Ei30	c. Pr-02-02.092

■ Note: For joint treatment/finishing/plastering, please follow the recommendations and regulations for ceiling systems given on pages 4 and 5.

Special Notes

The stability and appropriateness for the intended purpose is to be proven for each object depending on the installation height. The notes of reports and certificates have to be considered for ceilings with fire protection requirements.

Exterior ceilings – timber framework



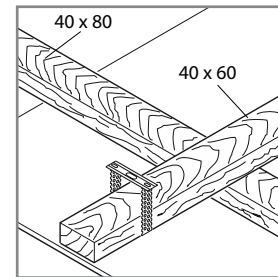
Suspension using Nonius hangers

Abbreviations

- a Spacing of the direct ceiling hangers (mm)
- b Spacing of the foundation battens 40/80 (mm)
- c Spacing of the supporting laths 40/60 (mm)

Description of the material

- 1 AQUAPANEL® Cement Board Outdoor
- 2 Battens and laths
- 3 Nonius hanger with universal bracket or direct suspension hangers

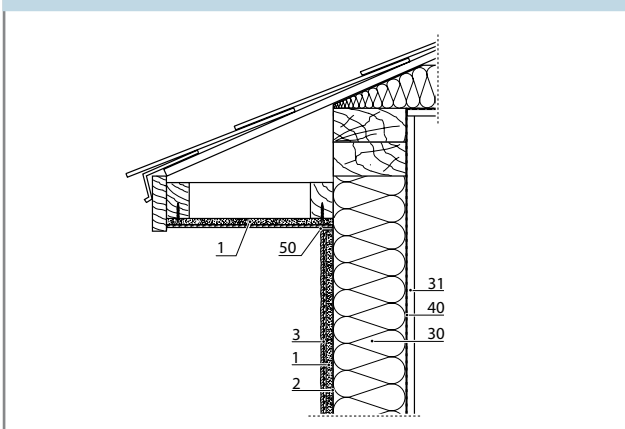


Direct securing with only one batten

Distance between laths and battens and suspension points

Layer option	Ceiling weight	Hangers	Distance (mm)
AQUAPANEL® Cement Board Outdoor (1 x 12.5 mm)	ca. 20 kg/m ²	0.4 kN	a: 600 b: 312.5 (300) c: 600
Direct application with one lath			
AQUAPANEL® Cement Board Outdoor (1 x 12.5 mm)	ca. 20 kg/m ²	0.4 kN	b: 312.5 (300) c: 600

Exterior soffits



Key

- 1 AQUAPANEL® Cement Board Outdoor
- 2 AQUAPANEL® Tyvek® StuccoWrap™
- 3 AQUAPANEL® render system
- 30 Insulating material, e.g. Knauf Insulation
- 31 Interior panelling, e.g. Knauf GKB
- 40 Vapour barrier / airtight layer
- 50 Elastic sealant



Material consumption tables

Ceiling Systems with AQUAPANEL® Cement Board		
Planking and Finishing		
Material requirement	Unit	Per m²
AQUAPANEL® Cement Board Outdoor, single-layer	m ²	1
AQUAPANEL® Maxi Screw	Piece	25 profile spacing 312.5 (300)
AQUAPANEL® Tape (10 cm)	m	2.1
AQUAPANEL® Board Primer	g	ca. 40 - 60
AQUAPANEL® Joint Filler – grey	kg	0.7
AQUAPANEL® Joint Finish & Skim Coating - white	kg (layer thickness 4 mm)	3.5
AQUAPANEL® Reinforcing Mesh	m ²	1.1
Assembly time	Per m² (installation by hand)	Per m² (installation by machine)
Assembly of AQUAPANEL® Cement Board Outdoor, including screws, joint filler and tape	18 Minutes	-
AQUAPANEL® Board Primer	1 Minute	-
AQUAPANEL® Joint Finish & Skim Coating - white	12-15 Minutes	7 Minutes
AQUAPANEL® Reinforcing Mesh	4-5 Minutes	-

Stability and construction

1. Stability

1.1. Actions

The stability of the ceiling system must be verified for each specific building project. National standards apply to design loads.

The following loads must be considered:

- Dead weight of the suspended ceiling (surface layer, supporting structure, fitted components)
- Wind load (if necessary, consider the internal pressure on back-ventilated surface layer) according to DIN 1991-1-4
- Snow and ice loads according to DIN EN 1991-1-3
- Forced actions
- Accidental actions according to DIN EN 1991-1-7

Horizontal loads arising from the suspended surface layer at an angle of inclination to the horizontal must be considered in the design analysis.

The stability of the supporting structure and its attachment to the building must be verified in each case.

1.2. Design Analysis

The user must provide a building-specific structural engineering report in all cases to verify the load-bearing capacity and functionality of the supporting structure. The report must include the actions, combination of actions and deformation behaviour.

The load-bearing capacity and attachment of the supporting structure or suspension system must be verified for each building project.

The verification must include all building components, connections and connecting elements in the supporting structure and their attachment to the supporting structural part. A suitable design analysis method must be applied dependent on the type of supporting structure. Proof of fitness for use is shown by a deformation limit of max. $f=l/500$.

1.2.1. Supporting structures made of metal

The load-bearing capacity of the metal supporting structure must be verified according to the DIN EN 1993 series of standards.

Thin-walled metal profiles may be used according to DIN 18182-1 provided their suitability (profile rigidity, load-bearing capacity of connections) within the system (profiles, connecting elements, hangers) is verified according to DIN 18168-2 or DIN EN 13964.

Only rigid suspension systems may be used with a minimum load-bearing capacity of 0.25 kN per hanger (equivalent to Load Class II according to DIN 18168-2) or better.

The functional test of the suspension system selected must comply with DIN EN 13964, Appendix G (Determination of durability under dynamic tensile and compressive loads, e.g. resulting from wind).

Corrosion protection on metal supporting structures must be selected specifically for each building project depending on the installation situation. The provisions stipulated in DIN 18168-1, Table 2, Line 2 or Line 3 apply, whereby the coating thickness of the zinc electroplating must be at least 7 µm.

1.2.2. Wooden supporting structures

The load-carrying capacity of the wooden supporting structure must be verified according to DIN EN 1995-1-1 in conjunction with DIN 1052. Service Class 2 according to DIN EN 1995-1-1 must apply in conjunction with DIN 1052.

1.2.3. Attachment to the substrate

Only fixing materials suitable for the substrate and the acting loads may be used and their suitability must be verified, e.g. by general building inspectorate approval.

1.3. Design Conditions

Damaged panels may not be installed. Expansion joints must be located at least every 15 m. The maximum permitted ceiling area without expansion joints is 15 m x 15 m.

The spacing between supporting battens may not exceed 312.5 mm.

The maximum permitted spacing for fixing materials is 220 mm.

A weather protection (e.g. flush-mounted with a paint coating or a surface system comprising flush- and surface-mounted components) has to be fitted to the cement-bound plaster boards "AQUAPANEL® Cement Board – Outdoor".

Stability and construction

2. Corrosion protection classes according to DIN EN 13964

In particular in moisture-laden zones, e.g. swimming baths, showers or outdoor building components to which ambient air has constant access; attention must be paid to sufficient corrosion protection of the metal supporting structure.

The new DIN EN 13964 based on DIN 18168-1/-2 is authoritative for the corrosion protection of suspended ceilings.

A large number of profile manufacturers offer wet room profiles in their product portfolios. Depending on the application for ceiling profiles, purchasers should consult the profile manufacturer in question.

Recommendations for attachment:

- Kunkel ceiling pins KDM,
Type K6, material A4 stainless steel
- MKT anchor bolts,
Type MKT B 6, material A4 stainless steel

DIN EN 13964, Tab. 7

Exposure classes

Class A

Building components generally exposed to varying relative humidity up to 70% and varying temperatures up to 25°C but without corrosive pollutants.

Class B

Building components frequently exposed to varying relative humidity up to 90% and varying temperature up to 30°C but without corrosive pollutants.

Class C

Building components exposed to an atmosphere with a level of humidity higher than 90% and accompanied by a risk of condensation.

Class D

More severe than the above.

Extract from DIN EN 13964, Tab. 8

Corrosion protection classes

Class C

Products with a continuously hot-dip metal coating Z100, ZA095 or AZ100 according to prEN 10327 with additional organic coating of 20 µm on each exposed side. Products with electroplated zinc coating flat according to EN 10152 with additional organic coating as follows:
ZE25/25 + 60 µm on exposed side,
ZE100/100 + 40 µm on exposed side.

Class D

Special measures depending on use and corrosion action.

Minimum corrosion protection according to Class C. Additional measures as required.

Sample specifications

Ceilings with Metal Furring

Manufacture, delivery and installation of a suspended ceiling with metal furring, faced with a single layer of AQUAPANEL® Cement Board Outdoor and filled over the whole area with a surface finish agreed in the contract. This is a turnkey solution including connections and supplementary services, F30-A

Item	Quantity/ME	Description of service	Unit cost	Total cost
		<p>m² Ceiling facing in accordance with DIN EN 13964 with AQUAPANEL® Cement Board Outdoor, with single-layer facing, F30-A</p> <p>Row ceiling of: _____ Installed height: _____ Height above floor: _____</p>		
		<p>m² Corrosion-protected metal furring in accordance with DIN EN 13964 of at least 0.6 mm galvanised sheet steel profiles:</p> <ul style="list-style-type: none"> - Hang using rigid Nonius hangers at a spacing of a = _____ mm - Basic profile _____ at a spacing of c = _____ mm - Support structure: CD 60 x 27mm at a spacing of b = 312.5 mm (300 mm) <p>The spacing shall be selected in accordance with the stability analysis.</p> <p>Possible corrosion protection in accordance with DIN EN 13964, tables 7 and 8, corrosion protection class C, D.</p> <p>Hanging the furring from the existing row ceiling using appropriate anchors, e.g. Kunkel ceiling plug type KDM or MKT B6 ceiling screws, A4 stainless steel, Fischer FNA II nail anchors, A4 steel.</p>		
		<p>m² Supply thermal insulation e.g. Knauf insulation manufacturer / type _____, in the form of cavity insulation and install with flush joints.</p>		
		<p>m² Install single-layer of AQUAPANEL® Cement Board Outdoor facing 12.5mm (cementitious, mineral-based construction board, non-combustible (A1), free of cellulose fibres), with 3 - 5mm joint gaps whilst avoiding cross-joints. Fastening the AQUAPANEL® Cement Board Outdoor to the furring using the associated AQUAPANEL® Maxi Screws (usage: 25 pcs./m²).</p>		
		<p>m² Fill the joints between the boards and the screw heads with AQUAPANEL® Joint Filler - grey. Apply 10 cm wide AQUAPANEL® Tape along the area of the joints.</p>		
		<p>m² Prime the inside of the panels with AQUAPANEL® Board Primer (usage 40 – 60g/m²).</p>		
		<p>m² Fill the ceiling area with AQUAPANEL® Joint Filler and Skim Coating - white - ; d ≥ 4mm, cover the whole area with AQUAPANEL® Reinforcing Mesh. Surface characteristics in accordance with the agreement.</p>		
		<p>All work to be carried out in accordance with the manufacturer's recommendations.</p>		

Ceilings with Wooden Furring

Manufacture, delivery and installation of a suspended ceiling with wooden furring, faced with a single layer of AQUAPANEL® Cement Board Outdoor and filled over the whole area with a surface finish agreed in the contract. This is a turnkey solution including connections and supplementary services

Item	Quantity/ME	Description of service	Unit cost	Total cost
		<p>m² Ceiling facing in accordance with DIN EN 13964 with AQUAPANEL® Cement Board Outdoor, faced in a single layer</p> <p>Raw ceiling of: _____ Installed height: _____ Height above floor: _____</p>		
		<p>m² Wooden furring comprising: Pine, grade S10/C24</p> <ul style="list-style-type: none"> - Hang using rigid Nonius hangers at a spacing of a = _____ mm - Basic framework _____ at a spacing of c = _____ mm - Support framework: at a spacing of b = 312.5 mm (300 mm) <p>The spacing shall be selected in accordance with the stability analysis. Hanging the furring from the existing raw ceiling using appropriate anchors, e.g. Kunkel ceiling plug type KDM or MKT B6 ceiling bolts, A4 stainless steel, Fischer FNA II nail anchors, A4 steel.</p>		
		<p>m² Supply insulating layer e.g. Knauf insulation manufacturer / type _____, in the form of cavity insulation and install with flush joints.</p>		
		<p>m² Install single layer of AQUAPANEL® Cement Board Outdoor facing 12.5mm (cementitious, mineral-based construction board, non-combustible (A1), free of cellulose fibres), with 3 - 5mm joint spacing whilst avoiding cross-joints.</p>		
		<p>m² Fasten the AQUAPANEL® Cement Board Outdoor to the furring using AQUAPANEL® Rustproofed Screws SN 40 (usage: 25 pcs./m²).</p>		
		<p>m² Fill the joints between the boards and the screw heads with AQUAPANEL® Joint Filler - grey. Apply 10 cm wide AQUAPANEL® Tape along the area of the joints.</p>		
		<p>m² Prime the inside of the panels with AQUAPANEL® Board Primer (usage 40 – 60g/m²).</p>		
		<p>m² Fill the ceiling area with AQUAPANEL® Joint Filler and Skim Coating - white ; d ≥ 4mm, cover the whole area with AQUAPANEL® Reinforcing Mesh characteristics in accordance with the agreement.</p>		
		<p>All work to be carried out in accordance with the manufacturer's recommendations.</p>		



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IDEA | DESIGN | PLAN | REALISATION | COMPLETION

AQUAPANEL®

Knauf Exterior Wall with AQUAPANEL® Technology Inside is a technologically advanced building system. Because it's a system, it involves clear step-by-step process from design idea to project completion. AQUAPANEL® cement board panels, accessories and services work in unison – you can be certain that your project will all come together as planned.

 www.AQUAPANEL.com

Knauf Exterior Wall with AQUAPANEL® Technology Inside