



**KNAUF**

JANUARY 2025



**SYSTEMS +**

Knauf Plasterboard Fire & Acoustic Systems Viet Nam

**Build on us.**

# CONTENTS

## A Introduction to Knauf VietNam

- A 2 About Knauf Group
- A 4 About Knauf Vietnam
- A 4 Merging Information Of Usq Boral Vietnam And Knauf Vietnam
- A 5 "Build On Us" – A Commitment Beyond Products
- A 5 Knauf Academy

## B General Information

- B 2 Preliminaries
- B 6 Materials
- B 10 Design

## C Acoustic Requirement

- C 2 Introduction
- C 3 Multi-Residential Buildings
- C 4 Commercial Buildings
- C 5 Educational Facilities
- C 7 Health Care Buildings
- C 8 Knauf Typical Acoustic Solutions

## D Ceilings

- D 2 Introduction
- D 11 Acoustic Ceilings
- D 13 Ceilings Under Concrete Floor
- D 16 Over Partition Systems
- D 18 Exterior Ceiling System Knauf Glass-Mat/ Aquapanel

## E Internal walls

- E 2 Introduction
- E 8 Lined Both Side
- E 16 Twin Stud
- E 20 Staggered Stud
- E 24 Acoustic Stud

## F External walls

- F 2 The Design And Construction Landscape Is Changing
- F 4 Knauf Exterior Wall – The Advantages
- F 24 Knauf Exterior Wall – The Solutions
- F 32 Knauf Exterior Wall – The Products

## G Special systems

- G 2 Column & Beam Encasement
- G 9 Fire Ventilation Duct
- G 11 Fire Solution

## H Junctions & Penetrations

- H 2 Introduction
- H 4 Fire Rated Steel Stud Walls
- H 22 Non-Fire Rated Steel Stud Walls

## I Finishing Plasterboard

- I 2 Knauf Levels of Finishing
- I 4 Knauf Taping & Jointing System

## PREFACE

Today Knauf is one of the world's leading manufacturers of modern insulation materials, dry lining systems, plasters and accessories, thermal insulation composite systems, floor screed, floor systems, and construction equipment and tools. With more than 300 production facilities and sales organisations in over 90 countries, 40,000 employees worldwide, the Knauf Group is, without doubt, one of the big players on the market - in Europe, the USA, South America, Russia, Asia, Africa and Australia.

At the Knauf Group, we believe the best innovations start with a purpose - a focus on why the innovation is needed and who will benefit from it. Our focus is to deliver innovations that help you work smarter, do more and build better. We do so by investing in purposeful innovation, expanding into different markets and constantly searching for new ways to increase performance and productivity.

This commitment to innovation and focus on you, our customer, is inspired by a desire to enable architects, contractors and workers alike to improve the way we live by changing the way buildings are designed and built.

At Knauf, we are committed to delivering only the best to you - our customers and partners. For more information on Knauf refer to [knauf.com](http://knauf.com)



All works undertaken to prescribe the use of or to install Knauf's products and systems must be performed by experienced and, where required by applicable laws, appropriately licensed personnel. Knauf's products and systems must be installed in accordance with Knauf's installation manual, Systems+, and any other product or system specific literature issued by Knauf. If installation works are not performed in compliance with such product literature, by experienced and licensed personnel, or are incorrectly performed by experienced or licensed personnel, there is a serious risk that the works, application and performance of the relevant system or products will be compromised, which could result in property damage, injury or death.

All personnel who undertake works to install Knauf's products and systems must comply with all applicable health and safety laws, including wearing appropriate personal protection equipment. If personnel do not comply with applicable health and safety laws, including by not wearing appropriate personal protection equipment, there is a serious risk of injury or death.

All of Knauf's products and systems must only be used for the uses identified in this document (and any other product or system specific literature issued by Knauf from time to time). Before prescribing or using any Knauf product or system for any other use, you must contact Knauf.

All recommended component parts for Knauf's products and systems should be used and not substituted for other products. If component parts are substituted, there is a serious risk that the works, application and performance of the relevant system or products will be compromised, which could result in property damage, injury or death.

## Section A

Introduction to Knauf VietNam

01/2025

### A/ INTRODUCTION TO KNAUF VIETNAM

- A 2 About Knauf Group
- A 4 About Knauf Vietnam
- A 4 Merging Information Of USG Boral Vietnam And Knauf Vietnam
- A 5 "Build On Us" - A Commitment Beyond Products
- A 5 Knauf Academy

# ABOUT KNAUF GROUP

## From a vision to a globally successful building material company.

Founded in 1932, Knauf is today one of the world market leaders in the field of sustainable lightweight construction. Our renowned brands reach more than 90 countries, with 80 raw materials processing plants and 300 manufacturing sites. Our comprehensive product range, which spans from drywall systems to plaster and ceiling solutions and innovative insulation materials, enables us to realize sustainable and efficient construction projects around the world.



## High-quality construction materials built on expertise.

With a strong track record of performance spanning decades, we offer a comprehensive portfolio tailored to meet the needs of both local construction projects and ambitious architectural structures across various application areas. From floors to ceilings, walls to facades and beyond, our solutions are meticulously designed, efficiently manufactured, and rigorously tested to the highest standards. You can count on premium quality and performance, including thermal insulation, sound absorption, and energy efficiency, while also complying with the strictest regulations. No matter the scope or complexity of your project, we are your trusted partner for solutions built to last.

### Increasing performance: gypsum drywall construction

For almost 100 years, we have been developing, refining and setting the standard in gypsum drywall construction materials. In our quest to deliver the highest performing products to our customers, we continue to enhance our manufacturing techniques and testing criteria. This ensures that no matter where in the world you are, our gypsum-based materials and solutions deliver the same level of durability, safety and compliance across all projects, as well as the flexibility to combine with other building materials.



## Ceilings and walls combining aesthetics with performance

In residential and commercial spaces, aesthetic design must match sustainable performance. That's why our range of ceiling and wall solutions deliver timeless style, enhanced acoustics, light reflectivity, fire protection and humidity resistance. Our experts can meet your most complex design requirements, offering tailor-made solutions that rely on a multi-material range of gypsum, mineral, metal, wood wool and more.

## Façade systems for every challenge

Differing construction traditions and regulations, combined with diverse climates demand unique façade solutions. With this knowledge in hand, Knauf is guided by a keen understanding of these challenges and a commitment to pushing the boundaries of innovation. We offer a robust façade product portfolio, consisting of warm wall systems, ventilated facades solutions, exterior rendering and specialised insulation materials.



## ABOUT KNAUF VIETNAM

Knauf Vietnam's business started in 2013 with the construction of plasterboard plant in Hai Phong. Up to now, more than 35 million euros invested in the most advanced technology production line has made Knauf (German brand) as one of the top-quality gypsum brands in Vietnam and Southeast Asia.

We are not only working to continually improve the quality of current products and services, but constantly monitoring and evaluating trends for new materials, technologies, and systems. In this way, we can identify and develop each new opportunity to maintain our leading-edge position.



## MERGING INFORMATION OF USG BORAL VIETNAM AND KNAUF VIETNAM

On April 1, 2021, Knauf Group acquired 50% shares of the Joint Venture USG Boral, thereby bringing its total shareholding to 100%. Now, Knauf is better positioned to provide with high-quality products, leading brands in the construction industry together with the professional services that meet customers' expectations.

This acquisition grants us the agility, capabilities, and broad business footprint to strengthen Knauf's position as the world's leading supplier of gypsum-based building materials. As a unified company with stronger growth prospects, Knauf is confident to help customers create more values thanks to the following advantages:

- Continuous Innovation on products and systems
- Greater reach and higher responsiveness to customer requirements
- High-class service to create conditions for customers to have a better experience

Partnership with our customers is integral to our success, and our focus on maintaining strong and long-time customer relationships will remain. As a result, Knauf's focus on maintaining strong and lasting customer relationships will not change. Knauf is committed to ensuring the stable and continuous product supply for its customers' profitable business growth.



## "BUILD ON US" – A COMMITMENT BEYOND PRODUCTS

"Build On Us" is more than a tagline. The new brand statement reflects Knauf's dedication to empowering its customers and partners. It is a promise that Knauf's expertise, innovation, and sustainability-driven approach will support every step of the construction journey. Whether you're a contractor or architect, you can rely on Knauf to deliver solutions that meet today's challenges while preparing for the future.



### Simplifying Complex Technical Information

At any phase of the construction process, Knauf wants to reduce technical complexities and empower its customers to build with confidence. We make it easy to understand, select, and install its premium solutions. Its range of resources includes product information packs, fire protection safety documents, up-to-date test certificates, and digital tools to effortlessly choose the right materials.

### Building The Sustainable Homes Of Tomorrow

Having operated as a privately owned business for more than 90 years, Knauf values the contributions of past generations. This ethos has propelled the company to the forefront of the sustainable lightweight construction industry, where it strives to meet the needs of future generations. Guided by enduring values and extensive research and development, Knauf is dedicated to creating advanced building materials for the world of tomorrow. Its portfolio, which includes interior finishings, thermal insulation, design ceilings, dry construction systems, and sustainable solutions, continues to address the most complex building requirements. Looking ahead, the combination of modern production facilities, a skilled workforce, and an unwavering commitment to excellence will enable Knauf to maintain its leadership in the industry.

For more information about the Knauf Group and our "Build On Us" vision, please visit: [Knauf.com](http://Knauf.com)

## KNAUF ACADEMY

The increasing demand for skilled workers in the Viet Nam construction industry became more evident. Knauf Viet Nam wants to do its share to fill the gap through the Knauf Academy, a develop Project that is co-financed by DEG from the public funds of the German Federal Ministry for Economic Cooperation and Development. The Knauf Academy aims to improve the technical qualifications and employability of skilled workers and students in the field of drywall construction. It establishes a formal learning system that will lead to more capable installers and better craftsmanship on project sites. The training modules will equip learners on both theoretical knowledge and practical skills of interior wall and ceiling system installations to help secure employment in their respective careers in the construction industry.



# Section B

General Information

01/2025

## **B/ GENERAL INFORMATION**

- B 2 Preliminaries
- B 6 Materials
- B 10 Design

KNAUF

# PRELIMINARIES

## Introduction

This manual is intended for use by building designers, builders, certifiers and plastering contractors dealing with fire rated and acoustic construction. It provides fire rating, acoustic and structural performance data for a wide range of Knauf building systems including lightweight wall and ceiling systems, masonry upgrades and beam/column fire protection systems.

In addition to the systems listed in this publication, Knauf offers many other system configurations to suit specific project requirements. Performance data on the full range of Knauf systems can be found at [knauf.com](http://knauf.com)

## Scope

This manual lists Knauf fire rated wall systems up to EI 180 Fire rated ceiling systems are available up to EI -/120/120 (from below) and beam/column fire protection systems up to R 180/-/-.

A wide range of acoustic systems are available to meet TCVN/QCVN and other performance requirements. These include plasterboard wall and ceiling systems with  $R_w + C_w$  50 or higher, a range of Knauf acoustic ceiling tiles up to NRC 0.75, and Knauf Echobloc with an NRC of up to 0.75.

## Certification

Knauf systems have been assessed to meet the relevant requirements of Vietnamese Standards TCVN/QCVN

### Fire Resistance

Fire testing and assessment has been done to TCVN 9311-8: 2012. Fire Resistance test - elements of building construction - Part 8: Specific requirement for non - local bearing vertical separating elements.

### Acoustic Ratings

All acoustic ratings are based on acoustic tests of similar systems (laboratory and/or site tests) as well as theoretical models, and are produced by experienced acousticians.

### Structural

Fire, acoustic and structural test reports and opinions can be made available on request from Knauf.

#### NOTES:

- Various system certifications are valid only when the relevant systems are constructed in accordance with Knauf specifications and using the stated materials and components. Fastening should be of the same type and at centres no greater than detailed for particular systems.
- While Knauf systems are certified to achieve the stated fire resistance and acoustic ratings, it is the responsibility of the relevant project consultant to ensure that the selected systems satisfy project requirements.
- Acoustic ratings provided in this publication are the expected laboratory test results based on the opinion of acoustical experts. Laboratory measurements are conducted under strict and near ideal conditions. On-site performance is generally lower due to flanking effects.

# PRELIMINARIES

## Standards

The following Vietnamese and other Standards are referenced in this publication:

- QCVN 16:2023/BXD : National technical regulations on products, goods of building materials
- QCVN 06:2022/BXD : National technical regulation on Fire safety for Buildings and Constructions
- TCVN 8256:2022 (Based on ASTM C1396/C 1396M & ASTM C1278/1278M) : Gypsum boards – Specification.
- TCVN 8257-3:2023 (Based on ASTM C473-19) : Gypsum panel products – Test methods for physical testing – Part 3: Determination of flexural strength.
- TCVN 8257-5:2023 (Based on ASTM C473-19) : Gypsum panel products – Test methods for physical testing – Part 5: Determination of humidified deflection
- TCVN 8258:2009 : Fiber-cement flat sheets – Specifications
- TCVN 8259-2:2009 : Fiber-cement flat sheets - Test methods - Part 2: Determination of bending strength
- TCVN 8259-4:2009 : Fiber-cement flat sheets - Test methods - Part 4: Determination of moisture movement
- TCVN 8259-6:2009 : Fiber-cement flats sheets – Test methods – Part 6: Determination of water permeability
- TCVN 9311-8:2012 (Based on ISO 834-8:2002) : Fire – Resistance test – Elements of building construction – Part 8: Specific requirements for non-loadbearing vertical separating elements.
- TCVN 2737-1995: Loads and Actions norm for design
- ASTM C1396/C 1396M : Standard Specification for Gypsum Board
- ASTM C1278/1278M : Specification for Fiber-reinforced Gypsum Panels
- ASTM C473-19 : The Standard for Standard Test Methods for Physical Testing of Gypsum Panel Products
- ASTM C471M-20a : Standard Test Methods for Chemical Analysis of Gypsum and Gypsum Products
- ASTM C635-22 : Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
- ASTM C645-18 : Standard Specification for Nonstructural Steel Framing Members
- ASTM E3090-20 : Standard Test Methods for Strength Properties of Metal Ceiling Suspension Systems
- ASTM D5116-17 : Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
- ISO 16000-9:2006 : Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method
- ISO 1182:2020 : Reaction to fire tests for products – Non-combustibility test
- ISO 834-8:2003 : Fire-resistance tests – Elements of building construction - Part 8: Specific requirements for non-loadbearing vertical separating elements
- ISO 834-9:2003 : Fire-resistance tests – Elements of building construction - Part 9: Specific requirements for non-loadbearing ceiling elements
- AS/NZS 2588:1998 : Gypsum plasterboard
- ASTM C1177 : Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- TCVN 16:2023/BXD: National Technical Regulations on Product, Goods of Building Materials.

## Abbreviations

The following abbreviations are used throughout this manual:

TABLE B1: ABBREVIATIONS	
ABBREVIATION	DESCRIPTION
TCVN	Viet Nam Standard
QCVN	Viet Nam Regulation
TCT	Total Coating Thickness
BMT	Base Metal Thickness
ctrs	Centres
Max	Maximum
LB	Load Bearing
Min	Minimum
NLB	Non-Load Bearing
Nom	Nominal
NA	Not Applicable
p	Page
pbd	Plasterboard
PKA	PKA Acoustic Consulting
UNO	Unless Noted Otherwise
AAAC	The Association of Australasian Acoustical Consultants
NCC	AU National Construction Code
GW	Glasswool
RW	Rockwool

## Performance Indicators

The following performance indicators are mentioned in various parts of this manual:

TABLE B2: PERFORMANCE INDICATORS	
INDICATOR	DESCRIPTION
Fire Resistance Properties	
REI	Fire Resistance Level
RISF	Resistance to Incipient Spread of Fire
Acoustic Properties	
$\alpha_w$	Weighted Sound Absorption Coefficient
CAC	Ceiling Attenuation Class
$D_{nc,w}$	Weighted Suspended Ceiling Normalised Level Difference (laboratory performance)
$D_{nT,w}$	Weighted Standardised Sound Level Difference (field performance)
$D_{nT,w} + C_{tr}$	Weighted Standardised Sound Level Difference with Spectrum Adaptation Term (field performance)
$L_{n,w}$	Weighted Normalised Impact Sound Pressure Level (laboratory performance)
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level (field performance)
NRC	Noise Reduction Coefficient
$R_w$	Weighted Sound Reduction Index (laboratory performance)
$R_w + C_{tr}$	Weighted Sound Reduction Index with Spectrum Adaptation Term (laboratory performance)
Dw	Weighted Level Difference
$T_{60}$	Reverberation Time
Other	
LR	Light Reflectance

For the full description of various performance indicators refer to the relevant parts of the General Information section.

# PRELIMINARIES

## Quality Assurance

All Vietnamese Knauf plasterboard production facilities are certified under Internal quality control of factory.

## Sustainability

### Raw Materials

Gypsum used in locally manufactured Knauf plasterboard products is mined from Knauf resources.

The mine has in place a rehabilitation and revegetation strategy aimed at creating a landscape with natural appearance and native local vegetation.

Plasterboard paper liner is manufactured from 100% recycled waste paper fibre and contains no virgin paper fibre.

### Plasterboard Manufacture

Apart from natural gypsum and recycled paper, the key inputs in the plasterboard manufacturing process are natural gas and potable water.

Knauf aims at exceeding the local Environment Protection requirements and at maximising the use of recycled water at its manufacturing facilities.

### Recycling

Plasterboard waste can be recycled into new plasterboard or as soil conditioner.

For further information contact your Vietnam Knauf office.

## Embodied Energy

As shown in the following table, embodied energy per kg of plasterboard compares favourably with other common lining materials:

TABLE B3: EMBODIED ENERGY OF LINING MATERIALS	
MATERIAL	PER* EMBODIED ENERGY (MJ/kg)
Plasterboard	4.4
Plywood	10.4
MDF	11.3
Hardboard	24.2

\* PER - Process Energy Requirements.  
Source: Building Materials Energy and the Environment, Bill Lawson, The Royal Australian Institute of Architects, 1996.

## Safety

The following precautions are recommended when installing and finishing plasterboard:

- Avoid creating dust when handling plasterboard or mixing plaster compounds.
- When sanding, minimise the effects of dust by"
  - providing adequate ventilation
  - wearing eye protection
  - wearing a respiratory mask conforming to TCVN
  - using mechanical sanding tools fitted with dust extractor and storage bag.
- Keep tools and materials out of reach of children. In addition, the users should observe Occupational Health and Safety tips contained on the packaging labels for Knauf products as well as safe manual handling practices.

## First Aid

- If plaster compound or dust comes into contact with the eyes, wash eyes thoroughly with clean potable water.
- If plaster compound or dust comes into contact with skin, wash skin thoroughly with soap and water.
- If dust is inhaled, move to a fresh air environment.
- If plastering compound or dust is ingested, drink plenty of water.

Material Safety Data Sheets for Knauf products can be downloaded from [knauf.com](http://knauf.com)

# PRELIMINARIES

## Plasterboard Properties

### Thermal Resistance

The thermal conductivity (R-values) of some plasterboard produced by Knauf, are provided in the following table:

TABLE B4: THERMAL RESISTANCE	
PLASTERBOARD PRODUCT	R-VALUE
STANDARD SHIELD 12.7MM	0.178 W/m.k
MOIST SHIELD 12.7MM	0.191 W/m.k
FIRE SHIELD 12.7MM	0.285 W/m.k

Calculation of the above R-values is based on test data of thermal conductivity as reported in VIBM (Viet Nam institute for building Materials).

When plasterboard is fixed to framework, creating a cavity construction, K-values of plasterboard systems can be easily upgraded through addition of bulk or reflective insulation.

Total thermal conductivity ratings of various external wall systems are shown in the relevant system tables.

### Specific Heat Capacity

The Specific Heat Capacity is a measure of a material's capacity to store heat, the higher the Specific Heat Capacity the greater the capacity to store heat.

TABLE B5: SPECIFIC HEAT		
PRODUCT	SPECIFIC HEAT CAPACITY	BASIS
12.7mm FIRE SHIELD	960 J/kgK ±10%	

### Temperature Effects

Thermal co-efficient of linear expansion of plasterboard is  $16.2 \times 10^{-6} \text{mm}/(\text{mm}^\circ\text{C})$  over the range  $4^\circ\text{C}$  to  $38^\circ\text{C}$ .

Knauf does not recommend the use of radiant heating systems continuously subjecting plasterboard ceilings to temperatures in excess of  $52^\circ\text{C}$ .

## Moisture Effects

The hygrometric co-efficient of linear expansion of plasterboard is  $7.2 \times 10^{-6} \text{mm}/(\text{mm}\% \text{RH})$  over the range 5% to 90% relative humidity.

As exposure to moisture may affect performance of plasterboard linings, it is recommended that plasterboard is installed in well ventilated areas protected from moisture penetration.

Building designers should be aware that some types of bulk insulation tend to absorb and retain the moisture against the face of plasterboard.

### Impact Resistant Linings

Knauf offers a number of lining products specifically developed for applications requiring enhanced impact resistance:

TABLE B6: IMPACT RESISTANCE LININGS	
PRODUCT	RELATIVE IMPACT RESISTANCE
1 x 15.9 FIRE SHIELD 1 x 12.7 GLASSMAT	(SD) Severe Duty
2 x 15.9 FIRE SHIELD	(SD) Severe Duty

## Moisture and Mould Resistance

Although plasterboard is not a waterproof material, Knauf offers a number of lining products classified as moisture resistant under the QCVN/TCVN requirements for domestic wet areas. These products include:

- MOISTSHIELD
- ULTRAMOISTSHIELD
- GLASSMAT
- AQUAPANEL

# MATERIALS

## Plasterboard

Knauf offers a wide range of plasterboard products to suit various applications:

TABLE B7: KNAUF PLASTERBOARD			
PRODUCT NAME	THICKNESS mm	WEIGHT kg /m <sup>2</sup>	APPLICATIONS
STANDARS SHIELD	9 12.7	5.6 7.8	Wall and ceiling linings
ULTRALIGHT	9	5.0	Wall and ceiling linings
MOISTSHIELD	9 12.7	6.3 9.47	Ceiling in wet areas
ULTRAMOISTSHIELD	9	6.3	Ceiling in wet areas
ECHOBLOC	12	8.5	Sound absorption within a room
FIRESHIELD	9.5 12.7 15.9	6.39 11.52 13.92	Fire resistant linings
GLASS MAT	12.7 15.9	9.8 13.4	Fire resistant linings in tiled wet areas, balcony ceiling

Note: Product availability should be checked with Knauf as some products may only be available on order and/or in minimum order quantities.

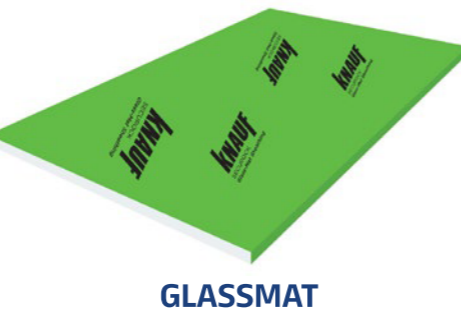
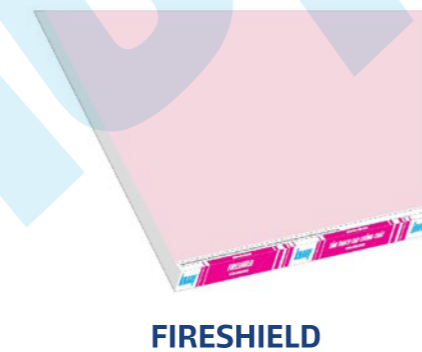
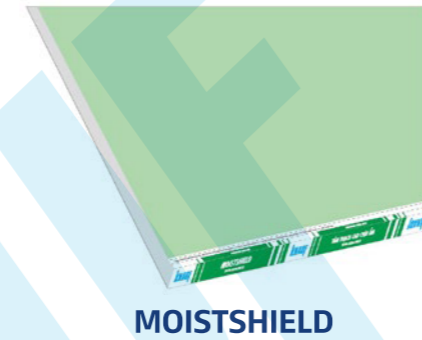
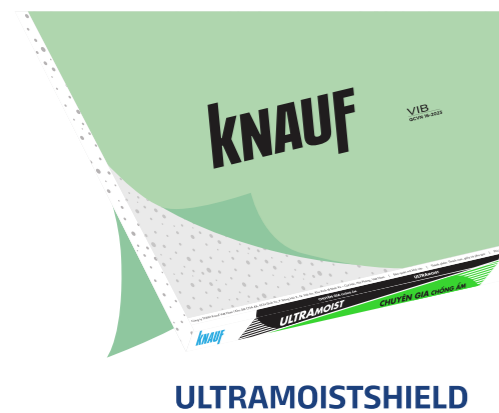


Figure B1: Knauf Plasterboards

# MATERIALS

## Metal Components

### Steel Stud Walls

Knauf steel stud wall systems utilise lipped C-studs, wall tracks and deflection head tracks as listed in the Steel Stud Walls section.

### Suspended Ceilings

Knauf suspended ceilings utilise the following suspension systems:

- T3 Brand Exposed Grid
- Supra concealed ceiling.
- Pro concealed ceiling.
- Xtra concealed ceiling.

## Insulation

### Rock wool & Glasswool Insulation

Insulation offers a unique combination of performance characteristics - delivers high levels of thermal performance, high levels of sound absorption, is naturally non-combustible and is inherently low in embodied carbon.

The following Insulation products have been tested and or assessed to be used in Knauf systems to achieve designated fire, acoustics and thermal performance:

- Glass wool insulation 50mm 24kg/m<sup>3</sup> density (GW)
- Rock wool insulation 50mm 60kg/m<sup>3</sup> density (RW)



# MATERIALS

## Fasteners

The following fasteners are suitable for fixing of plasterboard linings:




TABLE B8: PLASTERBOARD SCREWS <sup>1</sup>		
SCREW TYPE		APPLICATION
S		Steel TCT* up to 0.75mm
D		Steel TCT* 0.80 - 2.00mm
L		Gypsum board laminating

TABLE B9: PLASTERBOARD TO PLASTERBOARD FASTENERS		
NUMBER OF LAYERS OF PLASTERBOARD x THICKNESS		TYPE L <sup>10</sup> SCREWS FOR FIXING PLASTERBOARD A TO B
PLASTERBOARD A	PLASTERBOARD B	
1 x 12.7mm	12.7mm	10-8 x 32mm
1 x 15.9mm	15.9mm	10-8 x 38mm

\*BMT - Base Metal Thickness.

TABLE B10: PLASTERBOARD TO FRAME FASTENERS	
PLASTERBOARD THICKNESS mm	STEEL FRAME
	TYPE S <sup>3</sup> AND TYPE D <sup>6</sup> SCREWS
1 x 9	6-18 x 25 <sup>7</sup> D, S
1 x 12.7	6-18 x 25 <sup>7</sup> D, S
1 x 15.9	6-18 x 30 D, S
2 x 9	6-18 x 30D, S
2 x 12.7	6-18 x 40D, S
12.7 + 15.9	6-18 x 40D, S
2 x 15.9	6-18 x 45D, S
3 x 12.7	7-16 x 50S
3 x 15.9	8-15 x 60S

### NOTES:

- "S" is a needle point, bugle head type S gypsum screw for fixing to steel gauges of up to 0.75mm TCT.
- "D" is a drill point, bugle head type D gypsum screw for fixing to steel gauges 0.80 to 2.00mm TCT.
- "L" is a needle point, bugle head type L gypsum screw for fixing plasterboard to plasterboard.
- Screw designation given as (minimum screw gauge) - (threads per inch +1) x (minimum screw length).
- For ease of construction with framing steel gauges of less than 0.8mm TCT use 30mm minimum screw length.
- Correct screw length is critical when fastening to resilient furring channel to avoid acoustic bridging.
- Nail lengths are minimums, however care is needed when selecting longer nails to avoid nail bending in hardwoods or popping of plasterboard with unseasoned timber.
- For wall systems only. Tables to be read in conjunction with plasterboard installation details.

# MATERIALS

## AQUAPANEL® Cement Board

Knauf Aquapanel Cement Boards are manufactured with aggregated Portland cement and coated glass fibre mesh embedded in the back and front surfaces.

AQUAPANEL® Cement Board is non combustible and water resistant. Under water impact, AQUAPANEL® Cement Board displays extremely slight and system-safe changes in form.

The cement board changes neither its structural cohesion nor its static characteristics. AQUAPANEL® Cement Board is resistant to mould growth and is therefore also suitable for use in areas where there is a high level of damp.

Altogether, this robustness, resistance and reliability in performance makes AQUAPANEL® Cement Board ideal for both walls and ceilings systems in wet environments. Knauf utilises the following products in our wall and ceiling systems.

- 9mm AQUAPANEL® Cement Board Universal (approx. 8.5kg/m<sup>2</sup>)
- 12.5mm AQUAPANEL® Cement Board Indoor (approx 11 kg/m<sup>2</sup>)
- 12.5mm AQUAPANEL® Cement Board Outdoor (approx. 16.0kg/m<sup>2</sup>)
- 6/12.5mm AQUAPANEL® Cement Board Rooftop (approx 8.5/16.5 kg/m<sup>2</sup>)



Figure B2: AQUAPANEL® Cement Board

## Jointing Tape and mesh tape

Jointing tapes are used to provide reinforcement to plasterboard joints and angles.

Knauf tape is recommended by Knauf for jointing of gypsum wall and ceiling linings due to its high strength and suitability for all jointing compounds and applications.

Knauf jointing tape must be used in wet area and fire rated applications and with air-drying type jointing compounds.

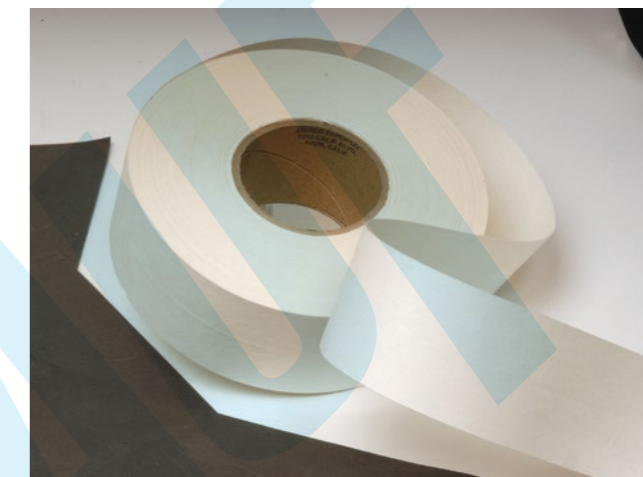


Figure B3: Paper Jointing Tape

## Sealants

Hilti or Fischer sealant is recommended for sealing of perimeter gaps and penetrations in Knauf fire rated and acoustic systems.

A suitable flexible waterproof sealant must be used to seal the sheet ends of moisture resistant plasterboard to other surfaces, such as preformed shower bases, baths and plumbing fixtures (see Wet Areas).

## DESIGN

### Structural

As required by relevant Vietnamese Standards, in addition to any acoustic or fire design, building elements must be checked for structural adequacy under dead, live, wind and other applicable loads.

Wall design must allow for:

- Expected vertical deflection due to building movement
- Thermal expansion during fire service
- The support, including lateral support of any door or access panel frames, supported external cladding, internal lining, dampers, shelves, cupboards, attachments or other loadings required to be supported by the wall or wall embedded frame
- Any loadings due to internal or external pressure differentials
- Vertical loads.

### Head Clearance

Almost all structures will deflect during service. Designers should be aware of the expected deflections of the building structure as they affect partitions. These deflections may be due to both dead and live loadings. Non-load bearing partitions are not designed to take any axial loading due to building deflection.

In fire rated steel stud walls, thermal expansion of studs of up to 5mm/m should be expected during fire service. Stud shortening due to thermal bowing may reduce the expansion, especially in thinner walls.

Designers should make due allowance for expected vertical deflections and stud thermal expansion in considering deflection head requirements and, where necessary, refer to Knauf for further information. Standard partition head details should accommodate normal service deflections.

### Plasterboard as Structural Bracing

Knauf does not recommend the use of plasterboard ceiling linings to brace the roof structure or individual roof truss chords.

Knauf does not recommend the use of plasterboard for dedicated bracing of walls.

### Maximum Wall Heights

Wall heights for non-load bearing steel stud walls must not exceed the maximum heights specified in Steel Stud Walls section.

Maximum heights for non-load bearing steel stud walls have been provided for 0.25kPa lateral serviceability pressure and are based on L/240 deflection criteria set out in the NCC.

For other design pressures contact hotline: 0906 997 459

### Load Bearing Walls

A load bearing wall is a wall that is intended to resist vertical forces in addition to its own weight.

Refer to Steel Stud Walls section for notes on load bearing steel stud frames.

### Wall Loading

Walls, including fire rated walls, that carry shelf loadings must be designed accordingly. Refer to Suprawall/ Rondo for permissible shelf loadings on steel stud walls.

The following shear loads can be supported directly by Plasterboard linings under non-fire rated conditions:

TABLE B11: MAXIMUM LOADS ON GYPSUM BOARD	
THICKNESS	MAXIMUM POINT LOAD PARALLEL TO THE BOARD*
1 layer of STANDARDSHIELD 9mm	4 kg
2 layer of STANDARDSHIELD 9mm	28 kg
1 layer of STANDARDSHIELD 12.7mm	8 kg
2 layer of STANDARDSHIELD 12.7mm	25 kg
1 layer of MOISTSHIELD 9mm	4 kg
2 layer of MOISTSHIELD 9mm	20 kg
1 layer of MOISTSHIELD 12.7mm	13 kg
2 layer of MOISTSHIELD 12.7mm	34 kg
1 layer of FIRESHIELD 9.5mm	12 kg
2 layer of FIRESHIELD 9.5mm	34 kg
1 layer of FIRESHIELD 12.7mm	30 kg
2 layer of FIRESHIELD 12.7mm	58kg
1 layer of FIRESHIELD 15.9mm	46 kg
2 layer of FIRESHIELD 15.9mm	58 kg

\* Loads should be attached with minimum 8 gauge high thread screws installed with the thread for the full thickness of the board.

### Allowable Ceiling Loads

Plasterboard spans and loads directly supported on ceiling linings must not exceed the maximum values indicated in Table D1 in the Ceilings section.

## DESIGN

### Seismic

Seismic compliance refers to the use of approved systems and designs that meet the seismic design requirements of a building project to provide life safety to occupants and maintain building function during and after an earthquake. Non-structural components often represent a high percentage of a project's capital investment. Failure of these components in an earthquake has the potential to cause harm, block egress and impede rescue efforts, and can disrupt the building's function. The basic objectives of seismic design for non-structural components are to provide life safety, minimise property loss and prevent functional loss.

All framing components and connections for walls and ceilings must be suitably designed by Knauf or project engineer in accordance with QCVN & TCVN and other relevant standards for use in seismic applications.

Knauf recommends that all Suspended Grid Ceiling Systems be designed and installed accordance with QCVN & TCVN

Every project must be specifically designed to meet QCVN & TCVN requirements based on the project location, importance level, and application type, and must be certified and approved based on local State building regulations and requirements.

### Fire Resistance

#### Fire Resistance Level (REI)

Fire rating requirements of the Building Code of Viet Nam are specified in terms of Fire Resistance Level (REI). The REI specifies the performance, in minutes, for each of the following three design criteria when specimens are fire tested to the requirements of the QCVN 06/2022:BXD

#### Structural Adequacy

The specimen can no longer carry its load (self weight and superimposed loads).

#### Integrity

Cracks or openings develop that allow the passage of flames or hot gases.

#### Insulation

The unexposed face temperature rises by more than 140°C on average or 180°C for a single point.

For example, a wall system under fire test that carries its load for 120 minutes and maintains its integrity and insulation for 120 minutes is given a REI of 120/120/120, ie 120 minutes structural adequacy, 120 minutes integrity and 120 minutes insulation.

Systems that achieve a particular REI can be used to satisfy the requirements for a lesser REI.

#### Support

Any structure required to support a fire rated system must have a fire resistance structural adequacy level of at least that of the system. This includes vertical support to ceilings and walls and lateral support to the top of walls which may be provided from both sides.

# DESIGN

## Adjacent Structure

Building elements, other than roof sarking or certain roof battens, must not pass through or cross a fire rated wall unless the Fire Resistance Level of that wall is maintained. Where trusses and beams pass over or through a fire rated partition, the following measures can be taken to ensure that the Fire Resistance Level of the partition is not degraded due to a failure of these members in the case of fire:

- Construct a fire rated ceiling that protects the structural members
- Fire protect the structural member or
- Ensure the partition can carry loading from the fire affected structural member and that the member can still carry its loading when it is supported on a partition (for trusses this may mean the inclusion of additional webbing above the partition). Ensuring the partition can carry these new loadings may require:
  - Making it into a load bearing partition
  - Constructing the partition with a protected column within it or
  - Constructing unprotected columns on both sides of the partition.

## Portal Frame Behaviour

In portal frames affected by the fire the rafters often push outwards on the column members until the ridge sinks and then pulls the columns inwards. Should drywall be used to provide a fire separation within portal framed building, the above mode of failure needs to be recognised by the designer.

As mentioned above, load bearing elements may need to be incorporated within, or adjacent to, the partition to maintain support to the roof structure during a fire event.

## Direction of Attack by Fire

In most cases the direction of attack by fire is assumed to be from both sides of the partition. In some cases, such as exterior walls, the rating may be required from one side only. For conventional fire rated plasterboard ceiling systems direction of attack by fire is always from below, while for spanning ceilings it can also be from both sides or from above. Applicable fire attack direction is indicated for each fire rated system listed in this manual.

## Maximum Heights

Maximum heights listed for fire rated steel stud partitions are the lesser of maximum fire heights and structural heights for a given wall configuration and stated lateral pressure. Maximum fire heights were derived from fire engineering principles.

Maximum structural heights have been obtained by computation and from extensive mechanical testing. Refer to maximum wall height tables for steel stud systems, for varying stud configurations to achieve alternative heights.

## Resistance to Incipient Spread of Fire (RISF)

Ceiling system must be resistant to the incipient spread of fire. This requirement determines the ability of the ceiling to provide adequate thermal insulation to combustible materials within the ceiling plenum thus avoiding the danger of the materials there igniting.

Many of the ceiling systems in this manual carry an RISF rating which is noted as such. RISF is a more onerous requirement than REI.

Systems that achieve a particular RISF may be used to satisfy the requirements for a lesser RISF.

## Insulation Materials

Insulation for thermal or acoustic reasons may be placed within partition cavities. The following is a list of insulation materials, that will not adversely affect the REI:

TABLE B12: INSULATION MATERIALS	
MATERIAL	RESTRICTION
Foil-backed sarking, batt, blanket or loose rockwool or ceramic fibre	No restriction
Batt, blanket, loose wool or glasswool	Any thickness but density not less than a tested system

## Fire Hazard Properties

Wall and ceiling lining materials in certain types of buildings must comply with the Fire Hazard Properties requirements of the QCVN/TCVN.

All Knauf gypsum board lining products are classified as CVO - Non Combustible when tested in accordance with the QCVN 06.

# DESIGN

## Combustibility

Knauf Gypsum board satisfied the classification of group non-combustion materials in QCVN 06:2022/BXD. BS/476. EN/15283-1

## Gas Reticulation in Fire Rated Walls

Oxygen or combustible fluid reticulation systems should not be located within fire rated walls unless designed, fire tested and constructed to suit this application.

## Penetrations

Penetrations in a fire rated system must be treated strictly in accordance with relevant test reports and approved installation details in order to maintain the system's Fire Resistance Level.

Where components by others are specified in Knauf fire rated penetration details (ie dampers GPOs, fire collars Fireduct, etc), such components must be installed in accordance with the manufacturer's specifications. It is the responsibility of the component manufacturer to ensure that the fire rating performance of the system is not affected.

## Smoke Walls

Where smoke walls are required in accordance with the NCC, such walls can be lined with minimum 12.7mm Fire Shield plasterboard.

## Jointing

Compounds used for finishing plasterboard joints in fire rated systems may be any plaster or vinyl based compounds supplied by Knauf that are normally used for this purpose.

Knauf jointing compounds have been shown by test not to self ignite at temperatures below 200°C and thus are suitable for use in fire rated systems.

## Acoustics

### Weighted Sound Reduction Index (R<sub>w</sub>)

The TCVN has adopted the Weighted Sound Reduction Index (R<sub>w</sub>) as a measure of sound insulation of building elements. A partition with a high R<sub>w</sub> isolates sound better than a partition with a low R<sub>w</sub> (an increase of 10 points in R<sub>w</sub> indicates doubling in perceived performance).

R<sub>w</sub> ratings are obtained from tests carried out in certified laboratories, under controlled conditions. Provided below are examples of R<sub>w</sub> levels of some Knauf wall systems:

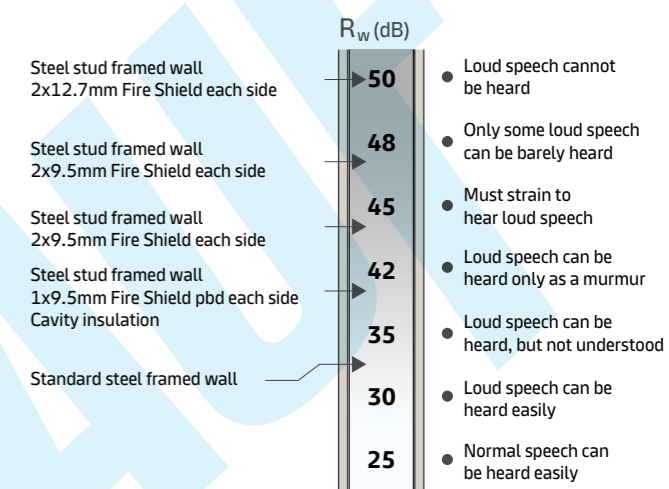


Figure B3: Noise Levels

## DESIGN

### Spectrum Adaptation Term ( $C_{tr}$ )

The  $R_w$  alone is not a good indicator of how well the partition isolates low frequency (bass) sounds. To better measure low frequency performance of wall & floor/ceiling partitions, the standard requires specific walls to meet an  $R_w + C_{tr}$  criterion.

When the  $C_{tr}$  is combined with the  $R_w$  the result is a single number index which provides a more reliable indicator of the ability of the partition to isolate noise containing low frequency components.

Two partitions with the same  $R_w + C_{tr}$  value will typically have similar low frequency isolation properties even if their respective  $C_{tr}$  terms are very different. The higher the  $R_w + C_{tr}$  value for a wall or ceiling partition the better the sound insulation performance, particularly in the low frequencies.

The  $C_{tr}$  typically ranges between -1dB to -15dB and is calculated from the airborne performance of a partition in the range of frequency bands measured.

### Impact Sound Insulation

#### Walls

Certain walls between sole occupancy units in multi-residential buildings should provide impact sound insulation.

Under the deemed-to-comply provisions of the walls requiring impact sound insulation in Class 2 and 3 buildings should be of 'discontinuous construction'. The discontinuous construction as a wall having a minimum 20mm cavity between two separate leaves, and:

- For masonry, where wall ties are required to connect leaves, the ties are of the resilient type
- For other than masonry, there is no mechanical linkage between leaves except at the periphery.

### Floors

In addition to a minimum sound insulation performance ( $R_w + C_{tr}$ ), the NCC contains a requirement for an impact sound rating of floors between sole occupancy units expressed as  $L_{n,w}$ .

The Weighted Normalised Impact Sound Pressure Level ( $L_{n,w}$ ) is measured in a laboratory and indicates how much sound reaches the receiving room from a standard tapping machine. The lower the number the better the performance of the floor at isolating impact sounds.

$L_{n,w}$  is defined in AS ISO 717.2 *Acoustics - Rating of sound insulation in buildings and of building elements - Impact sound insulation*.

### Difference Between Laboratory and Field Acoustic Performance

On-site field testing is allowed as a verification method to comply with the provisions of the NCC. The on-site rating measurement is the  $D_{nT,w}$  (Weighted Standardised Level Difference)/ FSTC and is, technically, slightly different to the laboratory  $R_w$  assessment.

When identical partitions are tested on site it is often found that the site rating,  $D_{nT,w}$ , is lower than the  $R_w$  (laboratory performance). This reduction in performance can be due to:

- Incorrect installation procedures
- Flanking paths (ie. noise passing through adjacent parts of the building)
- Non-ideal measurement conditions. For instance, small room sizes may affect accurate measurements in particular frequencies.

The Standard allows a 5dB concession between the laboratory performance and the field performance to allow for flanking and the technical difference in units. Therefore, the  $D_{nT,w} + C_{tr}$  may be up to 5dB less than the  $R_w + C_{tr}$ .

For the transmission of impact generated sound through floors, the Standard does not allow any concession from the laboratory performance to the field performance. Therefore, the on-site performance requirement,  $L'_{n,w}$  (Weighted Standardised Impact Sound Pressure Level), cannot exceed the maximum  $L_{n,w}$ .

## DESIGN

### Sound Insulation Rating of Services

Ducts, soil and waste pipes and water supply pipes that serve or pass through more than one SOU, including those located in a party wall or floor cavity to be acoustically separated from Habitable and non-Habitable rooms by a construction with a minimum  $R_w + C_{tr}$  rating.

In addition to the airborne rating, water supply pipes must only be installed in the cavity of discontinuous construction.

To achieve the sound insulation requirements of the NCC, one of the options for soil and waste pipe treatment includes acoustic lagging of the pipes which typically comprises a loaded vinyl isolated from the pipe with foam or fibreglass. It is important that the lagging and pipe are not contact with ceilings, walls or supports and the pipe mounts and supports are not in contact the surrounding bulkheads or risers.

### Over-partition Noise Rating

Sound can easily travel through an exposed grid or flush suspended ceiling and over the top of a partition where it abuts the underside of a suspended ceiling. This is a common source of sound transmission particularly where the ceiling is porous to sound.

In this case the sound rating of the ceiling element is stated as the  $D_{n,c,w}$  - Weighted Suspended-Ceiling Normalised Level Difference.

The  $D_{n,c,w}$  is defined in AS/NZS ISO 717.1 *Acoustics - Rating of sound insulation in buildings and of building elements Part 1: Airborne Sound Insulation*, where the individual  $D_{n,c}$  values (Suspended Ceiling Normalised Level Differences) are determined by laboratory measurements as defined in AS/NZS 2499 *Acoustics - Measurements of sound insulation in buildings and of building elements - Laboratory measurement of room-to-room airborne sound insulation of a suspended ceiling with a plenum above it*.

Where sound insulation is important, partitions should, wherever possible, continue through the ceiling to the structural soffit and be sealed at their perimeter.



Figure B4: Sound Transfer Over Partition

### Sound Absorption Rating

The reverberation time is a critical element in determining the acoustic quality of a space. The reverberation time is determined by a number of factors, but the most important is the amount of acoustic absorption in the space. The overall acoustic absorption is determined by the area of absorptive material and the absorption coefficient of the material.

The sound absorption coefficient,  $\alpha$ , is a measure of how well a material stops sound being reflected as is measured in accordance with AS ISO 354 *Acoustics - Measurement of Sound Absorption in a Reverberation Room*. The absorption coefficient varies as a function of frequency, and the sound absorption of a material is usually expressed as a single number rating, the Weighted Sound Absorption Coefficient,  $\alpha_w$ , which is calculated in accordance with AS ISO 11654 *Acoustics - Rating of Sound Absorption - Materials and Systems*.

### Construction Changes and Substitutions

Changes in construction and substitution of different materials can increase or decrease the acoustical isolation of wall and floor/ceiling systems and may result in the acoustical isolation falling below the specification. The following comments apply to wall systems unless otherwise noted:

#### Studs

- Except for staggered stud and twin stud wall systems, substituting timber studs in place of steel studs generally results in a significant decrease in sound insulation.
- In single stud walls lined both sides increasing the thickness of steel studs from 0.50 TCT to 0.72 TCT or 1.15 TCT will generally decrease sound insulation.
- Decreasing the stud spacing will decrease the sound insulation.

#### Plasterboard

Substituting with lighter plasterboard will usually result in a change in  $R_w$  of around 1-2dB for most systems, although a greater reduction may occur with separating wall systems such as Partiwall®.

#### Insulation

- Thinner insulation may decrease the sound insulation.
- Thicker insulation may increase the sound insulation.
- Higher density insulation will generally increase the acoustic performance of a system.

## DESIGN

### Fixings

- Using more screws or nails than specified may reduce the sound insulation.
- Using cornice adhesive or other methods of laminating plasterboard, other than nailing or screw fixing, will reduce the sound insulation.

### Perimeter Acoustical Sealing

It should be noted that as the sound insulation requirement of a partition increases, the control of flanking paths becomes more critical. Consequently, the perimeter sealing requirements for a low sound rating wall, such as  $R_w$  30dB, are lower than for a high sound rating wall, such as  $R_w$  60dB. It cannot be over-emphasised that for high performance walls, the sealing of each face must be virtually airtight.

For a sealant to be effective at controlling noise passing through gaps, it must have the following properties:

- Good flexibility, elastic set
- Low hardness
- Excellent adhesion, usually to concrete, timber, plaster and galvanised steel
- Minimal shrinkage (less than 5%)
- Density greater than 800kg/m<sup>3</sup>
- Fire rated (where required).

All of the above properties must be maintained over the useful life of the building.

Some silicone sealants and some acrylic latex sealants are examples of suitable sealants. Reference should be made to the manufacturer to ensure the particular type or grade of sealant is suitable for the purpose.

Knauf recommends Hilti or Fischer sealant for caulking of acoustic systems.

#### NOTE

Thee of expanding foam sealants is not acceptable.

### Noise Flanking

Noise flanking can significantly reduce the perceived isolation of a wall or floor/ceiling system and should therefore be given careful consideration.

Typical flanking paths for a wall include:

- Through ceilings and via the ceiling cavity above
- Through floors and via the floor crawl space below
- Through glazing and windows
- Through light switches, or GPOs, located in the wall
- Through gaps, cracks, holes or other penetrations or services (continuous pipes, ducts, etc.)
- Through shared building elements such as floor boards, floor joists, continuous plasterboard walls, continuous plasterboard ceilings and even continuous concrete walls and floors
- Through the perimeter joints between the wall and the floor, or the wall and the ceiling (or underside of the floor slab) or wall junctions
- Via adjacent walls or facade walls.

Typical flanking paths for a floor/ceiling system include:

- Through windows
- Through light fittings or air conditioning fixtures in the ceiling
- Through shared building elements, such as external walls
- Through any sound leaks
- Through perimeter joints between the floor and walls, or between the ceiling and wall.

## DESIGN

### Acoustic Performance On Site

Acoustic performance ratings stated in this manual are based on tested laboratory results or the expected laboratory results based on the opinions of independent acoustical consultants.

To reproduce the stated performance in the field, attention to detail in the design and construction of the partition/ceiling and its associated structure is of prime importance. Even the most basic principles, if ignored, can significantly downgrade the sound insulation performance.

Knauf cannot guarantee that the site tested acoustic performance of the systems will achieve the laboratory test results or the expected laboratory performance (opinion). The Standard provides a margin of 5dB between the laboratory tested values and the equivalent site tested values for airborne sound transmission loss, and different types of systems are likely to have different variances between laboratory and site tested values. However, with careful attention during erection of the wall or ceiling, correct installation to specification and proper caulking/sealing, the difference between the laboratory or estimated laboratory value and the site measured value should be minimised.

Apart from installation procedures, workmanship and caulking the following factors can also affect the acoustic performance on site:

### Door

Hollow core and even solid doors generally provide unsatisfactory sound insulation between rooms. Doors can also provide direct air leaks between rooms thus having a detrimental effect on the overall sound insulation of the partition in which they are located. The higher the insulation of the partition, the worse is the effect of doors.

Where sound insulation is important, specialised heavyweight doors or, preferably, two doors separated by an absorbent lined airspace or lobby should be used.

Because air leakage largely determines the sound insulation of a single door, consideration must be given to providing airtight seals between the door and the frame and at the threshold. The joints between the door frame and partition structure should also be sealed. The door seal must be compatible with the fire resistance of a door if required.

### Lightweight Panels Above Doors

These are often incorporated for aesthetic reasons, however, the performance of a partition with high sound insulation can be considerably downgraded by lightweight panels.

### Air Paths through Gaps, Cracks or Holes

Gaps, cracks or openings, however small, readily conduct airborne sounds and can considerably reduce the sound insulation of a construction.

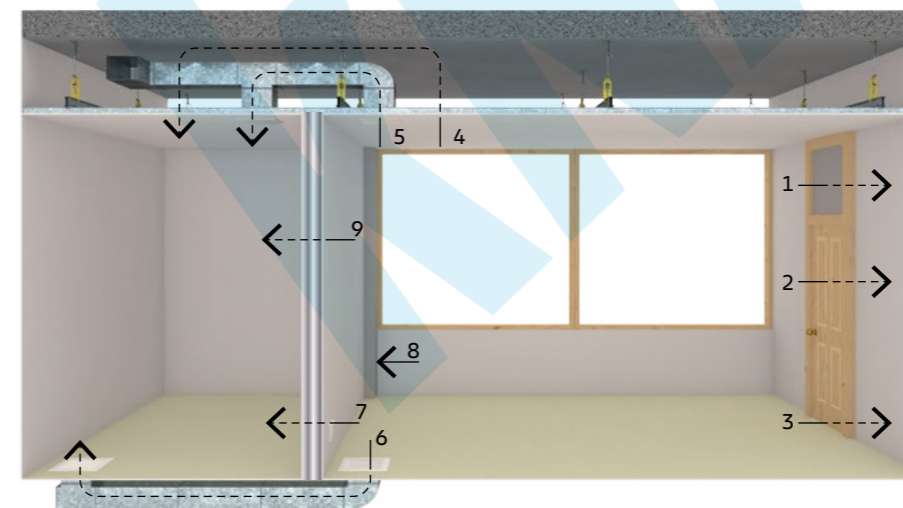


Figure B5: Sound Flanking Paths

#### Diagram Key

1. Lightweight panels above doors
2. Doors
3. Air leaks through gaps, cracks or holes
4. Sound transmission via suspended ceilings/partitions
5. Common ventilation system without sound absorbent treatment
6. Common floor duct
7. Electrical outlets and service pipes
8. Lightweight mullions or mullion/partition closers
9. Partition performance.

## DESIGN

### Appliances

In cases where sound insulation is important, noise producing fixtures or appliances such as water closets, cisterns, water storage tanks, dishwashers, washing machines and pumps should be repositioned or isolated from the structure with resilient mountings and flexible service leads and connections.

Where fittings are duplicated on opposite sides of partitions, such as back to back baths or unit shower cubicles, the partition wall should be continuous between the fittings, otherwise a path for direct sound transmission will exist.

### Electrical Outlets and Service Pipe Penetrations

Penetrations in separating walls should be avoided. This includes recessed fittings or ducts such as skirting heating, electrical or other wiring, light fittings, intercommunication systems and alarms, medical and laboratory gas outlets.

Plumbing connections between fittings or appliances on opposite sides of a partition offer a path for transmission of sound and should be sealed. If possible introduce discontinuity in the pipe work between fittings, such as a flexible connection within or on the face of a partition.

The acoustic performance may be downgraded where penetrations or services exist within the wall unless extreme care is taken at the detailing and construction stages. This is especially likely with acoustical bridging caused by plumbing or electrical services or by structural members including flooring.

Where penetrations are not avoidable in separating walls, electrical outlets, switch boxes and similar penetrations should not be placed back-to-back. Seal backs and sides of boxes and the perimeter of all penetrations with acoustic sealant. Preferably, sound-rated electrical outlets and switches should be used, or outlets and switches should be surface mounted on sound rated walls.

Electrical outlets must be offset from each other in timber or steel framed walls by not less than 300mm.

### Penetrations in Linings Separating Soil and Waste Pipes

The acoustic ratings for unlagged soil and waste pipes are provided in Section H of Systems+.

The effect of penetrations differs between the unlagged and lagged and clad pipes. Lagging and cladding has the benefit of reducing the noise emitted from the pipe itself.

Refer to lagging manufacturer's data for acoustic ratings of lagged soil and waste pipes.

### Wet Areas

#### Regulatory Requirements

Wet area is an area within a building supplied with water from a water supply system and includes bathrooms, showers, laundries and sanitary compartments.

Building elements in wet areas must be waterproof or water resistant depending on the location within a wet area.

#### Ceilings over Wet Areas

As the use of water resistant ceiling linings over wet areas, Knauf non-water resistant gypsum boards provide an adequate solution for this application. Knauf water resistant gypsum boards can be used in wet area ceilings if desirable.

Knauf recommends that ceiling paint in wet areas should be impervious to moisture.

#### Knauf Wet Area System

Knauf Wet Area System comprises materials and installation details outlined in Knauf Installation Manual and must be installed in accordance with Knauf specification to achieve the required performance.

Knauf Wet Area System complies with the requirements of QCVN/TCVN and is therefore suitable for use in residential buildings and other buildings with a similar usage of wet areas.

Knauf Wet Area System is not suitable for use in high exposure applications such as group shower rooms, steam rooms, etc. or in areas of high humidity (above 90% RH). For such applications refer to Knauf Aquapanel Cement Board Indoor systems in this manual.

## DESIGN

### Thermal Insulation

The total R-value of a building system is a sum of R-values of the system components, enclosed air gaps and internal and external air layers. R-values of various Knauf lining products are shown in Table B4.

Although plasterboard itself does not provide high thermal resistance, R-values of framed plasterboard systems can be significantly increased by incorporating bulk or reflective cavity insulation.

Refer to the External Walls section for thermal resistance ratings of Knauf external wall systems.

### Design Considerations

#### Condensation

Condensation occurs when warm and humid air comes into contact with cold surfaces.

Condensation on internal building surfaces is more likely to occur where there are large temperature fluctuations and the moisture content inside a house (often generated in a bathroom, laundry or kitchen) is high.

Repeat or prolonged condensation may lead to; nail-popping, sagging ceiling linings, rotting, mould growth, joint and corner cracking and deterioration of internal air quality. If left untreated, condensation may result in structural damage to the building and health concerns for the building occupants.

The following precautions can help minimise internal condensation:

- Keep air spaces well ventilated to promote moisture dissipation, especially in the roof and sub-floor spaces.
- In rooms such as bathrooms, kitchens and laundries exhaust moisture-laden air to the outside of the building and not into the roof or ceiling space.
- Use vapour barriers in conjunction with insulation around the building envelope. Place vapour barrier on the warm side of insulation.
- Use thermal breaks on steel framing members (refer NCC).

### Devices Generating Heat

Knauf Plasterboard does not recommend the use of radiant heating systems continuously subjecting plasterboard ceilings to temperatures in excess of 52°C.

Prolonged exposure to temperatures higher than 52°C may cause changes in the chemical composition of the gypsum core and loss of plasterboard integrity over time.

Combustible surfaces within 200mm of the edge of the nearest burner must be protected to a height of not less than 150mm above the periphery of that burner and for the full length of the cooking surface area.

9mm plasterboard covered with 5mm ceramic tiles or toughened safety glass is an acceptable method of protection for combustible surfaces in domestic applications. An additional layer of 6mm fibre cement fixed over the plasterboard is required for a sheet metal facing.

12.7mm and 15.9mm FIRESHIELD® is classified as a fire resistant material and is suitable for use in non-loadbearing applications to protect combustible surface materials adjacent to appliances other than commercial catering appliances.

#### NOTE

Knauf does not advise the use of plasterboard as a wall lining behind and around fireplaces unless protected in accordance with the NCC.

## DESIGN

### Control and Movement Joints

The purpose of control joints is to accommodate hygrometric (moisture caused) and/or thermally caused changes in plasterboard dimensions. Control joints are required in unbroken plasterboard walls and ceilings at no greater than 12 metre centres in both directions (6m maximum spacing for external ceilings).

Movement joints are required in walls and/or ceilings in order to accommodate movements in the building structure (ie. due to shrinkage, settlement, wind or seismic forces) and include construction and expansion joints and joints at changes in substrate materials.

Control joints in non-fire rated systems can be formed by control joint or plastic expansion beads that leave a neat and flexible joint.

Control joints in plasterboard walls and ceilings must coincide with control/movement joints in superstructure.

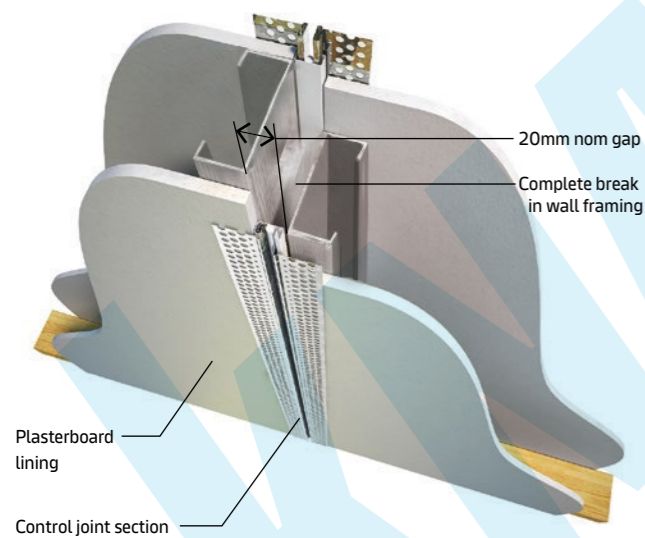


Figure B6: Control Joint in Non-Fire Rated System

### Jointing

Compounds used for finishing plasterboard joints in fire rated systems may be any plaster or vinyl based compounds supplied by Knauf that normally used for this purpose.

Knauf vinyl jointing compounds have been shown by test not to self ignite at temperatures below 200°C and thus are suitable for use in fire rated systems.

### Impact Resistance

Impacts on walls come in three basic forms: soft body, abrasive and hard body. Each of these can affect the wall lining in different ways and consequently affect the choice of the lining system.

#### Soft Body Impact

Soft body impact is the type of impact one would associate with people hitting walls with their shoulder or hip. Soft body impact testing is a requirement under the BS 5234 for certain types of wall systems.

Up to the point of breaking the lining, soft body impacts rarely leave any visible marks on the face of the wall, unlike hard body and abrasive impacts.

Where required, Knauf systems comply with the soft body impact resistance provisions of the BS 5234.



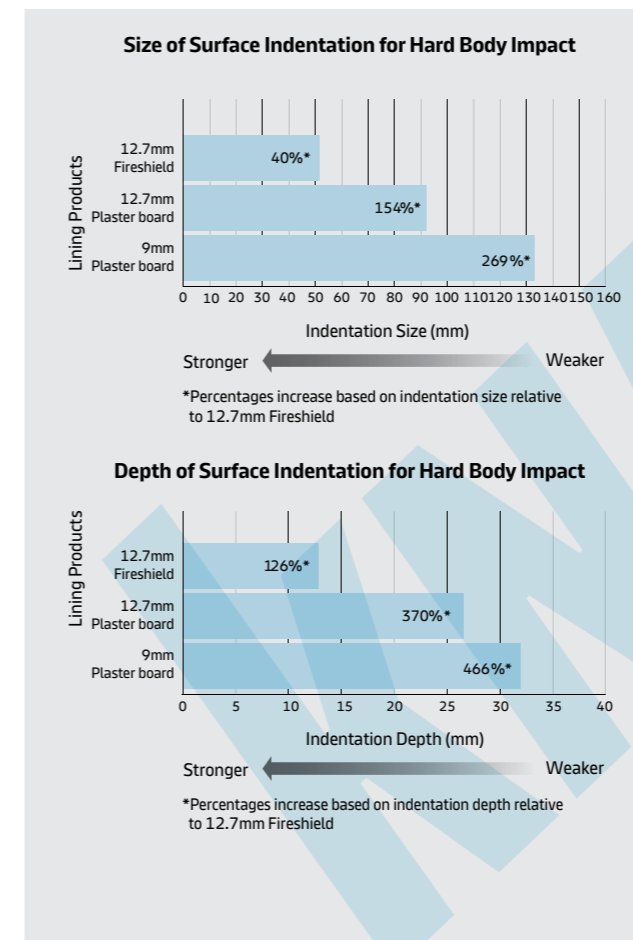
Figure B7: Impact Test In Progress

## DESIGN

### Hard Body Impact

BS 5234 specifies a static test measuring resistance to indentation of wall linings, but no hard body impact requirements. All plasterboard products produced by Knauf meet this surface indentation criteria.

These hard body impacts result in dents or gouges and sometimes penetration of the wall lining. Examples of hard body impacts would include kicks and hits with trolleys or hockey sticks. Knauf has developed hard body impact test simulations with a 4.0kg steel ball on various plasterboard products. Refer below for relative hard body impact performance.



### Abrasive Impact

This impact occurs when an object is scraped along the face of the wall and usually is seen by marks in the paint covering the wall lining.

Resistance against abrasion is more a function of the surface coating over the face of the wall lining, than the lining itself.

With a glancing impact, where a hard body object strikes the wall at an angle of less than 90 degrees, the damage will often be a combination of abrasion and denting.

### Design Options

The following design options can be incorporated in Knauf wall systems if required:

#### Insulation

Various forms of insulation can be placed within wall cavities and over ceilings to achieve acoustic or thermal requirements. However, designers should be aware of the following:

- The mass of insulation acting directly on ceilings must not exceed maximum loads indicated in the Ceilings section.
- Insulation that attracts and holds moisture for prolonged periods is not recommended for use in Knauf ceiling systems.

#### Overall Width of Partition

Twin and staggered stud walls, often used to form a services duct, can be varied in width to suit the building design. Note that reducing the width may adversely affect the acoustic properties of the partitions.

Where discontinuous construction, the gap between the two leaves of the partition should not be less than 20mm.

#### Frame

Other factors remaining the same, steel stud depth and gauge greater than that specified may be used without adversely affecting the fire resistance of the wall system (note that changes in stud size or gauge may affect the system acoustic rating).

## DESIGN

### Control and Movement Joints

Unless noted otherwise, all plasterboard supporting framework must be spaced at no greater than 610mm centres.

### Stud Substitution

Suprawall & Rondo steel studs have been used in development of Knauf acoustic and fire rated systems.

Limiting heights and spans listed are for Knauf studs only. Other stud sections should not be used unless it can be shown that they are at least equal to Knauf studs in all of the relevant performance characteristics.

Structural and fire properties of unclipped C-studs can vary significantly from those of lipped studs, therefore unclipped C-studs must not be used without their independent assessment by a qualified Engineer.

### Cavity Structures

Ballistic or forcible entry protective items may be included within walls. In the case of fire rated walls, adequate allowance must be made for expansion relief at the perimeter of ballistic/protective steel sheets. Security mesh may be incorporated within steel framed fire rated walls to Knauf details. Structural steel or timber sections may be incorporated within fire rated walls, refer to Column and Beam protection systems for details.

Noggings and plywood bracing may be incorporated within steel framed fire rated walls. Contact knauf.com for noggings and plywood backing details.

### Board Orientation

In wall systems the sheets of plasterboard may be oriented with the bound edges horizontal, vertical or, in the case of multilayer systems, both horizontally and vertically oriented layers. This option may be useful in achieving the best outcome in the prevailing lighting conditions.

### Beams and Columns

Wall support beams, walls under beams, structural frames and columns within walls may be incorporated as per standard Knauf details.

### Fastener Size and Spacing

Screws and nails of greater gauge and at lesser centres than specified may be used without adversely affecting the fire resistance level of a partition or ceiling (note that acoustic performance of the system may be affected).

### Curved Walls and Ceilings

Refer to Knauf for construction details for curved fire rated and non-fire rated walls and ceilings.

Curved fire rated ceilings to have a radius of no less than 6000mm.

### Attachments, Shelf Loading Capacity

In general, items may be attached through a fire rated lining to the wall frame providing that:

- The frame is designed and constructed to take the loading from the attachments and
- The attachments have a self ignition temperature of not greater than 200°C.

Electrical conduits may be attached to steel stud partitions by means of clipping to screw fixed pressed metal sections without detrimentally affecting the FRL of the partition provided that:

- The conduits are self supporting and do not impose any axial load on the partition and
- The clips used to restrain conduits are manufactured from a material having a melting point not exceeding 250°C.

Refer to Knauf for attachment options for non-load bearing walls. For load bearing steel stud walls, framing and fastenings are to be designed by an appropriately qualified Structural Engineer and shall comply with TCVN Standard for steel structures.

### Exterior Cladding, Lining

Exterior cladding or interior lining may be added to walls providing the frame is designed and constructed to accommodate the extra loading and, in the case of fire rated walls, the self ignition temperature of the cladding components exceeds 200°C.

As with other materials, plasterboard lined exterior walls will require careful detailing to avoid possible problems associated with effects of moisture.

### Penetrations

Access hatch, duct, GPO, lighting recesses, tapsets, pipe and cable penetrations in fire rated walls and ceilings are to be constructed to fire tested or assessed details.

The incorporation of services and penetrations must not adversely affect the structural capacity of the framing members or the acoustic properties of the wall system.

## DESIGN

### Lighting Recesses and Service Chases

Where items such as lights, plumbing, heating or electrical services are fitted within or pass up through a fire rated wall, the recess/chase must first be framed out then the top, bottom, sides and back are to be lined using the same thickness and number of linings as on the penetrated face of the wall.

All corners between plasterboard linings are to be formed herringbone style, backed by a stud, metal stud track or angle of greater than 0.7mm BMT and any cable penetrations are to be sealed with an approved fire grade sealant. Refer to the relevant details in the Junctions and Penetrations section.

#### NOTES

- The acoustic insulation capacity of walls is likely to suffer where chases and/or lighting recesses are provided within the wall or ceiling
- Lighting or other heat producing items should not be included within walls where there is any likelihood that, through continuous, extensive use, temperatures in the plasterboard surrounding the fitting remain above 52°C for a prolonged period of time.

### Access Panels

Access panels up to 600mm square may be constructed within non-load bearing fire rated walls with a FRL of up to -/120/120. Prefabricated non-fire rated and fire rated access panels are also available (refer to panel manufacturers for installation details and fire test reports/certificates).

### Ducts, Dampers and Grilles

Where items such as ducts, dampers and grilles pass through a fire rated wall, the penetration systems must be fire tested or assessed for compliance by Fire Testing Authority. The aperture must first be framed out allowing for lining and sealing of the aperture and expansion of the penetrating item during service where required. A use full rule of thumb for the amount of expansion to be allowed for is 10mm + 1% of the side under consideration. Some dampers are built to absorb their thermal expansion within their outside dimensions (refer to damper manufacturer's specifications).

The wall frame may need to be strengthened locally to account for any crippling of studs causing redistribution of loadings into the adjacent full height studs (ie. these studs may be required to be boxed or require additional structural steel).

The aperture should be lined using the same thickness and number of linings as on the face of the wall. The sealing/mounting system around the penetrating item is to be as tested or assessed for that particular item.

### Appearance

#### Levels of Finish

The term 'Level of Finish' applies to plasterboard linings prior to decoration.

Application and finishing defines three levels of finish: 3, 4 and 5. Level 4 is the default level of finish for plasterboard linings, unless specified otherwise.

It is essential that the level of finish is determined at the design stage since each level has specific requirements for substrate tolerances and plasterboard installation, jointing and finishing. The desired level of finish may not be achieved unless all of these requirements are met through various stages of construction.

Levels of finish recommended for various lighting conditions and surface decorations are shown in Figure B9.

For the full description of levels of finish and guidelines on assessment of finished surfaces, a summary of various levels of finish is provided below:

#### Level 3

This level of finish is used in areas that do not require decoration or where finish is not important (for example, above ceiling level or inside service shafts and the like).

All joints and interior angles must have tape embedded in the joint compound and one separate coat of joint compound applied over all joints and fastener heads.

Butt joints and recessed joints in walls and ceilings can be on framing members.

#### Level 4

This is the default and generally accepted level of plasterboard finish. All joints and interior angles must have tape embedded in the jointing compound and a minimum of two separate coats of joint compound applied over all joints, angles, fastener heads and accessories.

Wall butt joints can be on framing members. If wall butt joints are between framing members, any butt joints longer than 400mm and less than 2m above the floor must be back-blocked.

Ceiling butt joints must be between framing members. All ceiling butt joints must be back-blocked. Ceiling recessed joints must be back-blocked in any area containing three or more recessed joints.

If Level 4 surface is to be exposed to critical light (see Glancing Light on page A26), it should be covered with textured finishes or wall coverings. Smooth textured finishes and flat/matt or low sheen paints can be used when Level 4 finish is illuminated by non-critical lighting. Flat paints in this situation tend to conceal joints better.

# DESIGN

Weight, texture and sheen level of wall coverings and finishes should be carefully evaluated and joints should be adequately concealed if wall-covering material is lightweight, glossy or lightly patterned.

**NOTE**

- In critical lighting conditions, surface variations may still be apparent in a Level 4 surface finish.
- Gloss, semi-gloss or deep tone paints are not recommended for Level 4 finish, as they accentuate surface variations

## Level 5

Level 5 finish should be used where gloss or semi-gloss paints are specified or where lining surfaces will be exposed to critical lighting conditions.

Level 5 finish is characterised by a parity of surface texture and porosity. All joints and interior angles must have tape embedded in the jointing compound and a minimum of two separate coats of jointing compound applied over all joints, angles, fastener heads and accessories.

Butt joints in walls and ceilings must be between framing members and back-blocked. Recessed joints in the ceilings must be back-blocked.

The work is finished with proprietary surface preparations or skim coating to remove differential surface textures and porosity. A suitable paint or plaster material is sprayed, rolled or trowelled over the defined area. The surface texture must be random and monolithic, concealing joints and fixing points.

**NOTE**

- If Level 5 finish is desired for a decorated plasterboard surface, this must be specified at the design stage.
- Level 5 finish is difficult to achieve and always requires the cooperation of the framer, plasterer and painter in establishing suitable work practices that deliver the agreed painted finish for the given project.
- Some minor surface variations may still be visible in Level 5 finish, however, these will be minimised
- The surface of the defined area may require sanding to be suitable for decoration.

## Framing Tolerances

Refer to Table B8 for maximum allowable framing tolerances for various levels of finish.

## Influences

There are many factors in modern building design that influence the overall appearance of a wall or ceiling.

Modern features such as lower unbroken ceiling areas across adjoining rooms, large open living areas, and importantly, larger windows with greater use of natural light from skylights and mirrored walls etc often create conditions in which it is difficult to achieve the desired level of finish.

Consumers are often not aware of the difficulties involved in achieving their expectations, particularly when some design conditions highlight rather than camouflage surface conditions. It is therefore very important that the consumer's expected standard of finish matches the level of finish the tradesperson is capable of achieving given the particular design features of the project.

## Glancing Light

Glancing light is the light that shines across the surface of a wall or ceiling rather than directly on it. When considering the type of finish required it is important to understand how the overall appearance is likely to be affected by glancing light in a particular situation.

## Gloss/Sheen Paints

Full gloss paint finish is not recommended on plasterboard walls or ceilings. When semi-gloss paint is to be used in large open rooms or vast areas with uncurtained windows, the highest level of finish (Level 5) is essential.

Where gloss or impervious sheen paint finishes are desired for purely functional reasons eg, kitchens, bathrooms etc, some loss of appearance should be accepted.

## Paint Discolouration

Whilst a plasterboard installation may conform to the relevant Vietnam Standards, discolouration of the joints may occur due to effects of condensation, mould growth, contaminated paint or other factors.

The risk of paint discolouration can be reduced through good design practices and the use of quality products and workmanship.

TABLE B8: LEVELS OF FINISH REQUIREMENTS SUMMARY

LEVEL OF FINISH	ALLOWABLE BUTT JOINTS LOCATION		CEILING BUTT JOINTS BACK-BLOCKING	CEILING RECESSED JOINTS BACK-BLOCKING		FRAMING TOLERANCES <sup>*(mm)</sup>		JOINTING SYSTEM
	WALLS	CEILINGS		LESS THAN 3 RECESSED JOINTS IN A ROOM	3 OR MORE RECESSED JOINTS IN A ROOM	90% OF AREA	REMAINING AREA	
3	On or between framing members	On or between framing members	Optional	Optional	Optional	4	5	Tape Coat + 2nd Coat
4	On or between framing members	Between framing members only	Must	Optional	Must**	4	5	Tape Coat + 2nd Coat + Finishing Coat
5	Between framing members only	Between framing members only	Must	Must	Must	3	4	Tape Coat + 2nd Coat + Finishing Coat + Skim Coat over whole face

\* Maximum deviation at any point of the bearing surface of the finished framing prior to installation of plasterboard linings, when measured with 1.8m straight edge.

\*\* Level 4 ceilings supported by a ceiling suspension system do not require back-blocking of recessed joints provided there is not rigid connection between ceiling and wall.

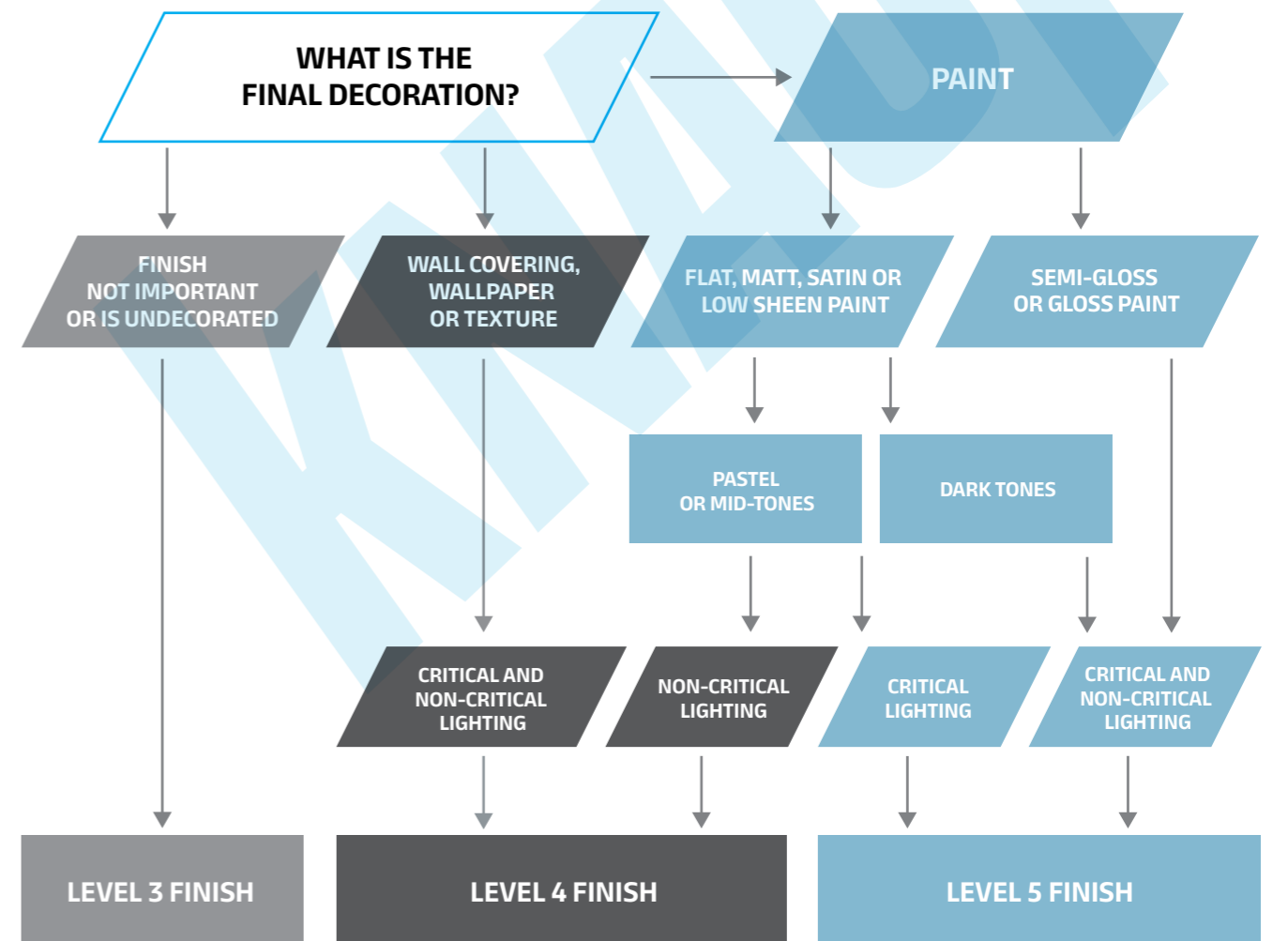


Figure B8: Levels of Finish

## Section C

Acoustic Requirements

01/2025

### **C/ ACOUSTIC REQUIREMENTS**

- C 2 Introduction
- C 3 Multi-Residential Buildings
- C 4 Commercial Buildings
- C 5 Educational Facilities
- C 7 Health Care Buildings
- C 8 Knauf Typical Acoustic Solutions

# INTRODUCTION

## Multi-residential Buildings

Any wall or floor/ceiling system separating sole-occupancy units in townhouses or multi-residential buildings should comply with the acoustic provisions of the Viet Nam Standard.

Because Vietnamese standards do not have many regulations related to acoustics, this section will mainly be based on the requirement of Australian Acoustical (AAAC) and National Construction Code (NCC).

While standard specifies minimum levels for sound insulation between attached dwellings, these levels may not always be sufficient to meet the expectations of the building occupants. In view of this, a higher degree of sound insulation, commensurate with the expectations of the end user, may need to be considered.

To this end the Association of Australian Acoustical Consultants (AAAC) developed the Guideline for Apartment and Townhouse Acoustic Rating providing a 'Star Rating' system that ranks the acoustical quality of multi-residential buildings on a scale from 2 (worst performing) to 6 (best performing) stars,

The Star Rating system covers noises associated with inter-tenancy activities such as voices, home theatre, internal building services and appliances (ie. air conditioning, lifts, water supply systems) as well as external noise intrusion (ie road, rail, and air traffic).

Provided on pages C3 are the performance indicators for star ratings meeting or exceeding NCC requirements (4 to 6 stars) for separating walls and floors. The full description of Star Rated system refer to the Guideline for Apartment and Townhouse Acoustic Rating available at the AAAC web site [aaac.org.au](http://aaac.org.au)

## Commercial Buildings

Concerned with the limited building regulations governing acoustical quality of commercial buildings, the AAAC has developed the Guideline for Commercial Building Acoustics focusing in particular on office buildings.

In developing this Guideline, the AAAC aimed at encouraging consistency between different developments and highlighting the importance of buildings acoustics to the apparent quality of commercial buildings.

This Guideline is intended to complement the relevant AS/NZS Standards (in particular AS/NZS 2107 *Acoustics - Recommended design sound levels and reverberation times for building interiors*) and Green Building Council Australia (GBCA) rating tools for Office Design and Office Interiors. It addresses such major issues as external noise, noise from building services, noise transfer between separate tenancies and noise transfer within the same tenancy

Extracts from the Guideline for Commercial Building Acoustics specific to noise isolation are provided on pages C4 and C5. The full Guideline can be found at [aaac.org.au](http://aaac.org.au)

## Educational Buildings

In the absence of consistent Australia-wide regulations and standards encompassing all aspects of the acoustic qualities of Educational buildings, the AAAC has developed the Guideline for Education Facilities Acoustics.

This Guideline is intended to be complimentary to local authority building requirements and individual and state guidelines (where they exist) and is consistent with the requirements,

The Guideline is aimed at achieving appropriate sound levels within teaching spaces while taking into account not only the activities that occur inside classrooms and teaching spaces, but also the activities that typically occur in adjacent spaces and outside during the course of a day.

Extracts from the Guideline for Education Facilities Acoustics are provided on pages C6 and C7. The full Guideline can be found at [aaac.org.au](http://aaac.org.au)

## Health Care Buildings

The design of health care facilities in Viet Nam must comply with the TCVN, the relevant Viet Nam Standards and state regulations.

As a further guide for designers and builders of health care facilities, included on page C8 are acoustic rating recommendations contained in the AAAC Guideline for Health Care Facilities. The full Guideline can be found at [aaac.org.au](http://aaac.org.au)

# MULTI-RESIDENTIAL BUILDINGS

## Extract from AAAC Guidelines

TYPE OF NOISE SOURCE	SOUND INSULATION EXPRESSED AS $D_{nT,w} + C_{tr}$		
	45*	50	55
	4 STAR	5 STAR	6 STAR
Normal Speech	Not Audible	Not Audible	Not Audible
Raised Speech	Just Audible	Not Audible	Not Audible
Dinner Party/Laughter	Just Audible	Not Audible	Not Audible
Shouting	Audible	Just Audible	Not Audible
Small Television/Small Entertainment System	Audible	Just Audible	Not Audible
Large Television/Large Hi-fi Music System	Clearly Audible	Audible	Just Audible
DVD With Surround Sound	Clearly Audible	Audible	Audible
Digital Television With Surround Sound	Clearly Audible	Audible	Audible

\*Min requirement.

INTERTENANCY ACTIVITIES	4 STAR	5 STAR	6 STAR
<b>(A) AIRBORNE SOUND INSULATION FOR WALLS AND FLOORS</b>			
Between Separate Tenancies $D_{nT,w} + C_{tr} \geq$	45*	50	55
Between A Lobby/Corridor & Bedroom $D_{nT,w} + C_{tr} \geq$	40	45	50
Between A Lobby/Corridor & Living Area $D_{nT,w} + C_{tr} \geq$	40	40	45
<b>(B) Corridor, Foyer To Living Space Via Door(s) <math>D_{nT,w} \geq</math></b>	30	35	40
<b>(C) IMPACT ISOLATION OF FLOORS</b>			
Between Tenancies $L_{nT,w} \leq$	50	45	40
Between All Other Spaces & Tenancies $L_{nT,w} \leq$	50	45	40
<b>(D) IMPACT ISOLATION OF WALLS</b>			
Between Tenancies	Yes	Yes	Yes
Between Common Areas & Tenancies	No	Yes	Yes

\*Min requirement.

### NOTE:

Wall and floor/ceiling systems separating sole-occupancy units in a multi-residential building must comply with the minimum acoustic provisions of the TCVN (refer to the Multi-Residential section for a summary of TCVN acoustic requirements).

# COMMERCIAL BUILDINGS

## Extract from AAAC Guidelines

**TABLE C3: ACCEPTABLE  $D_{w}$  VALUES DEPENDING ON A ROOM'S NOISE LEVEL AND THE TOLERANCE IN THE ADJACENT SPACE**

NOISE TOLERANCE IN RECEIVING ROOM	SOURCE ROOM ACTIVITY NOISE			
	LOW	AVERAGE	HIGH	VERY HIGH
High	30	35	40	45
Medium	35	40	45	50
Low	40	45	50	55
Very Low	45	50	55	60

For guidance on expected noise source levels and tolerance for various room occupancies refer to table C4.

**TABLE C4: ROOM NOISE SOURCE LEVELS AND TOLERANCE**

TYPE OF OCCUPANCY/ACTIVITY	SOURCE ACTIVITY LEVEL	NOISE TOLERANCE
Board and Conference Rooms	High	Very Low
Cafeterias	Very High	High
Call Centres	Average - High	Low - Medium
Computer (Server) Rooms	High	Medium - High
Corridors and Lobbies	Average	High
Design Offices	Average	Low
Drafting Offices	Average	Low
General Office Areas	Average	Medium
Private Offices	Low	Low
Public Spaces	Average	High
Reception Areas	Average	Medium
Rest Rooms and Tea Rooms	High	High
Toilets	Average	High
Undercover Car Parks	Very High	High

**TABLE C5: PERFORMANCE REQUIREMENTS BETWEEN SEPARATE TENANCIES WHERE SPACE USE IS UNKNOWN**

WEIGHTED LEVEL DIFFERENCE ( $D_w$ )				
POOR	AVERAGE	GOOD	VERY GOOD	EXCELLENT
35	40	45	50	55

TABLE C5: Provides acoustic quality as it relates to the quality of the development and where the use of the spaces either side of a common wall is unknown. The AAAC Guideline suggests a minimum  $R_w$  ( $D_w$  45) between tenancies.

**TABLE C6: PERFORMANCE REQUIREMENTS WITHIN THE SAME TENANCY WHERE SPACE USE IS YET TO BE DEFINED**

WEIGHTED LEVEL DIFFERENCE ( $D_w$ )				
POOR	AVERAGE	GOOD	VERY GOOD	EXCELLENT
30	35	40	45	50

TABLE C6: Provides acoustic quality as it relates to the quality of the development and where the use of the spaces on each side of the wall is yet to be defined, otherwise table C3 can be used.

**NOTE:**  
For office areas where walls do not extend full height, the ceiling selected will also become critical. Refer to Ceilings - Over Partition Systems for ceiling configurations required to maintain wall acoustic rating.

# EDUCATIONAL FACILITIES

## Extract from AAAC Guidelines

**TABLE C7: AIRBORNE AND IMPACT SOUND INSULATION REQUIREMENTS**

ROOM	SOUND INSULATION		
	SOURCE ROOM IMPACT GENERATION	SOURCE ROOM ACTIVITY AIRBORNE NOISE GENERATION	RECEIVING SPACE NOISE TOLERANCE
Atria (for circulation, not teaching)	Medium	Average	High
Art / craft studios	Medium	Average	Medium
Assembly halls up to 250 seats	High	Very High	Low
Assembly halls up over 250 seats	High	Very High	Low
Audio-visual areas	Low	High	Low
Cafeterias	High	Very High	High
Computer rooms - Teaching	Low	Average	Medium
Computer rooms - Laboratories	Low	Average	Medium
Conference room	Low	High	Very Low
Corridors and lobbies	Medium	Average	High
Drama Studios	Medium	High	Low
Dance Studios	High	Very High	Medium
Engineering workshops - Teaching	High	High	High
Engineering workshops - Non-teaching	High	High	High
Gymnasias / indoor sports	High	Very High	Medium
Weight training / fitness room	High	High	Medium
Interview / counselling rooms	Low	Low	Medium
Laboratories - Teaching	Low	Average	Medium
Laboratories - Working	Low	Average	Medium
Lecture rooms - up to 50 seats	Low	Average	Medium
Lecture theatres - without speech reinforcement and >50 seats	Low	Average	Low
Lecture theatres - without speech reinforcement	Low	High	Medium
Libraries - General areas	Medium	Average	Medium
Libraries - Reading areas	Low	Low	Low
Manual arts workshops	Medium	Average	Medium
Medical rooms (First aid)	Low	Low	Medium
Music practice rooms	Low	Very High	Low
Music studios	Low	Very High	Very Low
Nursery school - Play rooms	Medium	Average	Medium
Nursery school - Quiet rooms	Low	Low	Low
Office areas	Low	Average	Medium
Professional and administrative offices	Low	Average	Medium
Teaching spaces - Open plan	Low	Average	Low
Teaching spaces - Primary schools	Low	Average	Low
Teaching spaces - Secondary schools	Low	Average	Low
Teaching spaces - Hearing impaired	Low	Average	Low
Staff common rooms	Low	Low	Medium
Staff studies / collegiate	Low	Low	Low
Toilet / change / showers	Medium	Average	High
Swimming pools	Medium	High	High
Plant rooms	Low	High	High

## EDUCATIONAL FACILITIES

### Extract from AAAC Guidelines

NOISE TOLERANCE IN RECEIVING ROOM	ACTIVITY NOISE IN SOURCE ROOM			
	LOW	AVERAGE	HIGH	VERY HIGH
High	30	35	40	45
Medium	35	40	45	50
Low	40	45	50	55
Very Low	45	50	55	60

NOTE: Where doors are proposed between spaces consideration must be given to the placement and performance requirements of the door since ratings for doors with no acoustic treatment are not likely to exceed  $D_w$  20 dB while standard solid core doors with full perimeter acoustic seals could achieve a rating up to  $D_w$  30 dB

Noise tolerance in receiving room	IMPACT GENERATION IN SOURCE ROOM		
	LOW	MEDIUM	HIGH
High	70	65	60
Medium	65	60	55
Low	60	55	50*
Very Low	55	50*	45*

\* Where high impact generating activities are to be located above spaces with low noise tolerance, consideration should be given to the relocating of one of the spaces. Specialist advice should be sought where very high impact activities, such as gymnasia, are to occur above a sensitive space.

## HEALTH CARE BUILDINGS

### Extract from AAAC Guidelines

USAGE	INDICATIVE ACOUSTIC SEPARATION		USAGE	INDICATIVE ACOUSTIC SEPARATION	
	ADJACENT*	CORRIDOR**		ADJACENT*	CORRIDOR**
Single bed ward (including Mental Health, Parent Accommodation)	40	25	<b>PUBLIC AREAS</b>		
Multiple bed ward	40	25	Corridors and lobby spaces	-	-
Ward ensuites	40, Discont.	15	Cafeterias/ dining	40	15
Consulting, examination, interview, counselling/ bereavement	40	25	Family and parents' lounges	40	20
Treatment, procedures, surgeries	40	25	Toilets, amenities	40	15
Morgue presentation areas	45	25	Waiting rooms and Reception areas	40	-
Birthing room/delivery suites	45	25	Multi-faith, chapel, Lecture theatres, cinemas, multipurpose rooms	Specialist design input required	
Laboratories	40	20	Radio broadcast, interview or audio editing	Specialist design input required	
Clean utility/Dirty utility/ drug storage or preparation	35	15	Outdoor seating or activity areas	-	-
Speech and language therapy	40	25	<b>STAFF AREAS</b>		
Audiology/audiometry	As per AS1269.4	-	Enclosed nurse stations	35	-
Dental clinics	45	25	Boardroom/conference	45	25
Rehabilitation areas	40	25	Private offices	35	20
Hydrotherapy	45	25	Executive offices	40	25
General intensive care wards	45	25	Cellular offices (2-4 desks)	35	20
Neonatal or paediatric ICUs (NICU/PICU)	45	30	<b>UTILITY ROOMS</b>		
Pharmacy offices	35	20	Amenities, locker rooms	40	-
Kitchens, sterilisation and service areas	40	-	Morgue - Grossing stations, observation areas	55, Discont.	-
Operating theatres	40	25	<b>INFRASTRUCTURE</b>		
			Engineering, Workshops	55, Discont.	-
			Plantrooms, generators	55, Discont.	-

NOTE:

\* Minimum values to nearby noise-sensitive enclosed rooms where no common door exists - where interconnecting doors are proposed, these criteria are very difficult to achieve without effective spatial planning. Discontinuous walls as defined by the National Construction Code are recommended for impact or wall attached noise sources.

\*\* To circulation corridor, where the intermediate partition is a solid wall an operable door or air lock. Subtract 5 dB for listening areas with a visual connection (easily visible to the occupants of the space) Note that walls without a door onto a corridor would fall into the "Adjacent" category.

# KNAUF TYPICAL ACOUSTIC SOLUTIONS

TYPE C8: KNAUF TYPICAL ACOUSTIC SOLUTIONS									
No.	Acoustic Performance STC/Rw	Fire rating Performance EI	H max (mm)	Wall Width (mm)	Frame	Lining		Insulation	Applicable Areas
						Side 1	Side 2		
<b>DRYWALL</b>									
S01	47	45	3800	102	C76 x 0.5mm TCT @610	1x12.7mm FIRESHIELD	1x12.7mm FIRESHIELD	50mm RW 60kg/m³	Administration Offices - Business Centres and Meeting Rooms Administration Offices - Administration Offices Administration Offices - Lobby and Reception Areas
S02	48	60	4600	108	C76 x 0.5mm TCT @610	1x15.9 FIRESHIELD	1x15.9 FIRESHIELD	50mm RW 60kg/m³	Administration Offices - Business Centres and Meeting Rooms Administration Offices - Administration Offices Administration Offices - Lobby and Reception Areas
S03	49	60	5100	127	C76 x 0.5mm TCT @610	2x12.7mm STANDARDSHIELD* * for wet area, change standardshield to Glassmat 12.7mm	2x12.7mm STANDARDSHIELD* * for wet area, change standardshield to Glassmat 12.7mm	50mm RW 60kg/m³	Room - Toilet (Hotel) Toilet - Toilet (Hotel) Business Centres - Lobbies and Reception Areas (Hotel) Business Centres - General Administration Offices (Hotel) Business Centres - Guest Rooms and Suites (Hotel)
S04	50	60	5210	133	C76 x 0.5mm TCT @610	1x12.7mm STANDARDSHIELD (outer) + 1x15.9mm FIRESHIELD (inner)	1x12.7mm STANDARDSHIELD (outer) + 1x15.9mm FIRESHIELD (inner)	50mm RW 60kg/m³	Room - Room (Hotel) Room - Corridor (Hotel) Business Centres - Guest Rooms and Suites (Hotel) Business Centres - Restaurants
S05	54	120	4600	127	C76 x 0.5mm TCT @610	2x12.7mm FIRESHIELD	2x12.7mm FIRESHIELD	50mm RW 60kg/m³	Room - Room (Hotel) Room - Corridor (Hotel) Business Centres - Guest Rooms and Suites (Hotel) Business Centres - Restaurants
S06	54	150	5800	140	C76 x 0.5mm TCT @610	2x15.9mm FIRESHIELD	2x15.9mm FIRESHIELD	50mm RW 60kg/m³	Room - Room (Hotel) Room - Corridor (Hotel) Business Centres - Guest Rooms and Suites (Hotel) Business Centres - Restaurants
S07	57	60	4400	153	Twin C51 x 0.5mm TCT @610	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	50mm RW 60kg/m³	Room - Room (Hotel) Room - Corridor (Hotel) Business Centres - Guest Rooms and Suites (Hotel) Business Centres - Restaurants
S08	61	150	4500	166	Twin C51 x 0.5mm TCT @610	2x15.9mm FIRESHIELD	2x15.9mm FIRESHIELD	50mm RW 60kg/m³	Cinema/Ball Room/Conference Room



C Acoustic Requirements

C Acoustic Requirements



## Section D

Ceilings

01/2025

### **D/ CEILINGS**

- D 2 Introduction
- D 11 Acoustic Ceilings
- D 13 Ceilings Under Concrete Floor
- D 16 Over Partition Systems

# INTRODUCTION

## CONVENTIONAL CEILINGS

### Description

Knauf conventional ceilings comprise single or multiple-layer plasterboard linings attached to the underside of floor or structure above.

### Design Options

Knauf offers a wide range of plasterboard ceiling systems for application under floors.

Non-fire rated ceiling systems are available with acoustic ratings up to  $R_w$  57 or  $R_w + C_{tr}$  51 and  $L_{nw}$  values as low as 38 (on carpeted floors).

### Fire Rated Ceilings

Fire rated ceiling systems are available with Fire Resistance Levels up to -/120/120, Resistance to Incipient Spread of Fire (RISF) up to 120min, and acoustic ratings up to  $R_w$  65 and  $R_w + C_{tr}$  57, with  $L_{nw}$  values as low as 36 (on carpeted floors).

### Ceilings under Concrete Floors

Acoustic ratings for ceilings under concrete floors are provided for 150mm and 200mm slab thicknesses and the following floor coverings:

- Concrete flooring (min 8.5kg/m<sup>2</sup>) with or without acoustic underlay.
- Carpet + underlay.
- Tiled floor with or without acoustic underlay.
- Acoustic performances of up to  $R_w$  68 and  $R_w + C_{tr}$  62 can be achieved, with  $L_{nw}$  values as low as 29 (on carpeted floors).

### Attachment Options

Ceiling attachment options vary depending on the structure above and include:

- Direct fixed
- Furred
- Furred with acoustic mounts
- Suspended
- Suspended with acoustic mounts.

### Design Considerations

- Knauf ceiling systems are not designed to support the weight of construction or maintenance personnel, additional plant or storage of goods.
- Fire rated ceiling can be curved to a minimum radius of 6000mm.
- Ceiling systems can incorporate the following approved features: Access Panels, Bulkheads, Light & Luminaire fittings, Plumbing Pipe penetrations, Power Cable penetrations, Loaded penetrations, Control Joints, Protection to Steel and Timber Beams, Changes in ceiling slope direction and a variety of Perimeter Details.
- The use of false ceilings may eliminate the need for penetrations in fire rated ceilings. Refer Knauf for acoustic rating of fire rated ceiling systems with false ceilings.
- Suspension grids must be installed in accordance with Knauf specifications.

#### NOTES:

- Each suspension point must be capable of supporting the greater of 0.50kN (50kg) downwards, or the vertical actions determined in accordance with AS/NZS 2785 with an additional allowance of 50% of vertical actions.
- Extra suspension components must be provided to support light fittings, bulkheads and other fixtures.
- Plasterboard spans and total loads directly supported on ceiling linings must not exceed the values indicated in Table D1. Any additional loads must be independently supported from a roof or ceiling structure.
- Spans of Knauf frame must not exceed the values indicated in Table D2.

# INTRODUCTION

TABLE D1: MAXIMUM LOADS AND SPANS FOR INTERNAL CEILINGS

PLASTERBOARD TYPE	SPAN (mm)	MAXIMUM TOTAL LOAD* FOR GIVEN WIND CLASS (kg/m <sup>2</sup> )			
		N1	N2	N3	N4
9mm STANDARDSHIELD 12.7mm STANDARDSHIELD	610 (max)	2.6 <sup>†</sup>	2.6 <sup>†</sup>	2.0	2.0
	406	2.6 <sup>†</sup>			
12.7mm MOSTSHIELD 12.7mm & 15.9mm FIRESHIELD	610 (max)	2.0			
	406	2.6 <sup>†</sup>			
9mm MOSTSHIELD	406 (max)	2.0			

\* Total Load includes weight of insulation and any fixtures directly supported on ceiling linings.

† 1/3 Fixing method or full screw fixing must be used for non-fire rated ceilings if directly supported load exceeds 2.0kg/m<sup>2</sup> (maximum load 2.6kg/m<sup>2</sup>).

#### NOTES:

Loads in excess of the above must be supported independently from a roof or ceiling structure.

TABLE D2: SPACING FOR INTERNAL CEILINGS

WITHOUT INSULATION	SUPRA V	PRO V	PRO C	XTRA V	XTRA C
1 layer 9mm, 9.5mm	@1200 @406	@1100 @406	@1100 @406	@1000 @406	@1000 @406
1 layer 12.7mm, 15.9mm	@1100 @406	@800 @406	@800 @406	@800 @406	@800 @406
2 layer 9mm, 9.5mm	@800 @406	@800 @406	@800 @406	@600 @406	@600 @305
2 layer 12.7mm, 15.9mm	@800 @406	@800 @406	@800 @406	N/A	N/A
3 layer 9mm, 9.5mm	@800 @406	@600 @406	@600 @305	N/A	N/A
3 layer 12.7mm	@800 @305	@600 @406	@600 @305	N/A	N/A
3 layer 15.9mm	@600 @305	N/A	N/A	N/A	N/A

# INTRODUCTION

## Materials

The following materials and components are utilised in Knauf conventional ceiling systems listed in this manual:

### Ceiling Linings

- 9mm STANDARDSHIELD
- 9mm MOISTSHIELD
- 12.7mm STANDARDSHIELD/ MOISTSHIELD
- 12.7/15.9mm FIRESHIELD

### Concealed Ceiling Systems



Figure D1: V Channel Ceiling System

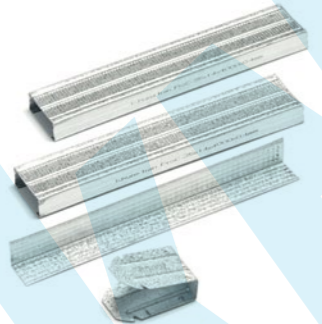


Figure D2: C Channel Ceiling System Figure

### Exposed Ceiling Systems

Ceiling attachment options vary depending on the structure above and include:

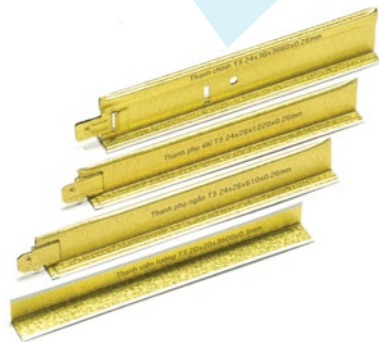


Figure D3: T3 Exposed Ceiling System

## Insulation

### Direct Fixed Systems

Where fixing direct to timber or steel framing, framework spacing must not exceed plasterboard span values 610mm for fire resistant boards.

### C Chanel Ceiling System

Knauf C Chanel Ceiling Systems are ideal for commercial, industrial and residential applications where the ceiling plenum is large and is intended to conceal air conditioning, and other M&E items.

Knauf C Chanel Ceiling Systems not only provide beautiful flush flat ceilings but can also provide fire protection and sound insulation.

### V Chanel Ceiling System

Knauf V Chanel Ceiling Systems use a male and female interlocking main runner connection that provide fast clip together components for easy installation and ceiling alignment. Knauf V Chanel Ceiling Systems are ideal for commercial, industrial and residential applications where the ceiling plenum is large and is intended to conceal air conditioning, and other M&E items.

Knauf V Chanel Ceiling Systems not only provide beautiful flush flat ceilings but can also provide fire protection and sound insulation.

### KNAUF K - BOARD Access Panel

Knauf K - Board is a readymade high quality access panel that is easily incorporated into plasterboard ceilings providing easy access to mechanical and electrical services above the ceiling.

### Exposed Grid Ceiling System

Knauf Exposed Grid Ceiling System is typically used for commercial and industrial applications which require aesthetic ceiling finishes or easy access to the ceiling void above. The system consists of high quality pre-painted metal sections that form a grid when locked together into which high quality Knauf Ceiling Tiles can be installed.

### T3 Exposed Grid Ceiling System

T3 Exposed Grid Ceiling System is typically used for commercial applications which require a higher level of ceiling aesthetics. The system consists of high quality pre-painted metal sections which have a shadow-line recess that adds to the overall aesthetics of the finished ceiling.

T3 sections form a grid when locked together into which high quality Knauf Ceiling Tiles can be installed.

# INTRODUCTION

## Knauf Pro V Concealed Ceiling Systems

Knauf Pro V Concealed Ceiling Systems use a male and female interlocking main runner connection that provide fast clip together components for easy installation and ceiling alignment.

Knauf Pro V systems are ideal for commercial, industrial and residential applications where the ceiling plenum is large and is intended to conceal air conditioning, and other M&E items.

Knauf Pro V systems not only provide beautiful flush flat ceilings but can also provide fire protection and sound insulation.

Each ceiling component has been specially engineered to optimise ceiling strength, rigidity and loading performance.

Ceiling voids can also be varied to accommodate mechanical and electrical services and air-conditioning ducting. All services installed above the ceiling must be supported by the structure above and not by the concealed ceiling system.

### Performance

The selection of ceiling system and boarding will depend on the performance and board thickness, refer to performance tables D2.

## Pro V Concealed Ceiling System

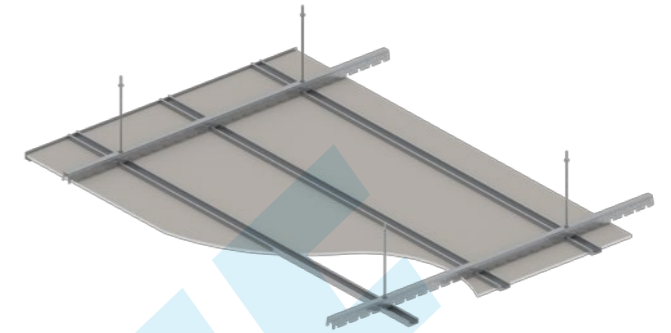


Figure D4: V Channel System

### Safety

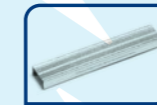


Knauf Pro V Concealed Ceiling Systems are classed as non-trafficable ceilings and should not be walked upon by installers or other trades people.

### Main Components



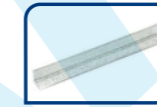
Knauf Pro V (main runner)



Knauf Pro V (cross runner)



Threaded Rod



V32 Wall Angle



Screws

### Add Components For Fire And Sound Performance



Intumescent Acoustic Sealant



Insulation

# INTRODUCTION

## Knauf Pro C Concealed Ceiling Systems

Knauf Pro C Concealed Ceiling Systems are ideal for commercial, industrial and residential applications where the ceiling plenum is large and is intended to conceal air conditioning, and other M&E items.

Knauf Pro C Concealed Ceiling Systems not only provide beautiful flush flat ceilings but can also provide fire protection and sound insulation.

Knauf Pro C Concealed Ceiling Systems are designed with simple fast clip together components for easy installation and ceiling alignment.

Each ceiling component has been specially engineered to optimise ceiling strength, rigidity and loading performance.

Ceiling voids can also be varied to accommodate mechanical and electrical services and air-conditioning ducting. All services installed above the ceiling must be supported by the structure above and not by the concealed ceiling system.

### Performance

The selection of ceiling system and boarding will depend on the performance required for fire, refer to performance tables D2.

### Main Components


### Add Components For Fire And Sound Performance

--	--

## Concealed Ceiling System

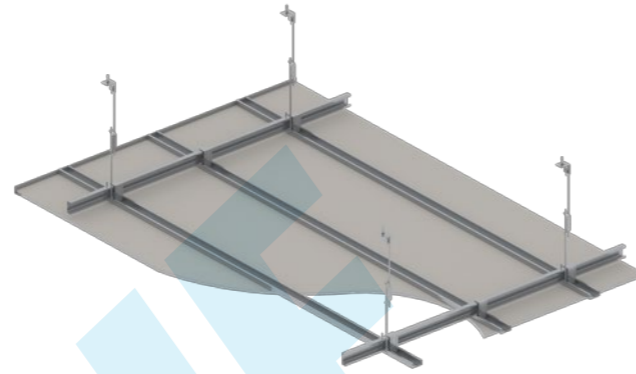


Figure D5: C Channel System

### Safety



Knauf Pro C Concealed Ceiling Systems are classed as non-trafficable ceilings and should not be walked upon by installers or other trades people.

# INTRODUCTION

## Knauf T3 Exposed Grid Ceiling System

Knauf T3 Exposed Grid Ceiling System is typically used for commercial applications which require a higher level of ceiling aesthetics. The system consists of high quality pre-painted metal sections which have a shadow-line recess that adds to the overall aesthetics of the finished ceiling.

Knauf T3 sections form a grid when locked together into which high quality Knauf Ceiling Tiles can be installed.

The system is suspended from soffits by using the Knauf hanger system which incorporates the Knauf Fix Spring for easy adjustments to ceiling flatness during installation.

### Performance

The selection of Knauf Ceiling Tiles will depend on the aesthetics requirement, ease of cleaning and if sound absorption performance is required.

Due to the extensive range of Knauf Ceiling Tiles and regular introduction of new aesthetic designs contact Knauf Technical Support Centre for further information.

### Safety



Knauf T3 Exposed Grid Ceiling System is classed as a nontrafficable ceiling and should not be walked upon by installers or other trades people.

### Main Components


## Exposed Ceiling System

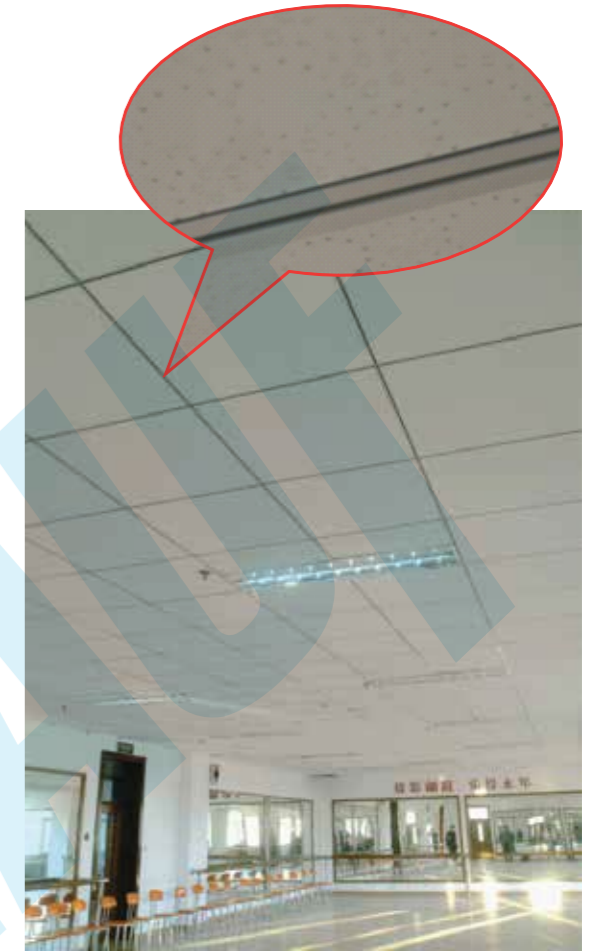


Figure D6: Exposed Ceiling System

## INTRODUCTION

### Conceal and Exposed Systems

- Ensure that furring channels or suspended grid are installed to a true and level plane.
- Plasterboard supporting members must be spaced at max 610mm ctrs.
- Main/cross Runner should be taken to and provided within 100mm of ceiling perimeter (min 15mm end clearance is required at walls).
- Allow for an expansion gap at the rate of 3mm per 1 metre run in abutting furring channels and Top Cross Rails in fire rated systems.
- Knauf concealed suspended ceiling system must be installed in accordance with Knauf specifications.

### Penetrations

Penetrations in a fire rated system must be treated strictly in accordance with relevant test reports and approved installation details in order to maintain the system's Fire Resistance Level.

Where components by others are specified in Knauf fire rated penetration details (ie dampers, GPOs, fire collars, etc), such components must be installed in accordance with the manufacturer's specifications. It is the responsibility of the component manufacturer to ensure that the fire rating performance of the system is not affected.

### Movement and Control Joints

- Control joints in internal ceilings should be spaced at 12m max intervals in both directions. Control joints in external ceilings should be spaced at 6m max intervals in both directions.
- Control joints must be provided over movement joints in the substrate or structural elements and at every change of lining or substrate material.
- Refer to [knauf.com](http://knauf.com) for control joint details in fire rated ceilings.
- Control joints in non-fire rated ceilings can be formed by lastic expansion beads.
- In multi-layer non-fire rated systems control joints can be provided in the face layer only.

### Plasterboard Fixing

#### Fire Rated Ceilings

- Plasterboard linings in fire rated plasterboard ceilings must be installed using screw fixing only. Adhesives are not permitted.
- Apply plasterboard sheets with recessed edges at right angles to framing members.
- In single layer systems, place butt joints on framing or mid-way between the framing members and back-block as shown in the [knauf.com](http://knauf.com).
- Screw fix the first (uppermost) layer sheets at 200mm max centres in the field of the board and at 150mm max centres along the board ends and edges. Stagger edge screw fixings in adjacent sheets.
- Screw fix additional plasterboard layers in the same manner as the first layer but with all joints in adjacent layers staggered min 200mm. If butt joints in additional layers fall between the framing members, screw laminate sheet ends to the previous layer with appropriate Laminating screws at 200mm max centres (refer to General Information – Materials – Screws).

### Non-fire Rated Ceilings

- Apply plasterboard sheets with recessed edges at right angles to framing members.
- Single layer non-fire rated plasterboard ceiling systems can be fixed using combination of Adhesive and Mechanical Fasteners as outlined in Knauf Installation Manual.
- Multi-layer non-fire rated plasterboard ceiling systems must be fixed using Mechanical Fasteners Only method.
- In single layer systems, butt joints must be between the framing members and back-blocked as described in Knauf Installation Manual. All recessed joints in an area containing three or more joints must also be back-blocked.

#### NOTES:

Knauf recommends back-blocking of all ceiling joints.

### Jointing and finishing

- Stop and finish face layer plasterboard joints with Knauf jointing system as outlined in Knauf Plasterboard Installation Manual.
- Plasterboard joints in inner layers of multi-layer fire rated and non-fire rated systems are not required to be stopped

#### NOTES:

Paper jointing tape must be used in fire rated systems.

To view the full range of installation details, head to [knauf.com](http://knauf.com).

## INTRODUCTION

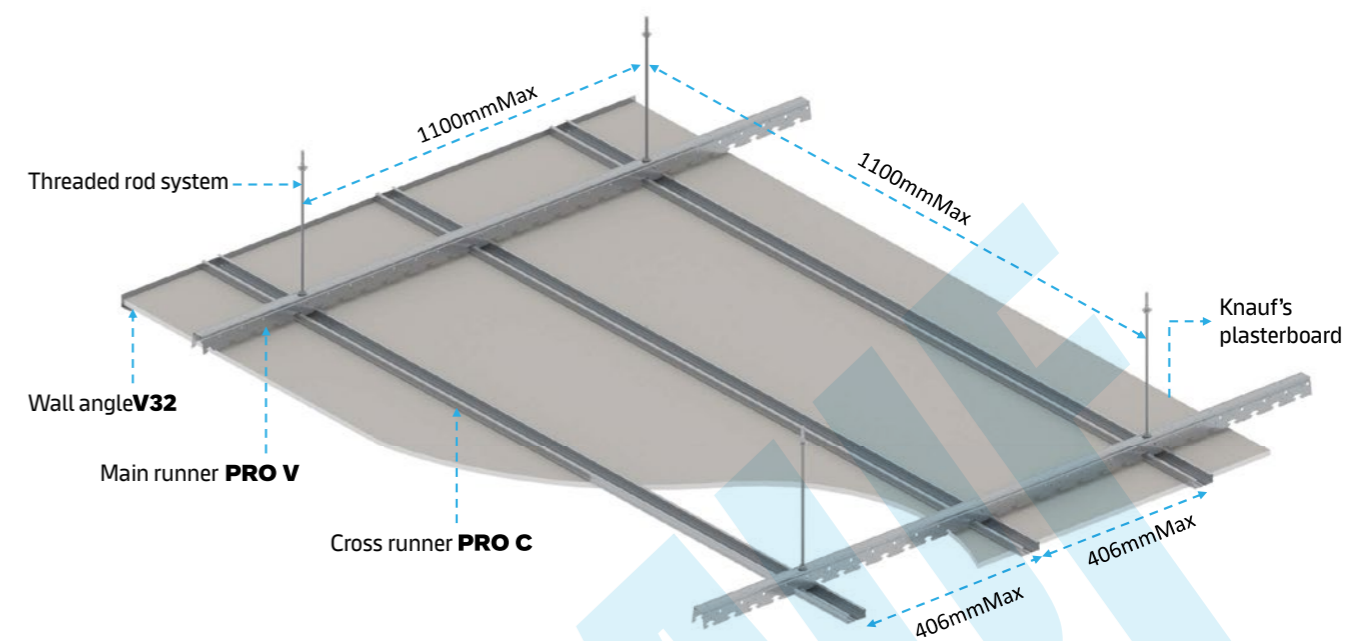


Figure D7: Pro V System

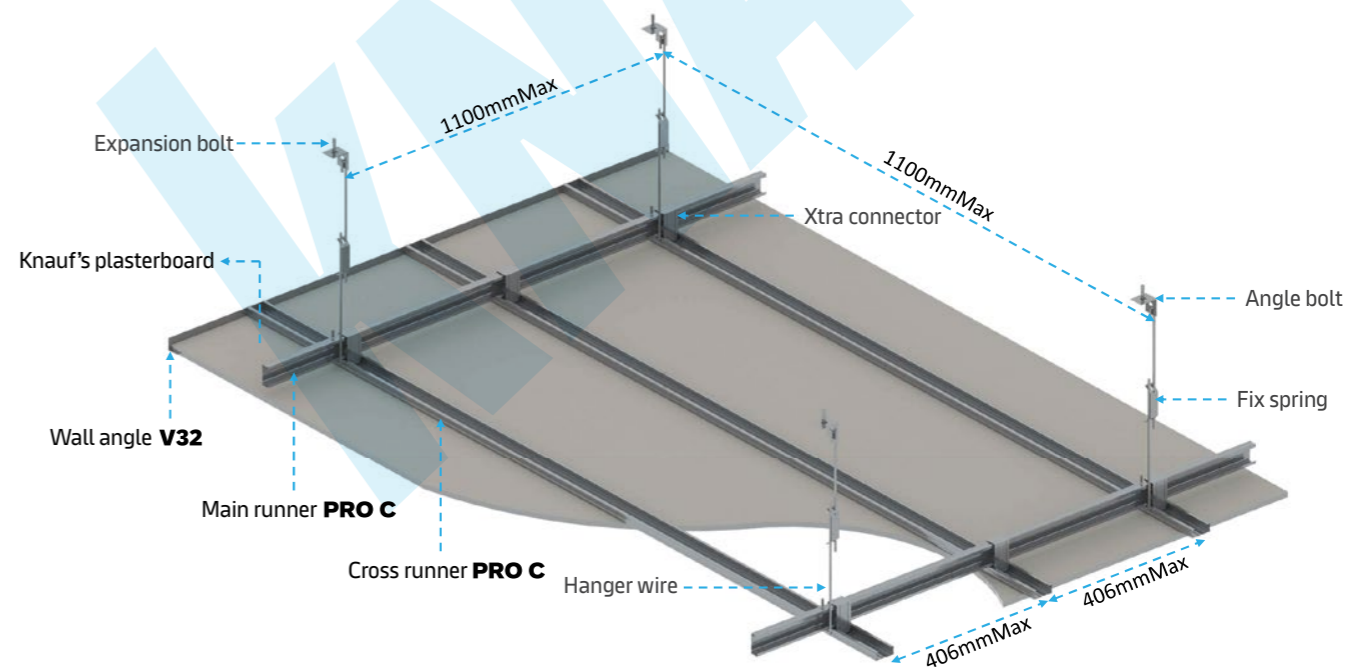


Figure D8: Pro C System

## ACOUSTICAL CEILINGS

### Description

Knauf Acoustical Ceilings are available in a range of sound absorption and over partition ratings and include:

- Knauf Ceiling System (Mineral Fibre Ceiling tiles)
- ECHOBLOC® plasterboard
- CLEANEO® plasterboard

This manual provides an outline of Knauf Acoustic Ceilings. For detailed information refer to Ceilings Products and Applications brochure and technical data sheets for various products.

### Design Options

#### Mineral Fibre Ceiling Tiles

Knauf mineral fibre ceiling tiles offer designers and builders a range of options with respect to:

- Surface textures and colours
- Edge and Grid profiles
- Noise Reduction Coefficient (NRC)
- Ceiling Attenuation Class (CAC)
- Light Reflectance (LR)
- Volatile Organic Compound (VOC) emissions
- Mould and bacteria resistance
- Recycled content
- Cost

Refer Acoustic Ceilings tables for the range of available Mineral Fibre Ceiling Tile products.

### ECHOBLOC® Plasterboard Ceilings

Echobloc perforated plasterboard ceilings offer combined benefits of decorative finish and a high level of sound absorption.

Echobloc perforated plasterboard is suitable for full ceiling installation or feature panels on walls or ceilings.

Created for noise absorption treatment, Echobloc is available in a number of stylish designs to suit multiple applications.

Refer to Echobloc tables and datasheets for acoustic performance of various Echobloc panels.



Figure D9: Echobloc Ceiling

# ACOUSTICAL CEILINGS

## Design Considerations

Selection of an appropriate acoustic ceiling solution may involve a large number of considerations such as aesthetics, acoustic performance, VOC emissions, mould and bacteria resistance, cost, etc.

Acoustic Ceilings tables included in this manual provide essential information on performance and features of Knauf acoustic panels. For additional information refer relevant Product Data Sheets at [knauf.com](http://knauf.com)

## Materials

- Knauf Mineral Fibre Tile Ceilings comprise mineral fibre tiles laid into T3 Exposed Grid system.
- Echostop® panels can be screw fixed to Knauf Conceal Ceiling System

## Installation

- Knauf V Chanel Conceal System
- Knauf C Chanel Conceal System
- Knauf T3 Exposed System

## Over Partition Ceiling Systems

Over partition performance of ceiling tiles is typically documented as a Ceiling Attenuation Class (CAC) value. More recently, this rating has been replaced by  $D_{nc,w}$  – Weighted Suspended Ceiling Normalised Level Difference.


The solutions provided in the Over Partition Ceiling Systems tables are based on an extensive laboratory test program. Variables tested included:

- Differing heights of extended wall linings above the ceiling level
- Different ceiling types on one and both sides of the dividing wall
- With and without above ceiling treatments
- Effect of ceiling penetrations.

The following key findings were made as a result of the testing program:


- No acoustical benefit whether the wall linings extend 100mm above the ceiling as opposed to a nominal distance of 20mm
- Penetrations such as standard light troffers both sides of the dividing wall do not degrade the  $D_{nc,w}$  of the ceiling (other types of ceiling penetrations will need to be assessed by a suitably qualified Acoustician).

# CEILINGS UNDER CONCRETE FLOOR

CC.1	ACOUSTIC RATINGS BASIS								
	System	Ceiling Lining	Flooring Type	Ceiling Cavity	Slab Thickness (mm)	150mm		200mm	
					Insulation	$R_w(R_w+C_p)$	$L_{n,w}$	$R_w(R_w+C_p)$	$L_{n,w}$
 <p><b>SYSTEM DESCRIPTION</b>  <b>Floor Structural:</b> Concrete slab  <b>Insulation:</b> Steel studs  <b>Ceiling board:</b> Refer to table  <b>Ceiling frame:</b> Suspended (For ceiling cavity refer to table)</p>	CC.1A	1x12.7mm STANDARDSHIELD	Bare Concrete	300	Nil.	60(54)	61	64(57)	58
					Glasswool 50mm x 24 kg/m <sup>3</sup>	60(59)	58	68(62)	55
		Tiled Floor + Flexible adhesive	300	Nil.	60(54)	61	64(57)	58	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	64(59)	58	68(62)	55	
CC.1B	1x12.7mm MOISTSHIELD	Bare Concrete	300	Nil.	60(54)	61	64(57)	58	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	60(59)	58	68(62)	55	
		Tiled Floor + Flexible adhesive	300	Nil.	60(54)	61	64(57)	58	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	64(59)	58	68(62)	55	
CC.1C	1x12.7mm GlassMat / FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	61(56)	31	65(59)	28	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	65(61)	30	69(64)	27	
		Tiled Floor + Flexible adhesive	300	Nil.	61(56)	60	65(59)	57	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	65(51)	57	69(64)	54	
CC.1D	1x15.9mm FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	60(56)	32	64(59)	29	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	64(61)	31	68(64)	28	
		Tiled Floor + Flexible adhesive	300	Nil.	60(56)	61	64(59)	58	
				Glasswool 50mm x 24 kg/m <sup>3</sup>	64(61)	58	68(64)	55	

Note:  $R_w$  / STC performance are based on Knauf database and expert opinion unless otherwise noted.  
 + Foam underlay: Minimum 3mm Dunlop DB3 foam underlay or equivalent  
 ^ Flexible adhesive: Laticrete 335 Premium flexible adhesive or equivalent

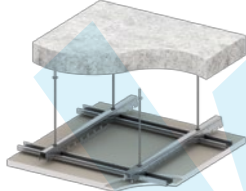
## CEILINGS UNDER CONCRETE FLOOR

CC.2		ACOUSTIC RATINGS BASIS							
NON-FIRE RESISTANCE LEVEL REI: -/-/-	System	Ceiling Lining	Flooring Type	Ceiling Cavity	Slab Thickness (mm)	150mm		200mm	
					Insulation	$R_w(R_w+C_{tr})$	$L_{n,w}$	$R_w(R_w+C_{tr})$	$L_{n,w}$
						Nil.	61(56)	31	65(59)
	CC.2A	1x12.7mm GlassMat / FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	61(56)	31	65(59)	28
					Glasswool 50mm x 24 kg/m <sup>3</sup>	65(61)	30	69(64)	27
			Tiled Floor + Flexible adhesive	300	Nil.	61(56)	60	65(59)	57
					Glasswool 50mm x 24 kg/m <sup>3</sup>	65(61)	57	69(64)	54

**SYSTEM DESCRIPTION**

**Floor Structural:** Concrete slab  
**Insulation:** Steel studs  
**Ceiling board:** Refer to table  
**Ceiling frame:** Suspended  
 (For ceiling cavity refer to table)

Note:  $R_w$  / STC performance are based on Knauf database and expert opinion unless otherwise noted.  
 + Foam underlay: Minimumm 3mm Dunlop DB3 foam underlay or equivalent  
 ^ Flexible adhesive: Laticrete 335 Premium flexible adhesive or equivalent


CC.60		ACOUSTIC RATINGS BASIS							
FIRE RESISTANCE LEVEL REI: -/60/60	System	Ceiling Lining	Flooring Type	Ceiling Cavity	Slab Thickness (mm)	150mm		200mm	
					Insulation	$R_w(R_w+C_{tr})$	$L_{n,w}$	$R_w(R_w+C_{tr})$	$L_{n,w}$
						Nil.	61(57)	31	65(60)
	CC.60	2x15.9mm FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	61(57)	31	65(60)	28
					Glasswool 50mm x 24 kg/m <sup>3</sup>	65(62)	30	69(65)	27
			Tiled Floor + Flexible adhesive	300	Nil.	61(57)	60	65(60)	57
					Glasswool 50mm x 24 kg/m <sup>3</sup>	65(62)	57	69(65)	54

**SYSTEM DESCRIPTION**

**Floor Structural:** Concrete slab  
**Insulation:** Steel studs  
**Ceiling board:** Refer to table  
**Ceiling frame:** Suspended  
 (For ceiling cavity refer to table)

Note:  $R_w$  / STC performance are based on Knauf database and expert opinion unless otherwise noted.  
 + Foam underlay: Minimumm 3mm Dunlop DB3 foam underlay or equivalent  
 ^ Flexible adhesive: Laticrete 335 Premium flexible adhesive or equivalent

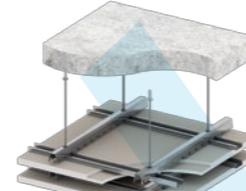
## CEILINGS UNDER CONCRETE FLOOR

CC.90		ACOUSTIC RATINGS BASIS							
FIRE RESISTANCE LEVEL REI: -/90/90	System	Ceiling Lining	Flooring Type	Ceiling Cavity	Slab Thickness (mm)	150mm		200mm	
					Insulation	$R_w(R_w+C_{tr})$	$L_{n,w}$	$R_w(R_w+C_{tr})$	$L_{n,w}$
						Nil.	61(58)	31	65(60)
	CC.90	3x15.9mm FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	61(58)	31	65(60)	28
					Glasswool 50mm x 24 kg/m <sup>3</sup>	65(63)	30	69(65)	27
			Tiled Floor + Flexible adhesive	300	Nil.	61(58)	60	65(60)	57
					GW 50 x 24 kg/m <sup>3</sup>	65(63)	57	69(65)	54

**SYSTEM DESCRIPTION**

**Floor Structural:** Concrete slab  
**Insulation:** Steel studs  
**Ceiling board:** Refer to table  
**Ceiling frame:** Suspended  
 (For ceiling cavity refer to table)

Note:  $R_w$  / STC performance are based on Knauf database and expert opinion unless otherwise noted.

CC.120		ACOUSTIC RATINGS BASIS							
FIRE RESISTANCE LEVEL REI: -/120/120	System	Ceiling Lining	Flooring Type	Ceiling Cavity	Slab Thickness (mm)	150mm		200mm	
					Insulation	$R_w(R_w+C_{tr})$	$L_{n,w}$	$R_w(R_w+C_{tr})$	$L_{n,w}$
						Nil.	65(59)	31	69(62)
	CC.120	2x15.9mm FIRESHIELD + Supra V frame + 2x15.9mm FIRESHIELD	Carpet floor + Foam Underlay	300	Nil.	65(59)	31	69(62)	28
					Glasswool 50mm x 24 kg/m <sup>3</sup>	69(64)	30	73(67)	27
			Tiled Floor + Flexible adhesive	300	Nil.	65(59)	60	69(62)	57
					Glasswool 50mm x 24 kg/m <sup>3</sup>	69(64)	57	73(67)	54

**SYSTEM DESCRIPTION**

**Floor Structural:** Concrete slab  
**Insulation:** Steel studs  
**Ceiling board:** Refer to table  
**Ceiling frame:** Suspended  
 (For ceiling cavity refer to table)

Note:  $R_w$  / STC performance are based on Knauf database and expert opinion unless otherwise noted.

# OVER PARTITION SYSTEMS

## Typical Layouts

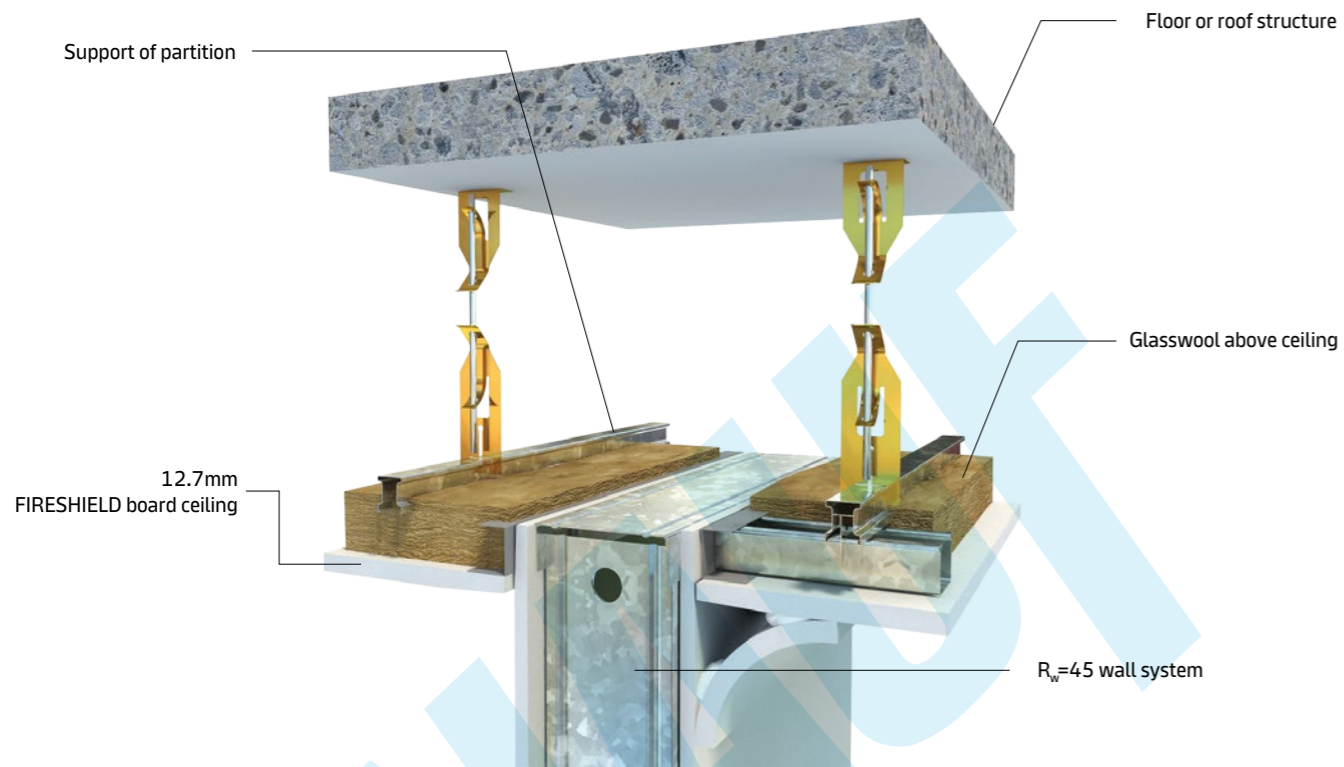


Figure D10: Ceiling configuration to maintain an  $R_w=45$  wall acoustic rating (\*)  
 (\*): With Glasswool 50mm 24 kg/m<sup>3</sup> over entire ceiling both sides of wall

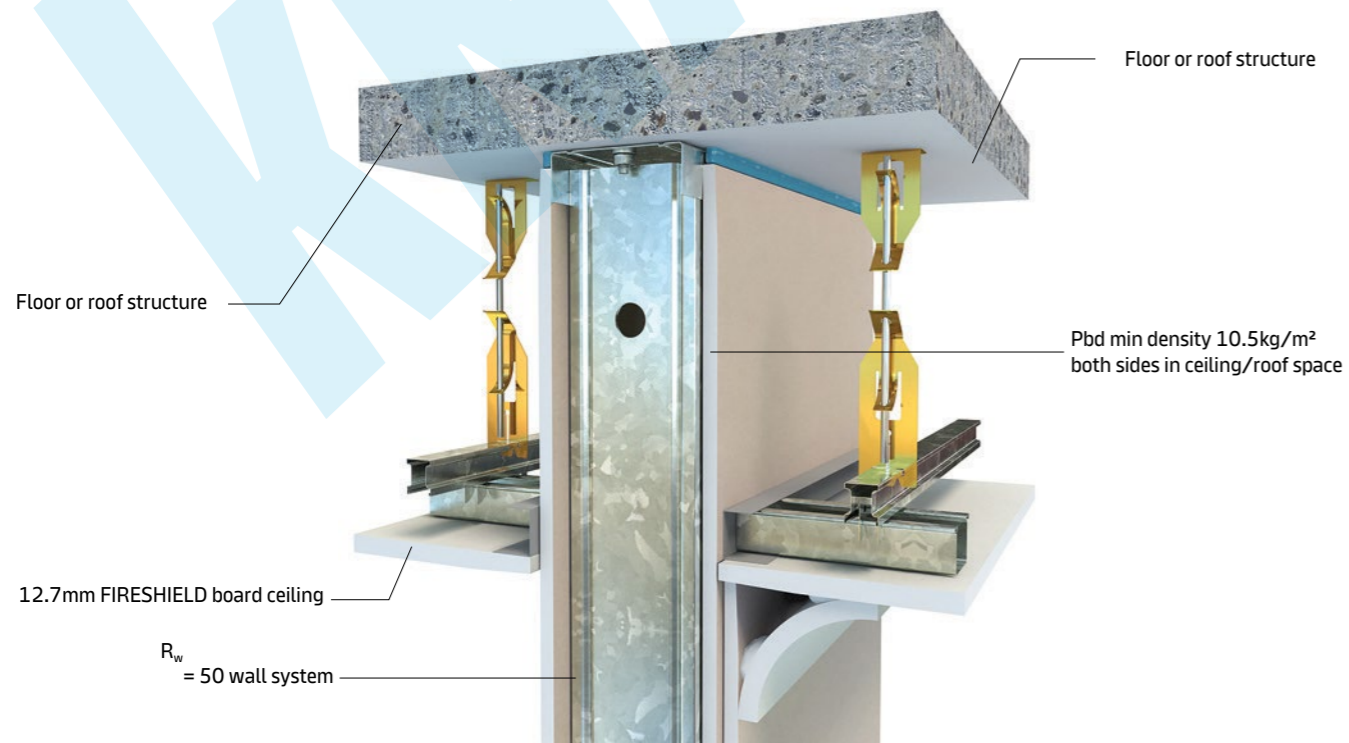


Figure D11: Ceiling configuration to maintain an  $R_w=50$  wall acoustic rating



# EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT/ AQUAPANEL

## Semi-exterior

At Knauf, we believe the best innovations are purposefully focused to serve market needs. Through an evergrowing portfolio of ground-breaking products backed by unparalleled services, Knauf presents the Exterior Ceiling Systems.

The systems consist of a versatile, easy-to-assemble and cost-effective exterior metal framing system paired with Knauf SECUROCK® Glass-Mat Sheathing.

Using standard steel studs profiles and purpose-made accessories, the exterior metal framing can be designed to cater for various wind loads while providing a safe framework.

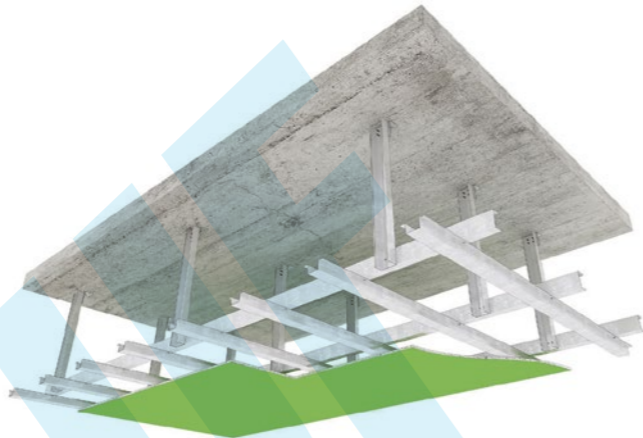
Knauf SECUROCK® Glass-Mat Sheathing is the perfect solution as it offers the same speedy installation steps as traditional plasterboard but with higher resistance to mould and moisture. Knauf's 3-coat jointing system also minimises joint cracks and the surface to be skin coated for a smooth finish.

## Application

### Arrival Porch/Porte Cochère - Semi-exposed Ceilings



### Soffits - Fascia - Balcony - Walkways



# EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT/ AQUAPANEL

## Eliminating Possible Occurrence of Typical Issues

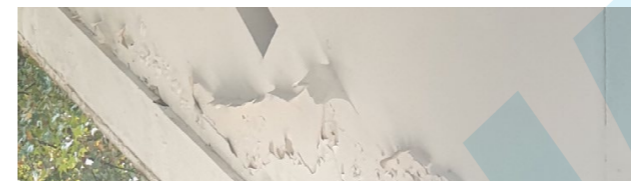
When a properly designed exterior framing system is paired with Knauf's SECUROCK® Glass-Mat Sheathing and finished to specification, an aesthetically pleasing ceiling can be achieved whilst eliminating the typical issues as below:



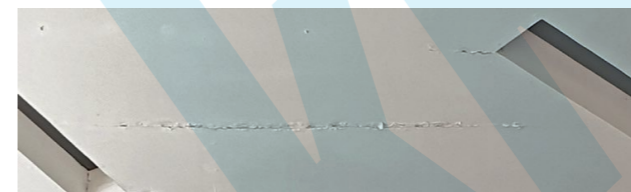
**Mould**



**Paint Peel**



**Crack**



**Varied Quality Standards Over Wide Product Range**

The other boards make the determination of the proper installation and finishing technique difficult, typically costlier and requires multiple reworks.

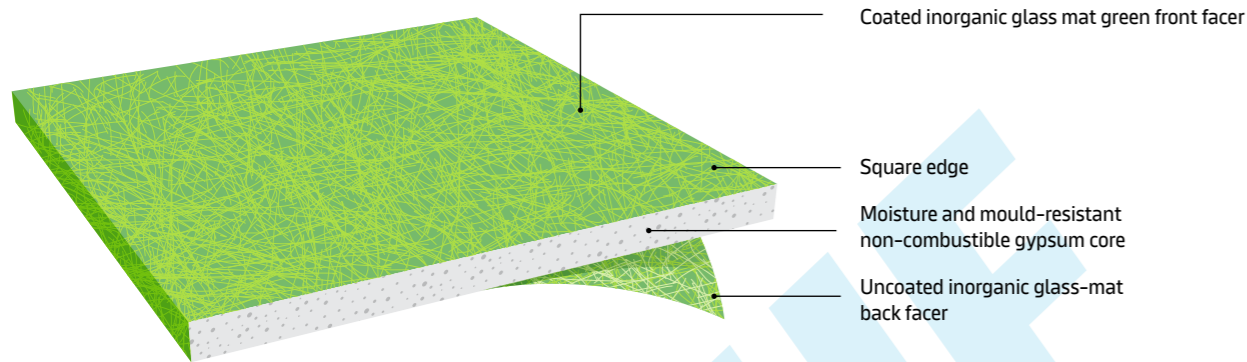


**Difficult Installation**

Other boards are heavy and typically cut with a circular saw, require screw pre-drilling and specific proper jointing method.

# EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT/ AQUAPANEL

## Water-resistant Gypsum Board Glass-Mat







### Introduction

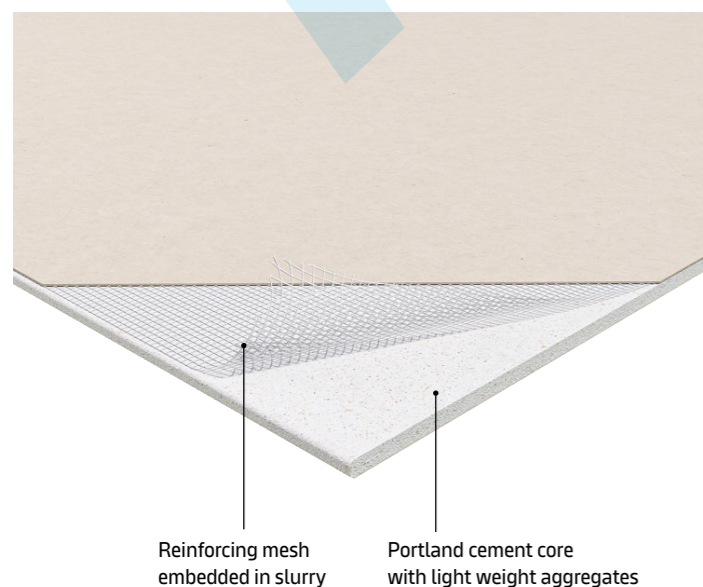
Knauf SECUROCK® Glass-Mat Sheathing is a non-combustible, moisture-and-mould-resistant panel that offers a fibreglass facer mat that sheds water. It is designed for use in exterior partitions and ceilings.

Depending on wind load affecting the structure, the glass-mat panel should be supported by metal framing members designed to achieve deflection criteria of L/360. Refer to the submittal sheet for more information.

The panels can be finished with Knauf's tried and tested 3-coat joint system, skimmed to a Level 4 or 5 finish as per ASTM C840 and painted or finished with a properly designed Direct-Applied Exterior Finishing System.

Attributes	ADVANTAGE
<b>Mould-resistant</b>	High resistance to mould and mildew and scores a 10 (highest) when tested in accordance with ASTM D3273 
<b>Water-resistant</b>	Glass-mat sheathing facer on both sides repel water 
<b>Fire-resistant</b>	Extensive ANSI/UL 263 Fire Resistant Designs (UL Designation USGX) Non-combustible and certified as Class O according to BS 476/EN/15283/QCVN 06: 2022/BXD 
<b>Quick, Dry Installation</b>	Quick score and snap, no sawing or special tools and rapid screw or nail attachment 

## AQUAPANEL® Cement Board



### Compatible with an extensive range of surface finishes

- 100% water-resistant, no swelling or loss of stability
- Resistant to moisture, weathering, mould and mildew
- Freeze-thaw cycle proven
- Stable and durable Portland cement construction
- Board can be curved, down to 1 meter
- Safe and hygienic material
- Non-combustible A1
- Strong, robust and high impact resistant



# EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT/ AQUAPANEL

## Small Areas (<3m Span)

- Soffit
- Balcony Ceiling
- Exterior Corridors/Walkways
- Porches
- Fascia
- Ceiling of Building Extensions



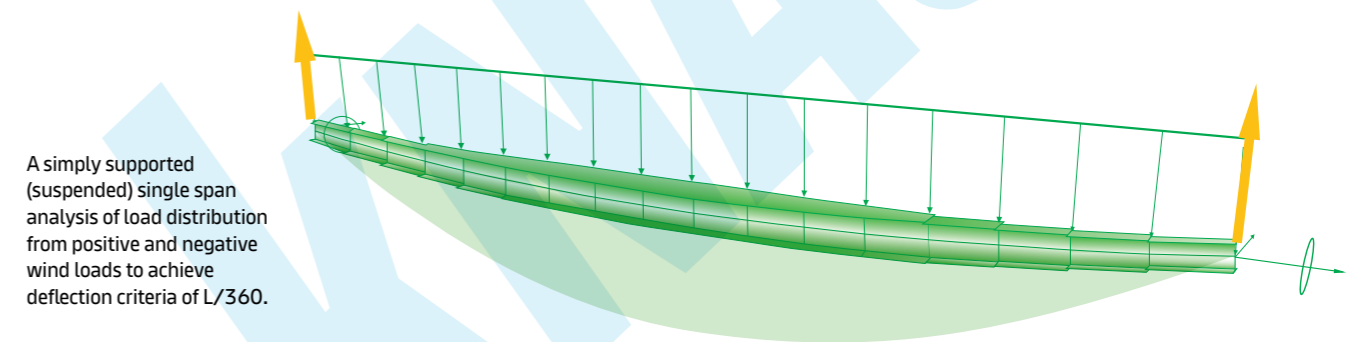
The exterior framing system is engineered for cost-effectiveness and hassle-free installation.

### Design & Safety Factors

Engineering designs and details cater for wind loads of up to 4.5kPa, for a maximum span of approximately 3.0m. (Consult the Knauf office for exterior ceiling solution).

### Single Span

The metal framing members are suspended on both ends (single span) with stud hangers, akin to installing a horizontal drywall framing.



A simply supported (suspended) single span analysis of load distribution from positive and negative wind loads to achieve deflection criteria of L/360.

## Advantages of eliminating suspension hangers will make the framing system:



**More Cost-Effective**  
Less components and parts



**Consistently Flat**  
No flatness adjustment required



**Easier Installation**  
No need to install anchors for hangers



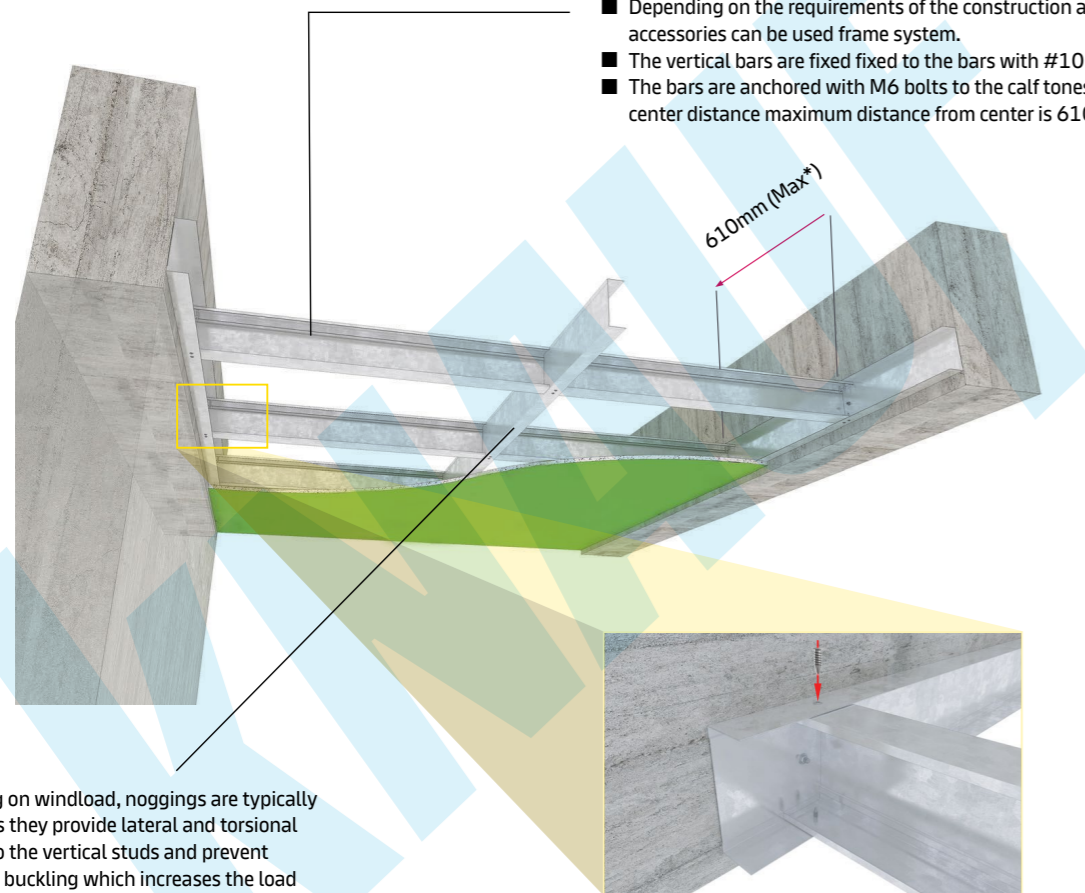
**Safe Installation**  
Less work-at-height requirements

## EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT

### Vertical and horizontal bars (Do not use suspension systems)

The vertical and horizontal bars used in this system do not require any additional bar brackets, making installation very quick and easy. Depending on the wind load acting on the structure, the size or thickness of the frame can vary as follows:

- Vertical bar: Frame width 51mm/64mm.
- Thickness: 0.5mm
- Recommended coating: AZ50
- Frame size and spacing are determined by design requirements.
- The frames are installed horizontally, with the span length of the ceiling.
- Depending on the requirements of the construction area, additional accessories can be used frame system.
- The vertical bars are fixed fixed to the bars with #10 size screws.
- The bars are anchored with M6 bolts to the calf tones according to center distance maximum distance from center is 610mm.



Depending on windload, noggings are typically required as they provide lateral and torsional restraint to the vertical studs and prevent premature buckling which increases the load that can be carried by the system.

#### NOTES:

- Consult Knauf for more information on systems and screws.
- Glass-Mat crew spacing varies depending on wind load.

## EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT

### Semi-open Ceiling Frame System (Large Semi-open Area (Span Length >3 Meters))

- Hotel Lobby
- Arrival Porch/Porte Cochère
- Casino Entrance
- Transportation Hub
- Building Foyer

#### Multiple Span Design

Engineering designs using simply supported multiple-span framing reduces the need for costly large and/or heavy gauge studs. It also guards against possible occurrence of multiple positive and negative forces over a large span of area.

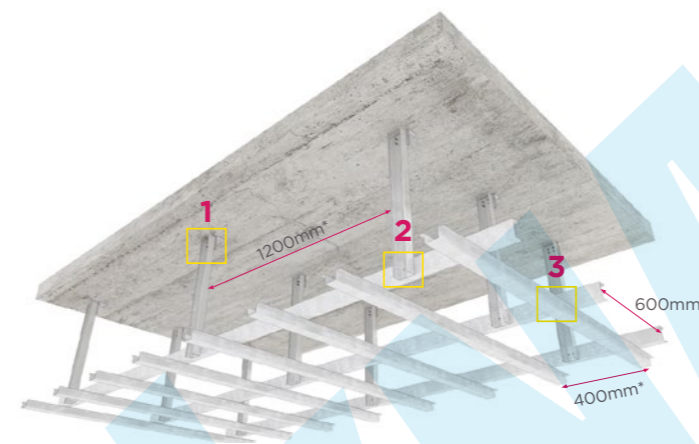
#### Studs and Tophats

Typical studs and tophats profiles are used in this system together with a specially designed exterior bracket. The system is easy to install with the use of #12 gauge hex head self-drilling screws. Depending on the wind loads affecting the structure, the size or thickness of framing member may vary as below:

- Frame width: 51mm/ 64mm.
- Thickness: 0.5mm
- Recommended coating: AZ50.

#### NOTES:

- \* Maximum distance as shown. Consult Knauf for information Screw and bracket spacing details.
- Glass-Mat screw spacing varies depending on wind load.



#### Connection between hanger and concrete ceiling:

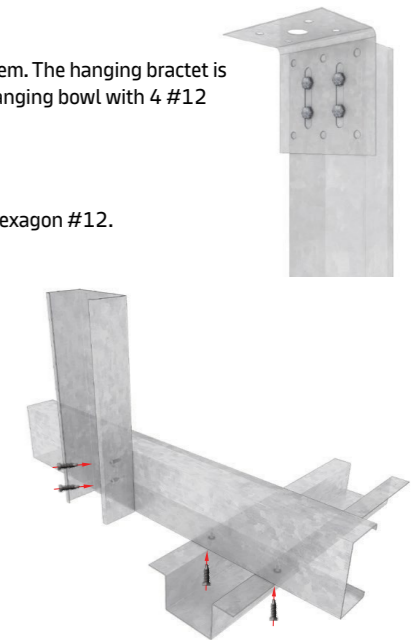
The hanger combined with the L hanging bracket create a solid anchor point for the balcony ceiling system. The hanging bracket is fixed to the concrete ceiling using approved expansion bolts, and rods. The hanger is also fixed to the hanging bowl with 4 #12 hex head screws at each position.

#### Connection between hanger and main bar (hanger acts as main bar runner)

The vertical hanger are fixed (back to back) with the main bar of the suspension system with 2 screws hexagon #12.

#### Link between main and cross runner

The Suprawall runner is screwed in place with 2 #12 (5.5mm) hex head screws to the bar plate main bone. The Suprawall bar surface provides a solid support for firing the jelly plate Highly water-resistant Glass-Mat.



## EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT

### Finishing with Knauf's Compounds

The term 'level of finish' applies to the ceiling lining prior to decoration. As per ASTM C840 (Application and Finishing of Gypsum Board) defines levels of finish 3, 4 and 5. Level 4 is the default level of finish for ceiling linings such as Knauf SECUROCK® Glass-Mat Sheathing, unless specified otherwise.

It is essential that the level of finish is determined at the design stage since each level has specific requirements for tolerances of the metal framing and glass-mat panel installation, jointing and finishing. The desired level of finish may not be achieved unless all of these requirements are met through various stages of construction. Knauf SHEETROCK® Glass-Mat Mold Tough® Panels could also be used in protected exterior soffit applications and Level 4 is the default level of finish unless specified otherwise.

#### Mock-up

A mock-up is recommended for a visual standard

- Level 4 finish joints and skim coat
- The jobsite standard(s) shall dictate if additional skim coat(s) is required (Level 4 or 5 Finish)

#### Application

- Panels should not be finished until the building is enclosed and panels are dry
- Level 4 Finish Jointing is recommended for glass-mat panels used in soffit areas and should be performed in accordance with ASTM C840 as per plasterboard jointing
- For Knauf SECUROCK® Glass-Mat Sheathing, a skim coat is strongly recommended in all Level 4/5 finish glass-mat applications for protected exterior ceiling areas
- A high-quality exterior grade primer and paint is recommended—please refer to paint manufacturer for recommendation

#### Levels of Finish



##### Level 4

- The default and generally accepted level of finish for glass-mat panels
- Examples: flat paints, light texture and smooth ceiling is specified
- Level 4 joints, sanded and apply up to 2 skim coats (minimum 1mm thickness/coat) with recommended Knauf Compound and gently sand each skim coat before applying the next coat for best result
- The skim coat surface must be smooth and free of tool marks and ridges (a light sanding of the skim coat may be necessary to remove tool marks)
- Application of a good quality primer is recommended prior to decorating

##### Level 5

- This finish is characterised by a parity of surface texture and porosity
- Examples: exposure to critical lighting, paints with high sheen levels other than flat are specified, high value spaces where the highest quality finish is expected
- Level 4 joints, sanded and minimum 2 skim coats over entire glass-mat surface (minimum 1mm thickness/coat) with Knauf Compound, gently sand each skim coat before applying the next coat for best result; a Level 5 surfacer as per paint manufacturer recommendation may be used after the glass-mat surface has been skim coated, sanded and smooth
- The skim coat surface must be smooth and free of tool marks and ridges (a light sanding of the skim coat may be necessary to remove tool marks)
- Application of a good quality primer is recommended prior to decorating

### Finishing with Other Proprietary Basecoats

The panels can be joint treated with other proprietary basecoats and mesh. The ceiling is then typically finished off with the manufacturer's recommended finishing system.

#### General Requirements:

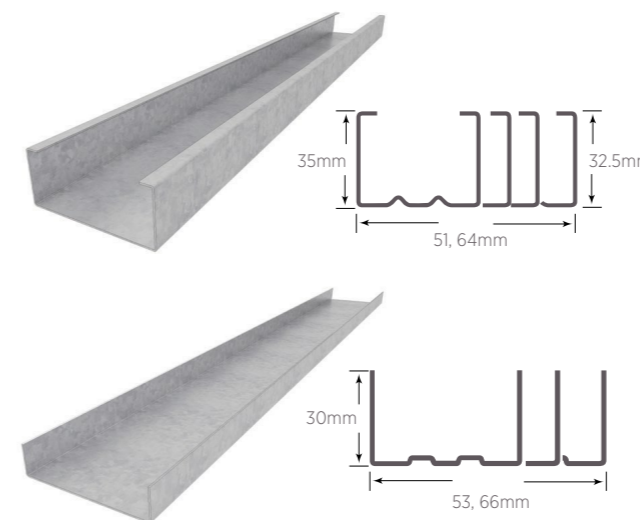
- After ensuring that Knauf SECUROCK® Glass-Mat Sheathing is installed according to USG Boral's installation guide, examine that the panel surfaces and adjacent materials are dry, clean and sound
- Verify the surface is flat and free of irreg

#### Joint Treatment and Surface Treatment:

- If using other proprietary products, then the respective company should advise on the applications and steps
- Follow the manufacturer's recommendations and guidelines for the installation

## EXTERIOR CEILING SYSTEM KNAUF GLASS-MAT

### Details About The Frame System



#### Hanger Suprawall

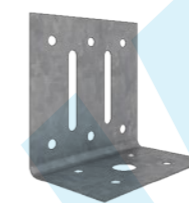
Size:  
5mm (edge) x 35mm (side) x Width as specified  
Steel grade: G350 (+/-50)  
Minimum yield strength: 275 MPa  
Anti-corrosion coating: AZ50  
Thickness: 0.5mm  
Contact Knauf for higher coating requirement

#### Frame Suprawall

Size:  
30mm (side) x Width as specified  
Steel grade: G350 (+/-50)  
Minimum yield strength: 275 MPa  
Anti-corrosion coating: AZ50  
Thickness: 0.5mm

#### Bracket LB 1 & 2

Size:  
LB-1: 75mm (Length) x 50mm (Width) x 80mm (Height)  
LB-2: 75mm (Length) x 50mm (Width) x 80mm (Height)  
Steel grade: S275  
Minimum yield strength: 275 MPa  
Anti-corrosion coating: Zinc plated  
Platform steel thickness:  
LB-1: 3.0mm  
LB-2: 1.5mm



#### Frame connection screws

Size:  
#10 - 16 x 16 (Diameter: 4.6mm)  
Coating: high anti-corrosion coating  
Extraction force: 1.16kN (0.9mm steel)  
Cutting force: 2.51kN (0.9mm steel)  
Tensile strength: 6.09kN



#### Anchor

Size:  
M6 8 x 40 (Outer diameter 8mm)  
Coating: Zinc  
Tensile strength: 2.0kN (minimum)  
Cutting force: 3.9kN (minimum according to calculated strength)



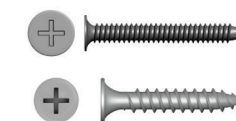
#### Hexagon Head Drill Screw

Size:  
#12 - 14 x 25 (Diameter: 5.5mm)  
Coating: Zinc  
Extraction force: 1.3kN (0.9mm steel)  
Cutting force: 2.67kN (0.9mm steel)  
Tensile strength: 10.34kN



#### Glass-Mat Screw

Size:  
#6 - 20 x 32 and 41 (Diameter: 3.5mm)  
Coating: Ruspert or Dacromate  
Minimum torsional strength: 2.7 N/m  
Reaches rust-free ability after 240 hours of salt mist spraying according to ASTM B117 standards





## Section E

Internal Walls

01/2025

### **E/ INTERNAL WALLS**

- E 2 Introduction
- E 8 Lined Both Sides
- E 16 Twin Stud Partition Systems
- E 20 Staggered Stud Partition Systems
- E 24 Acoustic Stud

# INTRODUCTION

## Description

Knauf Steel Stud Wall systems consist of single or multiple layers of plasterboard, screw fixed to one or both sides of light gauge Suprawall/Rondo.

## Design Options

Steel stud wall systems outlined in this manual provide Designers and Builders with a wide range of options to suit project specific requirements in regard to fire rating, acoustic isolation, water resistance and impact resistance. A large number of hybrid systems have been included, providing cost effective solutions when impact and/or water resistance requirements differ on each side of the wall.

The following types of Steel Stud Wall Systems are outlined in this manual:

- Lined One Side
- Lined Both Sides
- Twin Stud
- Acoustic Stud
- Staggered Stud

## Materials

### Plasterboard Linings

- 9mm/12.7mm STARDARDSHIELD
- 9mm/12.7mm MOISTSHIELD
- 9.5mm/ 12.7mm/15.9mm FIRESHIELD
- 12.7mm/15.9mm Glass Mat

## Insulation

### Knauf Insulation

- Glass wool 50mm 24 kg/m<sup>3</sup>
- Rock wool 50mm 60 kg/m<sup>3</sup>

## Steel Framing

Knauf steel stud wall systems outlined below:

### Suprawall C-studs

Suprawall C-studs are available in a number of sizes and Total Coated Thickness (TCT):

TABLE E1: SUPRAWALL STUDS		
STUD SIZE mm	TOTAL METAL THICKNESS (TCT) mm	
	0.50	0.72
51	●	
64	●	
76	●	
92	●	
102	●	
150		●



Figure E1: Suprawall C-studs

# INTRODUCTION

## Wall Tracks

Suprawall Tracks are available in the following sizes and Base Metal Thicknesses:

TABLE E2: SUPRAWALL TRACKS		
STUD SIZE mm	TOTAL METAL THICKNESS (TCT) mm	
	0.50	0.72
51	●	
64	●	
76	●	
92	●	
102	●	
150		●



Figure E2: Wall Track

## Deflection Head Tracks

Deflection head tracks are available in the following sizes and Base Metal Thicknesses:

TABLE E3: KNAUF/RONDO DEFLECTION HEAD TRACKS		
STUD SIZE mm	TOTAL METAL THICKNESS (TCT) mm	
	0.50	0.72
51	●	
64	●	
76	●	
92	●	
102	●	●
150		●

\* Deflection head tracks is special order.

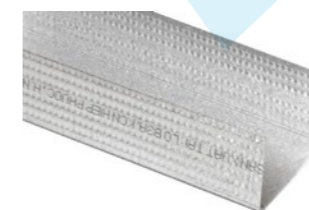


Figure E3: Deflection Head Tracks

## Design Considerations

### Maximum Heights

Wall heights for non load bearing (NLB) walls must be within the maximum heights as set out in the maximum wall height tables for various systems.

Maximum heights for non load bearing (NLB) steel framed walls have been provided for 0.25kPa lateral serviceability pressures and are based on L/240 deflection criteria.

Refer also to Notes to Maximum Height Tables below

### Notes to Maximum Height Tables

- Minimum yield stress of steel sections to be 270MPa.
- Deflection limit is height/240 to a maximum of 30mm
- Maximum slenderness ratio L/r = 300.
- Wall heights tabled are for single piece lipped C-studs at maximum centres shown. Stud splicing is not permitted in fire-rated applications.
- Wall heights tabled are for non-load bearing walls and account for self weight and lateral pressures stated.
- Shelf loading is not permitted for the tabulated maximum wall heights. Refer to Knauf Suprawall/Rondo for maximum heights with shelf loadings.
- Tabulated heights are for internal walls only. Contact Knauf Suprawall/Rondo if walls are subject to external pressures.
- For fire service, 50Pa pressure assumed. Where pressures are greater than 50Pa and fire loadings are likely to be coincident, Knauf should be consulted.
- All plasterboard all plastered board and Farama is to be manufactured by Knauf.
- Walls are to be constructed to Knauf standard C-Stud fire rated or screw-fixed non-fire rated wall details as appropriate but with 300mm maximum screw centres.

# INTRODUCTION

## Head Track Capacities

Knauf Steel Stud Wall systems consist of single or multiple layers of plasterboard, screw fixed to one or both sides of light gauge Suprawall framing.

### Design Options

- Wall heights tabled are calculated using standard head track reaction capacities as follows:

TABLE E4: STANDARD HEAD TRACK REACTION CAPACITY kN						
TRACK TCT mm	PLASTERBOARD					
	1x9.5	1x12.7	1x15.9	2x9.5	2x12.7	2x15.9
0.5	0.40	0.60	0.90	0.40	0.60	0.90

Notes:  
- 10mm max clearance at top of stud, board

- The tabulated heights have not been checked for a deflection head track requirements as outlined below.
- Where greater vertical deflection capacity is required, Knauf Suprawall/Rondo deflection heads may be used with allowable head track reaction capacities as follows:

TABLE E5: DEFLECTION HEAD TRACK REACTION CAPACITY kN						
TRACK TCT mm	PLASTERBOARD					
	1x9.5	1x12.7	1x15.9	2x9.5	2x12.7	2x15.9
0.72	0.40	0.44	0.44	0.40	0.44	0.44
1.15	0.40	0.60	0.90	0.40	1.03	1.03

Notes:  
- 20mm max clearance at top of stud, board

- Alternative head track installations must be checked in accordance with Suprawall/Rondo head track capacity tables.
- The allowable head track reactions noted above, rely on the plasterboard for restraint and must be installed strictly in accordance with Suprawall/Rondo details.
- Plasterboard to be fixed to both sides of the wall frame to the full nominal height of the wall exclusive of any allowance for soffit deflection.
- Additional rows of noggings may be included in the wall frame to maintain stability during construction.

## Head Track Capacities

TABLE E6: WALL HEAD/BASE DESIGN	
WALL CONSTRUCTION	CLEARANCE
Twin stud, Head track	10mm max clearance at top of stud, board
	20mm max clearance at top of stud, board
Twin stud, Base track	(Studs hard down into track)
Staggered Stud	30mm max clearance at top of stud, board

Notes for staggered stud only:  
- min 12.7mm plasterboard

For other reaction capacities refer Knauf/Rondo.  
Nogged wall frames with board to one side only (ie twin stud walls) require one row of noggings/nogging track 100mm max below soffit and other noggings as below:

TABLE E7: NOGGINGS FOR SYSTEMS LINED ONE SIDE	
WALL HEIGHT	ROWS OF NOGGINGS
Up to 3000mm	One row noggings/nogging track at mid height
3000mm to 6000mm	Two rows noggings/nogging track at third points of height
6000mm to 8000mm	Three rows noggings/nogging track at quarter points of height
Greater than 8000mm	Four rows of noggings/nogging track at fifth points of height

# INTRODUCTION

## Load Bearing Walls

A load bearing (LB) wall is a wall that is intended to resist vertical forces additional to those due to its own weight. Maximum loads for load bearing non-fire rated steel stud walls can be determined by the normal structural design. Maximum wall heights for load bearing fire rated steel stud walls can be similarly determined by structural design, however an appropriate lining must be used to provide fire protection to the wall frame as outlined below and where relevant apply an Axial Capacity Reduction (ACR) to achieve the required Fire Resistance Level. The following wall types with board to each side of single stud or twin stud wall may be used as load-bearing fire rated walls achieving the REI stated under the conditions listed below:

TABLE E8: FRLs FOR LOAD BEARING (LB) WALLS			
FIRE SHIELD		FIRE RESISTANCE LEVEL	FIRE ATTACK DIRECTION
SIDE 1	SIDE 2		
1x12.7mm	1x12.7mm	45/45	Both side
1x15.9mm	1x15.9mm	60/60	Both side
2x12.7mm	2x12.7mm	120/120	Both side
2x15.9mm	2x15.9mm	150/150	Both side

### Conditions:

- All joints to be backed by nogging or studs. Elsewhere nogging to be provided at 1200mm maximum centres.
- Bracing to be provided within the wall as required by structural design ignoring plasterboard contribution.
- Frame to be designed by an appropriately qualified Structural Engineer and shall comply with ASTM C645-18: Standard Specification for Non-True steel training Members.
- Any structure providing support, including lateral support, to the load bearing fire rated wall must have an REI of at least that of the wall.
- Stud splicing not allowed. Otherwise wall to be lined to standard Knauf non-load bearing fire rated details.

Refer Knauf/Rondo for load bearing wall details.

## Shelf Loads

Walls that carry shelf loadings must be designed accordingly. Refer to Technical Manual for permissible shelf loadings for non-fire rated steel stud walls. Refer to Knauf for design of fire rated steel stud walls with shelf loadings.

## Penetrations

Penetrations in a fire rated system must be treated strictly in accordance with relevant test reports and approved installation details in order to maintain the system's Fire Resistance Level. Where components by others are specified in Knauf fire-rated penetration details (ie. dampers, GPOs, fire collars, etc), such components must be installed in accordance with the manufacturer's specifications. It is the responsibility of the component manufacturer to ensure that the fire rating performance of the system is not affected.

# INTRODUCTION

## Installation

Knauf steel stud wall systems must be assembled strictly in accordance with the details and specifications outlined in this manual in order to achieve stated Fire Resistance Levels and acoustic ratings.

### NOTE:

Where proprietary products have been tested in Knauf systems by other manufacturers, reference should be made to the product manufacturer's specifications for details of tested designs and related Standards.

## Installation and fastening sequence

Light gauge steel studs are prone to flexing and twisting when driving fasteners to secure plasterboard sheets.

The first plasterboard sheet installed at a joint should be fixed to the open side of a stud flange. Additional sheets are then installed in the direction toward the closed side of the stud web.

When installing the first side, screw-fasten the plasterboard sheets to studs at edges only, as illustrated in Figure E4 (positions 1 and 2). Then, on the second side, fasten the edge (position 3) followed by intermediate studs (position 4). Return to the first side and fasten sheets to previously unattached studs (position 5).

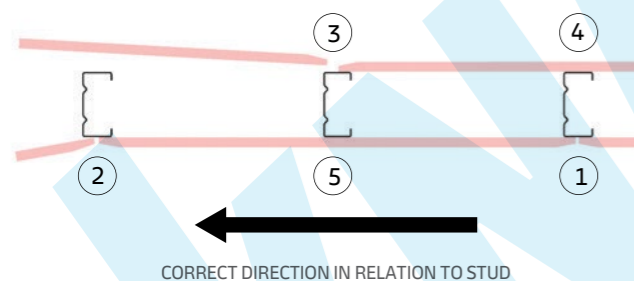


Figure E4: Correct Fastening Sequence

The correct direction of sheet installation is in the direction from the open side of the stud to the closed side of the stud web (Figure E5). The first sheet installed at a joint is screwed to the flange at the open side of the stud. The flange will initially deflect then straighten as the screw pulls tight. Ensure that the stud is adequately supported to avoid twisting, and fully screw this sheet to the stud before continuing.

The next sheet is now screwed to the flange at the closed side of the stud. The deflection on this part of the flange is very small, and the previously installed sheet helps keep the assembly rigid during the installation of the second sheet.

If fixed correctly the result is a flat joint with no lipping. The correct installation sequence is illustrated in Figure E5 below:

Do fix plasterboard sheets in the direction from the open side of the stud to the closed side of the stud:

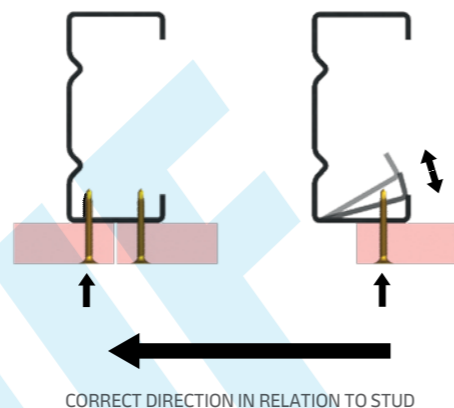


Figure E5: Correct Fastening Sequence Detail

## Laying out

- Accurately mark wall layouts.
- Always check individual measurements against overall site dimensions.
- Align the top and bottom tracks accurately according to the plan layout. Attach at ceiling and floor to structural elements.
- Use suitable fasteners for anchoring top and bottom tracks.
- Locate fasteners at 50mm from each end and spaced at maximum 610mm centres along each track.

## Framing installation

- For studs in fire rated walls up to 3000mm high, cut studs nom 15mm short of the floor-to-ceiling height to allow 15mm expansion gap at top.
- For studs in walls higher than 3000mm, allow 5mm gap per 1000mm of height for expansion. Allowance should be made for possible deflection of floor/roof structure over walls.
- Studs may be boxed together to provide greater frame strength.
- Studs are usually boxed to frame door and other openings and to support heavy fixtures on the partition.
- Studs in fire rated partitions are not to be fastened to top and bottom tracks (UNO) except boxed studs at fire door openings which should be pop riveted to the tracks. When framing openings, secure both flanges of boxed studs to the tracks, using pop rivets (refer to Knauf.com for details).
- In addition to noggings specified in the maximum heights notes, noggings are required as headers above doorways, for reinforcement behind fixture attachments, and where special circumstances require additional stiffening of the frame. (Noggings are formed from lengths of steel track, approximately 100mm longer than the stud spacing. Cut the track flanges at approximately 45 degrees and bend the track ends at right angles to fit between the studs. Position and fasten with stud crimper, or with pop rivets for fire door application).

# INTRODUCTION

## Plasterboard application

- Plasterboard linings can be installed vertically or horizontally in fire rated and non-fire rated wall systems. Refer [knauf.com](http://knauf.com) for plasterboard installation and details for steel stud wall systems.
- If no deflection requirement exists, cut plasterboard sheets to provide 10mm maximum gap at floor and ceiling.
- Centre abutting vertical sheet edges on stud flanges.
- Fasten plasterboard sheets to steel framing with appropriate screws as outlined in General Information section. Place screws 10mm-16mm from sheet ends and edges UNO. Do not fasten plasterboard to top and bottom tracks (UNO) in fire rated systems UNO. Sheets should be installed by advancing in the direction of the stud web (refer Figures E4 and E5).
- Offset plasterboard joints on opposite sides in adjacent layers refer to [knauf.com](http://knauf.com) for details.
- For maximum screw spacings refer to [knauf.com](http://knauf.com) for details.

## Installation details

To view the full range of system CAD details, head to [knauf.com](http://knauf.com)



## Jointing and Finishing

- Finish all joints and internal and external corners in face layers with the appropriate Knauf jointing system (refer to Knauf Plasterboard Installation Manual). Joints and junctions in inner layers of multiple layer systems are not required to be stopped.
- Paper tape must be used in fire rated and wet area systems.
- Stop exposed fasteners on face layers.

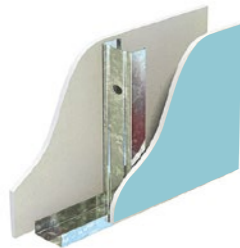
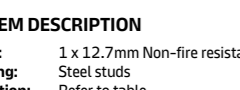
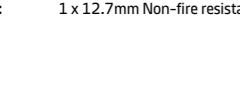

## Decorating

Apply paint or other decorative finishes as required. Refer to Knauf Plasterboard Installation Manual for recommendations on decoration of plasterboard.

## Plasterboard application

- Steel stud wall systems are non load bearing (NLB) unless noted otherwise.
- Wall systems should not be used where conditions of constant excessive moisture or humidity are prevalent ie, in excess of 90% relative humidity.
- Movement joints in plasterboard are required at building construction joint locations. Control joints in plasterboard are required at not more than 12 metre maximum centres, at change in framing substrate material and at building structure joint locations e.g. expansion or control joint.
- All fire rated penetrations must be installed in accordance with approved manufacturer's specifications e.g. dampers, pipes and fire doors etc. Refer to Knauf for specific details and information.
- Fire rated systems must be assembled strictly in accordance with relevant test reports, opinions, approved system details and specifications.
- Steel Studs in fire rated partitions are not to be fastened to top and bottom tracks (UNO) except boxed studs facing fire door openings, in which case the boxed studs are pop riveted to the tracks.
- Steel wall framing must be constructed to Suprawall/Rondo specifications and spaced at centres maximum.
- Components must not be used if fractured or damaged.
- Butt joints to be backed by stud or nogging for fire rated systems.
- Mid span nogging is recommended for erection purposes for steel stud walls greater than 3600mm.

# LINED BOTH SIDE

SB.1 NON-FIRE RESISTANCE LEVEL REI: -/-/-	ACOUSTIC RATINGS BASIS											
	Based on Studs @610 Centres											
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	76.4	89.4	101.4	117.4	127.4	175.4		
				Stud Size (mm)	51	64	76	92	102	150		
				Insulation	STC / Rw*							
	SB.1A	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil	34	35	36	36	36	37		
				Glasswool 50 x 24 kg/m³	39	40	42	43	43	44		
				Rockwool 50 x 60 kg/m³	40	41	43	44	44	44		
	SB.1B	1x12.7mm MOISTSHIELD	1x12.7mm MOISTSHIELD	Nil	35	36	37	37	37	38		
				Glasswool 50 x 24 kg/m³	40	41	43	44	44	45		
				Rockwool 50 x 60 kg/m³	41	42	44	45	45	45		
	SB.1C	1x12.7mm STANDARDSHIELD	1x12.7mm Glassmat	Nil	35	36	37	37	37	38		
				Glasswool 50 x 24 kg/m³	40	41	43	44	44	45		
				Rockwool 50 x 60 kg/m³	41	42	44	45	45	45		
	SB.1D	1x12.7mm Glassmat	1x12.7mm Glassmat	Nil	37	38	38	39	39	40		
				Glasswool 50 x 24 kg/m³	43	44	45	45	45	46		
				Rockwool 50 x 60 kg/m³	44	45	46	46	46	46		

**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 12.7mm Non-fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 12.7mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)		406						610					
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	3200	3700	4200	5000	5200	x	2800	3400	3700	4000	4900	x
	0.72	x	x	x	x	x	7340	x	x	x	x	x	5330

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB.2 NON-FIRE RESISTANCE LEVEL REI: -/60/60	ACOUSTIC RATINGS BASIS											
	Based on Studs @610 Centres											
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	101.8	114.8	126.8	142.8	152.8	200.8		
				Stud Size (mm)	51	64	76	92	102	150		
				Insulation	STC / Rw*							
	SB.2A	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	Nil	41	42	43	44	44	45		
				Glasswool 50 x 24 kg/m³	46	47	48	49	49	50		
				Rockwool 50 x 60 kg/m³	47	48	49	50	50	51		
	SB.2B	2x12.7mm MOISTSHIELD	2x12.7mm MOISTSHIELD	Nil	42	43	44	45	45	46		
				Glasswool 50 x 24 kg/m³	47	48	49	50	50	51		
				Rockwool 50 x 60 kg/m³	48	49	50	51	51	52		
	SB.2C	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	Nil	41	42	43	44	44	45		
				Glasswool 50 x 24 kg/m³	46	47	48	49	49	50		
				Rockwool 50 x 60 kg/m³	47	48	49	50	50	51		
	SB.2D	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	Nil	42	43	44	45	45	46		
				Glasswool 50 x 24 kg/m³	47	48	49	50	50	51		
				Rockwool 50 x 60 kg/m³	48	49	50	51	51	52		
	SB.2E	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Nil	42	43	44	45	45	46		
				Glasswool 50 x 24 kg/m³	47	48	49	50	50	51		
				Rockwool 50 x 60 kg/m³	48	49	50	51	51	52		
	SB.2F	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Nil	41	42	43	44	44	45		
				Glasswool 50 x 24 kg/m³	46	47	48	49	49	50		
				Rockwool 50 x 60 kg/m³	47	48	49	50	50	51		

**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Non-fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Non-fire resistant Board

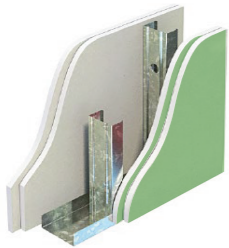
Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)		406						610					
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	3500	4100	4600	5400	5800	x	3200	3800	4200	5000	5600	x
	0.72	x	x	x	x	x	7610	x	x	x	x	x	6990

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB.3  NON-FIRE RESISTANCE LEVEL REI: -/-/-	ACOUSTIC RATINGS BASIS											
	Based on Studs @610 Centres											
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)								
				114.6	127.6	139.6	155.6	165.6	213.6			
Stud Size (mm)				51	64	76	92	102	150			
Insulation			STC / Rw*									
SB.3A	15.9mm GLASSMAT 15.9mm GLASSMAT	15.9mm GLASSMAT 15.9mm GLASSMAT	Nil.	45	46	47	48	48	49			
			Glasswool 50 x 24 kg/m³	52	53	53	54	54	55			
			Rockwool 50 x 60 kg/m³	53	54	54	55	55	56			



Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

**SYSTEM DESCRIPTION**

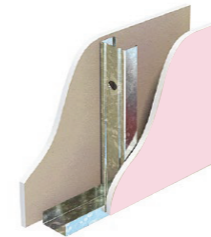
- Side 1:** 2 x 15.9mm Non-fire resistant Board
- Framing:** Steel studs
- Insulation:** Refer to table
- Side 2:** 2 x 15.9mm Non-fire resistant Board

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)	406						610						
	51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	3620	4220	4700	5600	6000	x	3400	4000	4300	5200	5600	x
	0.72	x	x	x	x	x	7550	x	x	x	x	x	7190

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB45.1  FIRE RESISTANCE LEVEL REI: -/45/45 (*) Fire from both sides	ACOUSTIC RATINGS BASIS											
	Based on Studs @610 Centres											
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)								
				76.4	89.4	101.4	117.4	127.4	175.4			
Stud Size (mm)				51	64	76	92	102	150			
Insulation			STC / Rw*									
SB45.1A	1x12.7mm FIRESHIELD	1x12.7mm FIRESHIELD	Nil.	38	39	40	41	41	42			
			Glasswool 50 x 24 kg/m³	44	45	46	47	47	48			
			Rockwool 50 x 60 kg/m³	45	46	47	48	48	49			
SB45.1B	1x12.7mm FIRESHIELD	1x12.7mm Glassmat	Nil.	37	38	38	39	39	40			
			Glasswool 50 x 24 kg/m³	43	44	45	45	45	46			
			Rockwool 50 x 60 kg/m³	44	45	46	46	46	47			
SB45.1C	1x12.7mm Glassmat	1x12.7mm Glassmat	Nil.	37	38	38	39	39	40			
			Glasswool 50 x 24 kg/m³	43	44	45	45	45	46			
			Rockwool 50 x 60 kg/m³	44	45	46	46	46	47			



**SYSTEM DESCRIPTION**

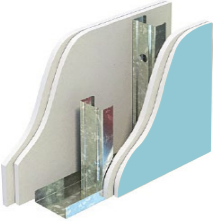
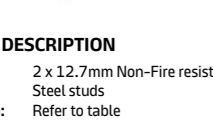
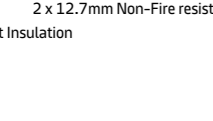
- Side 1:** 1 x 12.7mm Fire resistant Board
- Framing:** Steel studs
- Insulation:** Refer to table
- Side 2:** 1 x 12.7mm Fire resistant Board
- (\*) Without Insulation

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)	406						610						
	51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	3500	4100	4600	5400	5600	x	3200	3800	4200	5000	5300	x
	0.72	x	x	x	x	x	7700	x	x	x	x	x	7000

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB60.1	ACOUSTIC RATINGS BASIS									
	Based on Studs @610 Centres									
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	101.8	114.8	126.8	142.8	152.8	200.8
				Stud Size (mm)	51	64	76	92	102	150
Insulation				STC / Rw*						
	SB60.1A	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	Nil.	41	42	43	44	44	45
				Glasswool 50 x 24 kg/m³	43	47	48	49	49	50
				Rockwool 50 x 60 kg/m³	47	48	49	50	50	51
	SB60.1B	2x12.7mm STANDARDSHIELD	2x12.7mm Glassmat	Nil.	43	44	45	46	46	47
				Glasswool 50 x 24 kg/m³	48	49	50	51	51	52
				Rockwool 50 x 60 kg/m³	49	50	51	52	52	53
	SB60.1C	2x12.7mm Glassmat	2x12.7mm Glassmat	Nil.	44	45	46	47	47	48
				Glasswool 50 x 24 kg/m³	50	51	51	52	52	53
				Rockwool 50 x 60 kg/m³	51	52	52	53	53	54

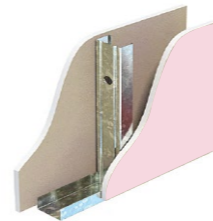
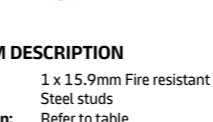
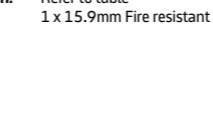
**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Non-Fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Non-Fire resistant Board  
 (\*) Without Insulation

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)							PRESSURE: 0.25 kPa						
Stud Spacing (mm)	406						610						
	Stud Size (mm)	51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	3500	4100	4600	5400	5800	x	3200	3800	4200	5000	5600	x
	0.72	x	x	x	x	x	7610	x	x	x	x	x	6990

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB60.2	ACOUSTIC RATINGS BASIS									
	Based on Studs @610 Centres									
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	82.8	95.8	107.8	123.8	133.8	181.8
				Stud Size (mm)	51	64	76	92	102	150
Insulation				STC / Rw*						
	SB60.2A	1x15.9mm FIRESHIELD	1x15.9mm FIRESHIELD	Nil.	38	39	40	41	41	42
				Glasswool 50 x 24 kg/m³	45	46	47	47	47	48
				Rockwool 50 x 60 kg/m³	46	47	48	48	48	49
	SB60.2B	1x15.9mm FireShield	1x15.9mm Glassmat	Nil.	38	39	40	41	41	42
				Glasswool 50 x 24 kg/m³	45	46	47	47	47	48
				Rockwool 50 x 60 kg/m³	46	47	48	48	48	49
	SB60.2C	1x15.9mm Glassmat	1x15.9mm Glassmat	Nil.	38	39	40	41	41	42
				Glasswool 50 x 24 kg/m³	44	45	46	47	47	48
				Rockwool 50 x 60 kg/m³	45	46	47	48	48	49

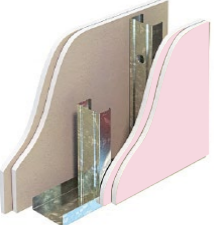

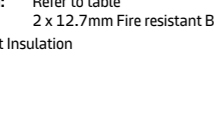
**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 15.9mm Fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 15.9mm Fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)							PRESSURE: 0.25 kPa						
Stud Spacing (mm)	406						610						
	Stud Size (mm)	51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	3400	4100	4700	5600	6000	x	3400	4000	4300	5200	5500	x
	0.72	x	x	x	x	x	7800	x	x	x	x	x	7200

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB120.1		ACOUSTIC RATINGS BASIS									Based on Studs @610 Centres					
FIRE RESISTANCE LEVEL REI: -/120/120 (*) Fire from both sides		System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)											
					101.8	114.8	126.8	142.8	152.8	200.8						
					Stud Size (mm)	51	64	76	92	102	150					
						Insulation										
						STC / Rw*										
	SB120.1A	2x12.7mm FIRESHIELD	2x12.7mm FIRESHIELD	Nil.		46	47	47	48	48	49					
				Glasswool 50 x 24 kg/m <sup>3</sup>		52	53	53	54	54	55					
				Rockwool 50 x 60 kg/m <sup>3</sup>		53	54	54	55	55	56					
	SB120.1B	2x12.7mm FIRESHIELD	2x12.7mm Glassmat	Nil.		45	46	47	47	47	48					
				Glasswool 50 x 24 kg/m <sup>3</sup>		51	52	53	53	53	54					
				Rockwool 50 x 60 kg/m <sup>3</sup>		52	53	54	54	54	55					
	SB120.1C	2x12.7mm Glassmat	2x12.7mm Glassmat	Nil.		44	45	46	47	47	48					
				Glasswool 50 x 24 kg/m <sup>3</sup>		50	51	51	52	52	53					
				Rockwool 50 x 60 kg/m <sup>3</sup>		51	52	52	53	53	54					

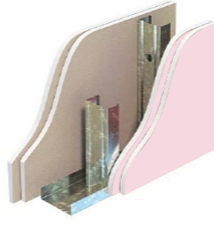

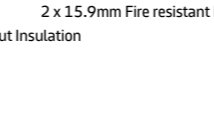
**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Fire resistant Board  
 (\*) Without Insulation

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)								PRESSURE: 0.25 kPa					
Stud Spacing (mm)		406						610					
		Stud Size (mm)		51	64	76	92	102	150	51	64	76	92
BASE METAL THICKNESS	0.5	2600	3100	3700	4600	4900	x	2600	3100	3700	4600	4900	x
	0.72	x	x	x	x	x	6700	x	x	x	x	x	6700

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# LINED BOTH SIDE

SB150.1		ACOUSTIC RATINGS BASIS									Based on Studs @610 Centres					
FIRE RESISTANCE LEVEL REI: -/150/150 (*) Fire from both sides		System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)											
					114.6	127.6	139.6	155.6	165.6	213.6						
					Stud Size (mm)	51	64	76	92	102	150					
						Insulation										
						STC / Rw*										
	SB150.1A	2x15.9mm FIRESHIELD	2x15.9mm FIRESHIELD	Nil.		46	47	47	48	48	49					
				Glasswool 50 x 24 kg/m <sup>3</sup>		52	53	53	54	54	55					
				Rockwool 50 x 60 kg/m <sup>3</sup>		53	54	54	55	55	56					
	SB150.1B	2x15.9mm FIRESHIELD	2x15.9mm Glassmat	Nil.		46	47	47	48	48	49					
				Glasswool 50 x 24 kg/m <sup>3</sup>		52	53	53	54	54	55					
				Rockwool 50 x 60 kg/m <sup>3</sup>		53	54	54	55	55	56					
	SB150.1C	2x15.9mm Glassmat	2x15.9mm Glassmat	Nil.		45	46	46	47	47	48					
				Glasswool 50 x 24 kg/m <sup>3</sup>		51	52	52	53	53	54					
				Rockwool 50 x 60 kg/m <sup>3</sup>		52	53	53	54	54	55					

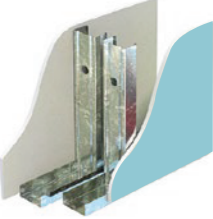



**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 15.9mm Fire resistant Board  
**Framing:** Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 15.9mm Fire resistant Board  
 (\*) Without Insulation

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)								PRESSURE: 0.25 kPa					
Stud Spacing (mm)		406						610					
		Stud Size (mm)		51	64	76	92	102	150	51	64	76	92
BASE METAL THICKNESS	0.5	3700	4300	4700	5600	6000	x	3400	4000	4300	5200	5600	x
	0.72	x	x	x	x	x	7800	x	x	x	x	x	7200

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height information height shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# TWIN STUD

TS.1	ACOUSTIC RATINGS BASIS		Based on Studs @610 Centres							
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	152.4	178.4	202.4	234.4	254.4	350.4
				Stud Size (mm)	51	64	76	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/-/-			Insulation	STC / Rw*						
	TS.1A	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	39	40	42	42	42	44
				Glasswool 50 x 24 kg/m³	49	50	50	51	51	51
				Rockwool 50 x 60 kg/m³	50	51	51	52	52	52
	TS.1B	1x12.7mm MOISTSHIELD	1x12.7mm MOISTSHIELD	Nil.	40	41	42	43	43	45
				Glasswool 50 x 24 kg/m³	50	51	51	52	52	52
				Rockwool 50 x 60 kg/m³	51	52	52	53	53	53
	TS.1C	1x12.7mm STANDARDSHIELD	1x12.7mm Glassmat	Nil.	40	41	42	43	43	45
				Glasswool 50 x 24 kg/m³	50	51	51	52	52	52
				Rockwool 50 x 60 kg/m³	51	52	52	53	53	53
	TS.1D	1x12.7mm Glassmat	1x12.7mm Glassmat	Nil.	42	43	44	46	46	47
				Glasswool 50 x 24 kg/m³	52	53	54	54	54	55
				Rockwool 50 x 60 kg/m³	53	54	55	55	55	56

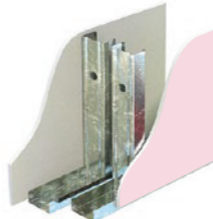

**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 12.7mm Non-fire resistant Board  
**Framing:** Twin Steel studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 12.7mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406						610							
	51	64	76	92	102	150	51	64	76	92	102	150		
BASE METAL THICKNESS	0.5	2400	2800	3200	3700	4200	x	2400	2800	3200	3700	4200	x	
	0.72	x	x	x	x	x	5400	x	x	x	x	x	5400	

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# TWIN STUD

TS.2	ACOUSTIC RATINGS BASIS		Based on Studs @610 Centres							
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	158.8	184.8	208.8	240.8	260.8	356.8
				Stud Size (mm)	51	64	76	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/-/-			Insulation	STC / Rw*						
	TS.2A	1x15.9mm Glassmat	1x15.9mm Glassmat	Nil.	45	46	47	48	49	51
				Glasswool 50 x 24 kg/m³	54	55	55	56	56	56
				Rockwool 50 x 60 kg/m³	55	56	56	57	57	57
	TS.2B	1x15.9mm FIRESHIELD	1x15.9mm FIRESHIELD	Nil.	47	48	48	49	50	52
				Glasswool 50 x 24 kg/m³	56	57	58	58	58	59
				Rockwool 50 x 60 kg/m³	57	58	59	59	59	60

**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 15.9mm Fire resistant Board  
**Framing:** Twin Steel studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 15.9mm Fire resistant Board

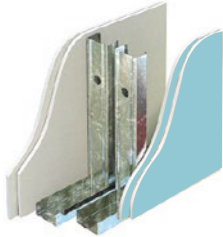
Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406						610							
	51	64	76	92	102	150	51	64	76	92	102	150		
BASE METAL THICKNESS	0.5	2500	2800	3300	3700	4200	x	2500	2800	3300	3700	4200	x	
	0.72	x	x	x	x	x	5400	x	x	x	x	x	5400	

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# TWIN STUD

TS.3	ACOUSTIC RATINGS BASIS									
	Based on Studs @610 Centres									
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	177.8	203.8	227.8	259.8	279.8	375.8
<b>NON-FIRE RESISTANCE LEVEL REI: -/60/60 (*)</b>				Stud Size (mm)	51	64	76	92	102	150
				Insulation	STC / Rw*					
				Nil.	49	49	50	51	52	54
TS.3A	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	Glasswool 50 x 24 kg/m³	56	56	57	57	57	57	
			Rockwool 50 x 60 kg/m³	57	57	58	58	58	58	
			Nil.	50	50	51	52	53	55	
TS.3B	2x12.7mm MOISTSHIELD	2x12.7mm MOISTSHIELD	Glasswool 50 x 24 kg/m³	57	57	58	58	58	58	
			Rockwool 50 x 60 kg/m³	58	58	59	59	59	59	
			Nil.	49	49	50	51	52	54	
TS.3C	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	Glasswool 50 x 24 kg/m³	56	56	57	57	57	57	
			Rockwool 50 x 60 kg/m³	57	57	58	58	58	58	
			Nil.	50	50	51	52	53	55	
TS.3D	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	Glasswool 50 x 24 kg/m³	57	57	58	58	58	58	
			Rockwool 50 x 60 kg/m³	58	58	59	59	59	59	
			Nil.	50	50	51	52	53	55	
TS.3E	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Glasswool 50 x 24 kg/m³	57	57	58	58	58	58	
			Rockwool 50 x 60 kg/m³	58	58	59	59	59	59	
			Nil.	49	49	50	51	52	54	
TS.3F	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Glasswool 50 x 24 kg/m³	56	56	57	57	57	57	
			Rockwool 50 x 60 kg/m³	57	57	58	58	58	58	
			Nil.	49	49	50	51	52	54	



**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Non-fire resistant Board  
**Framing:** Twin Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Non-fire resistant Board  
 (\*) Without Insulation

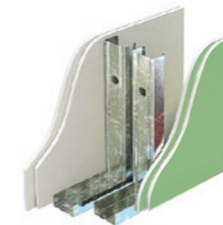
Note: Rw/TC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)		406						610					
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	2400	2800	3300	3700	4200	x	2400	2800	3300	3700	4200	x
	0.72	x	x	x	x	x	5400	x	x	x	x	x	5400

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# TWIN STUD

TS.4	ACOUSTIC RATINGS BASIS									
	Based on Studs @610 Centres									
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	190.6	216.6	240.6	272.6	292.6	388.6
<b>NON-FIRE RESISTANCE LEVEL REI: -/150/150 (*)</b>				Stud Size (mm)	51	64	76	92	102	150
				Insulation	STC / Rw*					
				Nil.	51	52	53	54	55	58
TS.4A	1x15.9mm Glassmat 1x15.9mm Glassmat	1x15.9mm Glassmat 1x15.9mm Glassmat	Glasswool 50 x 24 kg/m³	60	61	61	62	62	62	
			Rockwool 50 x 60 kg/m³	61	62	62	63	63	63	



**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 15.9mm Non-fire resistant Board  
**Framing:** Twin Steel studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 15.9mm Non-fire resistant Board  
 (\*) Without Insulation

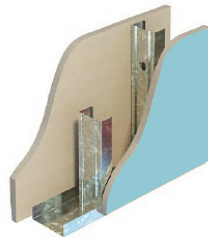
Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													
PRESSURE: 0.25 kPa													
Stud Spacing (mm)		406						610					
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150
BASE METAL THICKNESS	0.5	2300	2800	3300	3700	4200	x	2300	2800	3300	3700	4200	x
	0.72	x	x	x	x	x	5400	x	x	x	x	x	5400

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# STAGGERED STUD

SGS.1	ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres			
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	117.4	127.4	175.4
				Stud Size (mm)	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/-/-				Insulation			STC / Rw*
SGS.1A	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	37	37	39	
			Glasswool 50 x 24 kg/m <sup>3</sup>	45	45	47	
			Rockwool 50 x 60 kg/m <sup>3</sup>	46	46	48	
SGS.1B	1x12.7mm MOISTSHIELD	1x12.7mm MOISTSHIELD	Nil.	38	38	40	
			Glasswool 50 x 24 kg/m <sup>3</sup>	46	46	48	
			Rockwool 50 x 60 kg/m <sup>3</sup>	47	47	49	
SGS.1C	1x12.7mm STANDARDSHIELD	1x12.7mm Glassmat	Nil.	38	38	40	
			Glasswool 50 x 24 kg/m <sup>3</sup>	46	46	48	
			Rockwool 50 x 60 kg/m <sup>3</sup>	47	47	49	
SGS.1D	1x12.7mm Glassmat	1x12.7mm Glassmat	Nil.	40	40	42	
			Glasswool 50 x 24 kg/m <sup>3</sup>	48	48	50	
			Rockwool 50 x 60 kg/m <sup>3</sup>	49	49	51	



**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 12.7mm Non-fire resistant Board  
**Framing:** Steel Staggered studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 12.7mm Non-fire resistant Board

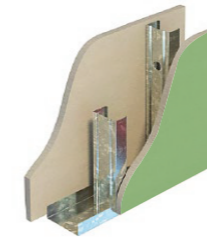
Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)  
 Wall width depend on the track size.

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)												PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406						610						
	51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	2400	2450	2700	2800	3200	x	2400	2450	2700	2800	3200	x
	0.72	x	x	x	x	x	6700	x	x	x	x	x	6700

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# STAGGERED STUD

SGS.2	ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres			
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	123.8	133.8	181.8
				Stud Size (mm)	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/-/-				Insulation			STC / Rw*
SGS.2A	1x15.9mm Glassmat	1x15.9mm Glassmat	Nil.	43	43	46	
			Glasswool 50 x 24 kg/m <sup>3</sup>	51	51	53	
			Rockwool 50 x 60 kg/m <sup>3</sup>	52	52	54	



**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 15.9mm Non-fire resistant Board  
**Framing:** Steel Staggered studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 15.9mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)  
 Wall width depend on the track size.

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)												PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406						610						
	51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	2400	2450	2700	2800	3200	x	2400	2450	2700	2800	3200	x
	0.72	x	x	x	x	x	6700	x	x	x	x	x	6700

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# STAGGERED STUD

SGS.3	ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres			
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	142.8	152.8	200.8
				Stud Size (mm)	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/60/60				Insulation			STC / Rw*
	SGS.3A	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	Nil.	44	44	46
				Glasswool 50 x 24 kg/m³	53	53	56
				Rockwool 50 x 60 kg/m³	54	54	57
	SGS.3B	2x12.7mm MOISTSHIELD	2x12.7mm MOISTSHIELD	Nil.	45	45	47
				Glasswool 50 x 24 kg/m³	54	54	57
				Rockwool 50 x 60 kg/m³	55	55	58
	SGS.3C	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	44	44	46
				1x12.7mm MOISTSHIELD	53	53	56
		1x12.7mm MOISTSHIELD	54	54	57		
	SGS.3D	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	45	45	47
				1x12.7mm MOISTSHIELD	54	54	57
		1x12.7mm MOISTSHIELD	55	55	58		
	SGS.3E	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	45	45	47
				1x12.7mm Glassmat	54	54	57
		1x12.7mm Glassmat	55	55	58		
	SGS.3F	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Nil.	44	44	46
				1x12.7mm STANDARDSHIELD	53	53	54
		1x12.7mm Glassmat	54	54	57		

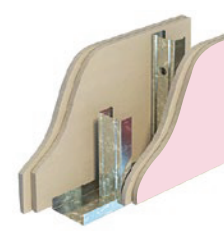
**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Non-fire resistant Board  
**Framing:** Steel Staggered studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)  
 Wall width depend on the track size.

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													PRESSURE: 0.25 kPa	
Stud Spacing (mm)		406						610						
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	2400	2450	2700	2800	3200	x	2400	2450	2700	2800	3200	x	
	0.72	x	x	x	x	x	6900	x	x	x	x	x	6900	

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# STAGGERED STUD

SGS.4	ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres			
	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	155.6	165.6	213.6
				Stud Size (mm)	92	102	150
NON-FIRE RESISTANCE LEVEL REI: -/150/150				Insulation			STC / Rw*
	SGS.4A	1x15.9mm Glassmat/ FIRESHIELD	1x15.9mm Glassmat/ FIRESHIELD	Nil.	48	48	51
				Glasswool 50 x 24 kg/m³	57	57	59
				Rockwool 50 x 60 kg/m³	58	58	60

**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 15.9mm Non-fire resistant Board  
**Framing:** Steel Staggered studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 15.9mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)  
 Wall width depend on the track size.

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)													PRESSURE: 0.25 kPa	
Stud Spacing (mm)		406						610						
Stud Size (mm)		51	64	76	92	102	150	51	64	76	92	102	150	
BASE METAL THICKNESS	0.5	2400	2450	2700	2800	3200	x	2400	2450	2700	2800	3200	x	
	0.72	x	x	x	x	x	6900	x	x	x	x	x	6900	

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# ACOUSTIC STUD

AS.1		ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres	
<b>NON-FIRE RESISTANCE LEVEL</b> REI: -/-/-	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	142.8	
				Stud Size (mm)	92	
	Insulation				STC / Rw*	
					Nil.	38
	AS.1A	1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD	Glasswool 50 x 24 kg/m³	45	
				Rockwool 50 x 60 kg/m³	46	
				Nil.	39	
AS.1B	1x12.7mm MOISTSHIELD	1x12.7mm MOISTSHIELD	Glasswool 50 x 24 kg/m³	46		
			Rockwool 50 x 60 kg/m³	47		
AS.1C	1x12.7mm STANDARDSHIELD	1x12.7mm Glassmat	Nil.	39		
			Glasswool 50 x 24 kg/m³	46		
AS.1D	1x12.7mm Glassmat	1x12.7mm Glassmat	Nil.	42		
			Glasswool 50 x 24 kg/m³	48		
			Rockwool 50 x 60 kg/m³	49		

**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 12.7mm Non-fire resistant Board  
**Framing:** Acoustic studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 12.7mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)		PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406	610	
Stud Size (mm)	92	92	
BASE METAL THICKNESS	0.5	4500	4200
	0.72	x	x

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# ACOUSTIC STUD

AS.2		ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres	
<b>NON-FIRE RESISTANCE LEVEL</b> REI: -/-/-	System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	123.8	
				Stud Size (mm)	92	
	Insulation				STC / Rw*	
					Nil.	43
	AS.2A	1X15.9MM FIRESHIELD/ Glassmat	1x15.9mm FIRESHIELD/ Glassmat	Glasswool 50 x 24 kg/m³	49	
				Rockwool 50 x 60 kg/m³	50	
				Nil.	43	

**SYSTEM DESCRIPTION**  
**Side 1:** 1 x 15.9mm Non-fire resistant Board  
**Framing:** Acoustic studs  
**Insulation:** Refer to table  
**Side 2:** 1 x 15.9mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)		PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406	610	
Stud Size (mm)	92	92	
BASE METAL THICKNESS	0.5	4600	4300
	0.72	x	x

- Note:
- Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.
  - Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.
  - Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# ACOUSTIC STUD

AS.3		ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres	
NON-FIRE RESISTANCE LEVEL REI: -/-/-		System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	142.8
					Stud Size (mm)	92
					Insulation	STC / Rw*
	AS.3A	2x12.7mm STANDARDSHIELD	2x12.7mm STANDARDSHIELD	Nil.	44	
				Glasswool 50 x 24 kg/m³	52	
				Rockwool 50 x 60 kg/m³	53	
AS.3B	2x12.7mm MOISTSHIELD	2x12.7mm MOISTSHIELD	Nil.	45		
			Glasswool 50 x 24 kg/m³	53		
			Rockwool 50 x 60 kg/m³	54		
AS.3C	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	Nil.	44		
			Glasswool 50 x 24 kg/m³	52		
			Rockwool 50 x 60 kg/m³	53		
AS.3D	1x12.7mm STANDARDSHIELD 1x12.7mm MOISTSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm MoistShield	Nil.	45		
			Glasswool 50 x 24 kg/m³	53		
			Rockwool 50 x 60 kg/m³	54		
AS.3E	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Nil.	45		
			Glasswool 50 x 24 kg/m³	53		
			Rockwool 50 x 60 kg/m³	54		
AS.3F	1x12.7mm STANDARDSHIELD 1x12.7mm STANDARDSHIELD	1x12.7mm STANDARDSHIELD 1x12.7mm Glassmat	Nil.	44		
			Glasswool 50 x 24 kg/m³	52		
			Rockwool 50 x 60 kg/m³	53		

**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 12.7mm Non-fire resistant Board  
**Framing:** Acoustic studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 12.7mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)		PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406	610	
Stud Size (mm)	92	92	
BASE METAL THICKNESS	0.5	4600	4300
	0.72	x	x

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# ACOUSTIC STUD

AS.4		ACOUSTIC RATINGS BASIS			Based on Studs @610 Centres	
NON-FIRE RESISTANCE LEVEL REI: -/-/-		System	Lining Side 1	Lining Side 2	Nom Wall Width (mm)	155.6
					Stud Size (mm)	92
					Insulation	STC / Rw*
	AS.4A	1x15.9mm FIRESHIELD 1x15.9mm Glassmat	1x15.9mm FIRESHIELD 1x15.9mm Glassmat	Nil.	49	
				Glasswool 50 x 24 kg/m³	57	
				Rockwool 50 x 60 kg/m³	58	

**SYSTEM DESCRIPTION**  
**Side 1:** 2 x 15.9mm Non-fire resistant Board  
**Framing:** Acoustic studs  
**Insulation:** Refer to table  
**Side 2:** 2 x 15.9mm Non-fire resistant Board

Note: Rw/STC performance are based on acoustical simulations unless otherwise noted (\*)

MAX WALL HEIGHTS NON-LOAD BEARING WALLS (MM)		PRESSURE: 0.25 kPa	
Stud Spacing (mm)	406	610	
Stud Size (mm)	92	92	
BASE METAL THICKNESS	0.5	4600	4300
	0.72	x	x

Note:  
 ■ Limiting height shown are the lesser of Fire Height (f) without pressure, and Structural Limiting Height (in nn fire rating condition) at 0.25 kPa governed by deflection L/240 (d), Strength (s) or End Reactio (r). End reaction refers to the manner in which stud is restrained in the top and bottom track i.e. friction fit or rigid fixed.  
 ■ Where the system will be required to resist pressure or other loadings during fire service refer to Knauf Viet Nam for limiting height informationheight shown.  
 ■ Nogging @1200 is recommended for erection purpose in wall higher than 3000mm.

# SINGLE STUD PARTITION SYSTEMS

## Knauf SUPRAWALL™ Single Stud Partition Systems

Knauf SUPRAWALL™ Single Stud Partitions are economical friction fit systems used for the assembly of frames for non-loadbearing partitions. The unique design of the components ensures high strength with easy installation. Knauf partitions are suitable for both residential, commercial and industrial use. They are strong high performance systems which are:

- Cost effective
- Lightweight (10 times lighter than brick)
- Versatile (accommodates building design)
- Able to achieve high levels of fire resistance
- Able to achieve high acoustic insulation
- Able to resist impact and abrasions
- Able to achieve high quality surface finishes

## Knauf FIRE SHIELD™ Partitions

Fire Shield™ partitions comprise of a C-Stud framing and plaster boards to provide a stronger partition which is more resistant to knocks and scratches.

In addition, partitions also provide superior sound insulation and fire resistance when compared with partitions using Knauf Standard Shield™ plasterboards.

## Performance

The selection of C-Stud size, and the type, number and thickness of plasterboard layers will depend on the partition height and the performance required for fire resistance and sound insulation.

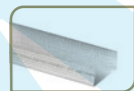
## Jointing

All plasterboard joints should be taped and jointed as specified in this manual, refer to the Finishing Solutions Section for details.

## Main Components



Suprawall Stud



Suprawall Track



Knauf Screws (as appropriate)

## Add Components for fire partitions

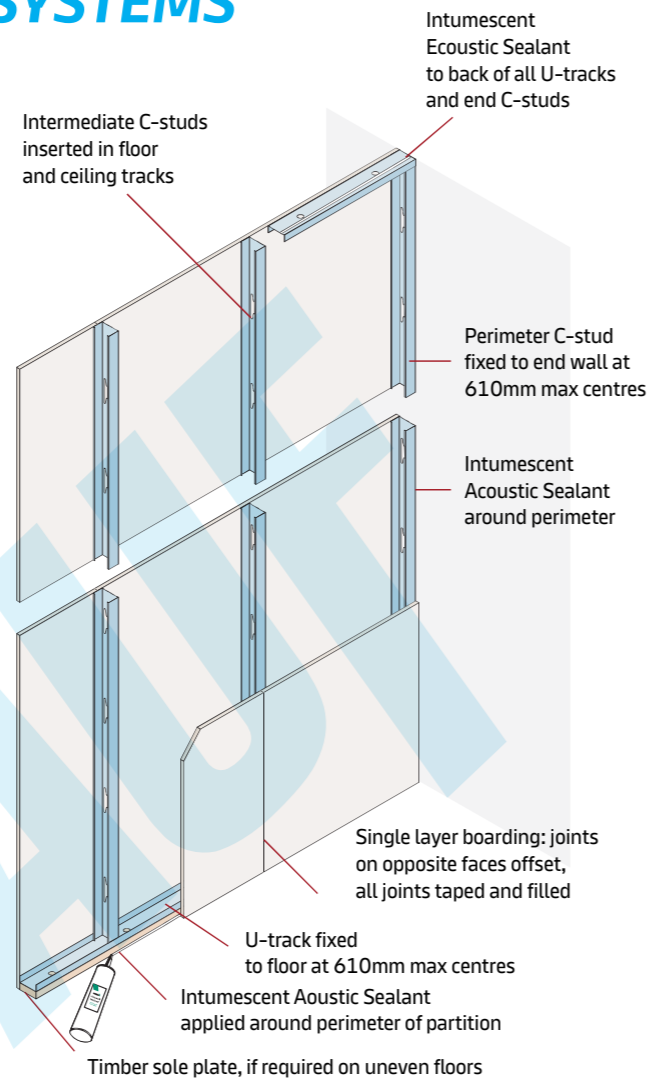


Intumescent Acoustic Sealant (By Others)

## Add Components for partitions with Insulation



Insulation (By Others)



# STAGGERED STUD PARTITION SYSTEMS

## Knauf SUPRAWALL™ Staggered Stud Partition Systems

Knauf SUPRAWALL™ Staggered Stud Partition Systems are non-loadbearing partitions which have been designed to provide improved acoustic performance when compared with equivalent widths of single stud partitions.

An average of 1-2dB improvement is gained by using the staggered stud design.

SUPRAWALL™ Staggered Stud Partition Systems are constructed by installing U-Tracks which are slightly wider than the C-Studs, this allows C-Studs to be staggered creating a frame separation within the partition. Once frame is erected, plasterboard is then faced into each staggered frame.

Due to the staggered stud frame design creating a separation within the partition the SUPRAWALL™ Staggered Stud Partition Systems are suitable for areas with a height limit of 4m.

## Performance

The selection of U-Track and C-Stud size, and the type, number and thickness of plasterboard layers will depend on the partition height and the performance required for fire resistance and sound insulation.

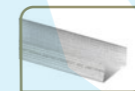
## Jointing

All plasterboard joints should be taped and jointed as specified in this manual, refer to the Finishing Solutions Section for details.

## Main Components



Suprawall Stud



Suprawall Track

## Add Components for fire partitions



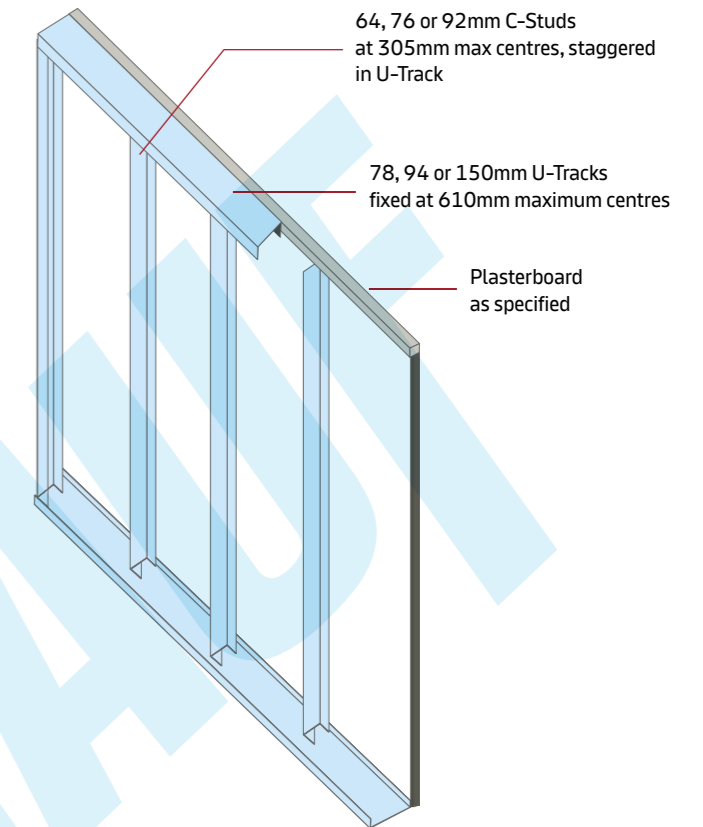
Intumescent Acoustic Sealant (By Others)

## Add Components for partitions with Insulation



Glass wool (By Others)

## Staggered Stud Partition Detail



# TWIN STUD PARTITION SYSTEMS

## Knauf SUPRAWALL™ Twin Stud Partition Systems

Knauf SUPRAWALL™ Twin Stud Partition Systems are non-load bearing partitions designed for installations requiring enhanced fire, sound and impact resistance and for use in creating exceptionally wide or high partitions in excess of 10m,

SUPRAWALL™ Twin Stud Partition Systems also allow for easier installation of mechanical and electrical services which run through the twin frame system.

This has made these partitions popular for buildings ranging from manufacturing facilities, multiplex cinemas and multi-occupancy buildings to hospitals.

SUPRAWALL™ Twin Stud Partition Systems are constructed using two separate metal stud frames set a minimum of 20mm apart and braced together as specified using either V-Brace, plaster board, C-Stud or U-Track. Once frame is erected, plaster board is then faced onto each side of the twin frame.

### Performance

The selection of C-Stud size, and the type, number and thickness of plasterboard layers will depend on the partition height and the performance required for fire resistance and sound insulation.

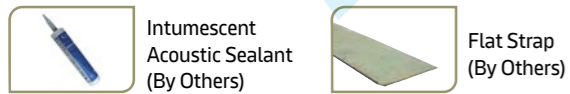
### Jointing

All plasterboard joints should be taped and jointed as specified in this manual, refer to the Finishing Solutions Section for details.

### Main Components



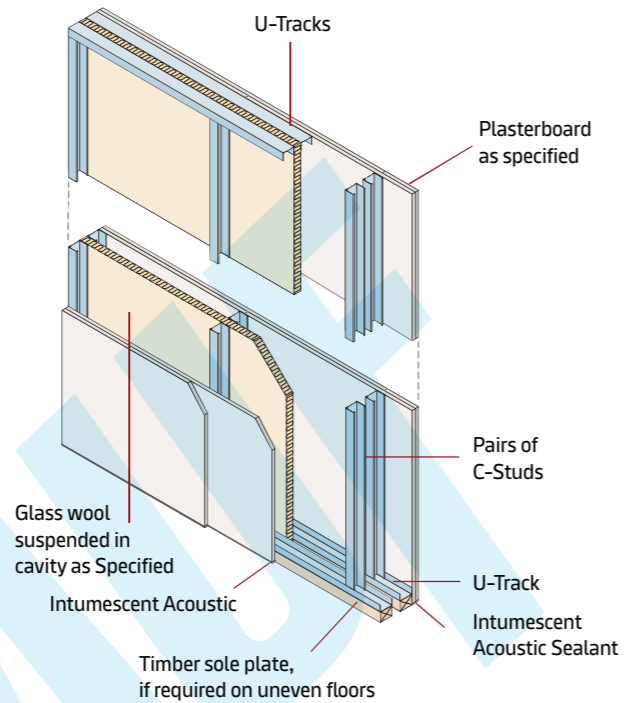
### Add Components for fire partitions



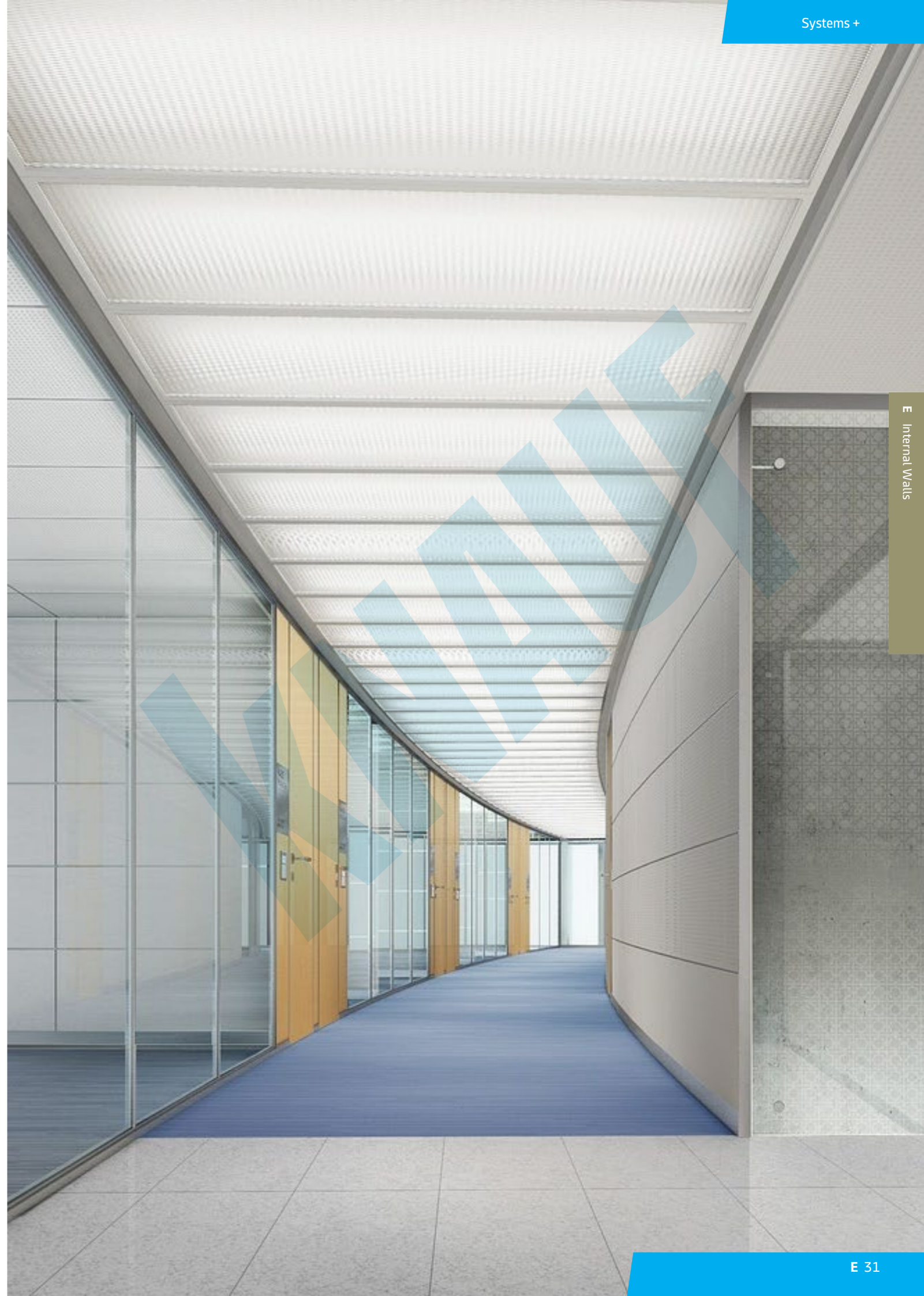
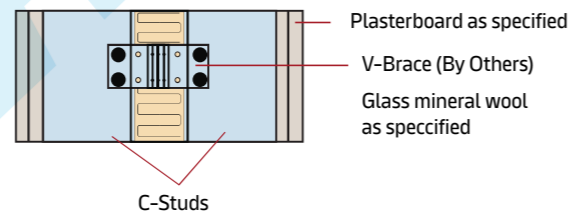
### Add Components for partitions with Insulation



## Twin Stud Partition System



## Stud bracing using V-Brace





## Section F

External Walls

01/2025

### **F/ EXTERNAL WALLS**

- F 2 The Design And Construction Landscape Is Changing
- F 4 Knauf Exterior Wall – The Advantages
- F 24 Knauf Exterior Wall – The Solutions
- F 32 Knauf Exterior Wall – The Products

## THE DESIGN AND CONSTRUCTION LANDSCAPE IS CHANGING



There's an increasing demand to build faster, more efficiently and cost-effectively. There's a global call for more imaginative and sustainable designs. And there's a revolution in materials and construction techniques, opening up a new world of possibilities.

Architects are at the forefront of these changes. Driven by their vision and experience, the built environment is changing for the better, with more ambitious ideas, inspirational designs and beautiful spaces where people want to live and work.

For over 80 years, Knauf has been partnering architects in shaping this new landscape.

Continually pioneering new products, services and solutions in drywall construction, we push the boundaries of what's possible, opening the door to bolder design and better buildings. This is our expertise. Combined with the experience and talent of architects, we're changing the way the world builds – more creatively, more efficiently, more sustainably.

# KNAUF EXTERIOR WALL – THE ADVANTAGES

## Built On Experience

In a fast-changing world, Knauf Exterior Wall with AQUAPANEL® Technology delivers creativity, certainty and complete peace of mind whatever the building type – from offices and residential accommodation through to hospitals and stadiums.



Suzhou Olympic Sports Centre | Jiangsu, China



Markor Cave | Beijing, China



Hunan Broadcasting System Program Production Center | Changsha, Hunan, China



Tai Kwun Centre | Hong Kong, China



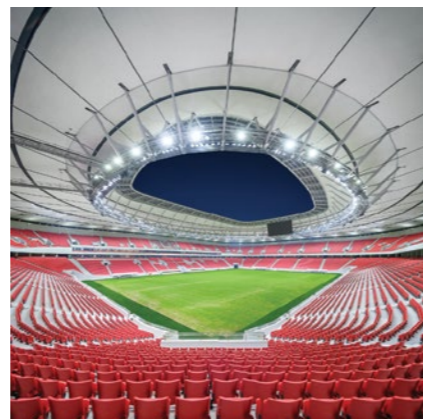
Suzhou No.2 Library | Jiangsu Province, China



Xiqu Centre | Hong Kong, China



Shaw Auditorium | Hong Kong, China  
© Copyright Kris Provoost, courtesy of Henning Larsen Architects



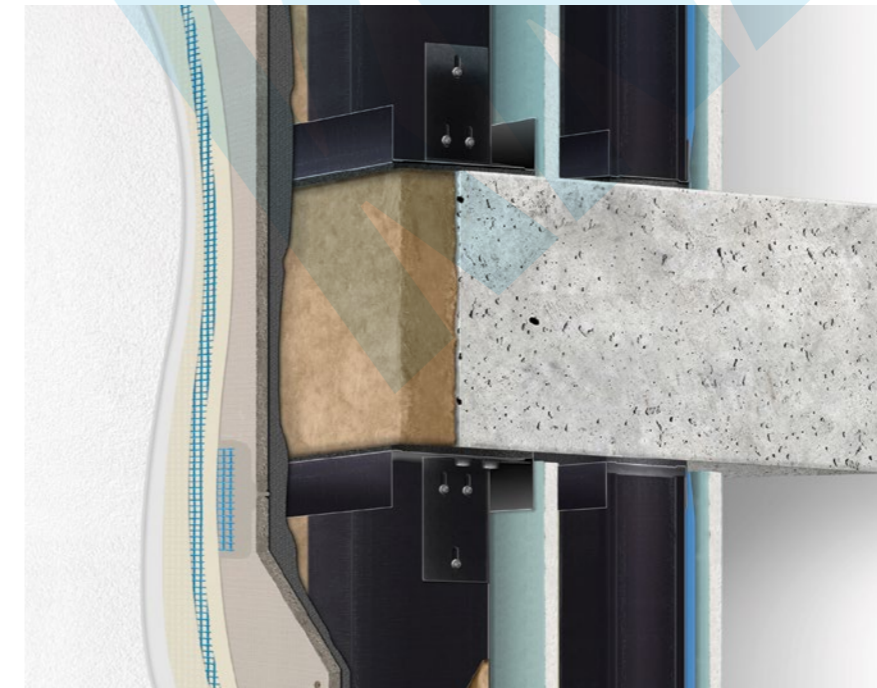
SAIC Motor Pudong Arena | Shanghai, China

## Dedicated System Solutions

Knauf Exterior Wall comes in two basic types: drywall, or as a rear-ventilated rainscreen facade. It therefore offers an extremely flexible and adaptable solution which can accommodate an impressive range of designs, opening up new architectural possibilities and helping to turn vision into reality, whether it's being used to create commercial or residential buildings, or sports arenas or healthcare establishments. Truly, we are changing the way the world builds.

### Knauf Exterior Wall – rear-ventilated rainscreen facade

With rainscreen facades for use above solid substructures such as brick or concrete, thermal insulation is separated from the weather protection materials ensuring a constant flow of air in the ventilated space to remove moisture from the building and to optimise indoor climate. Even if the facade is damaged, the insulation remains intact.



### Knauf Exterior Wall – drywall solution

Drywall systems are available as single stud or double stud solutions with a variety of creative design options. And although it is most commonly used in skeleton constructions comprising reinforced concrete, drywall is also suitable for timber or lightweight steel-frame constructions.

F External Walls

F External Walls

# KNAUF EXTERIOR WALL – THE ADVANTAGES

## Creative Freedom Without Limits

Architects and specifiers worldwide are discovering the liberating potential of Knauf Exterior Wall with AQUAPANEL® Technology. Strong, light and easy to shape into inspirational designs, the system is also able to accommodate a huge range of finishes to beautiful effect. And thanks to its easy adaptability and simple integration of building technology, Knauf Exterior Wall always remains flexible against any usage – or weather-related influences.



### New design possibilities for curved walls

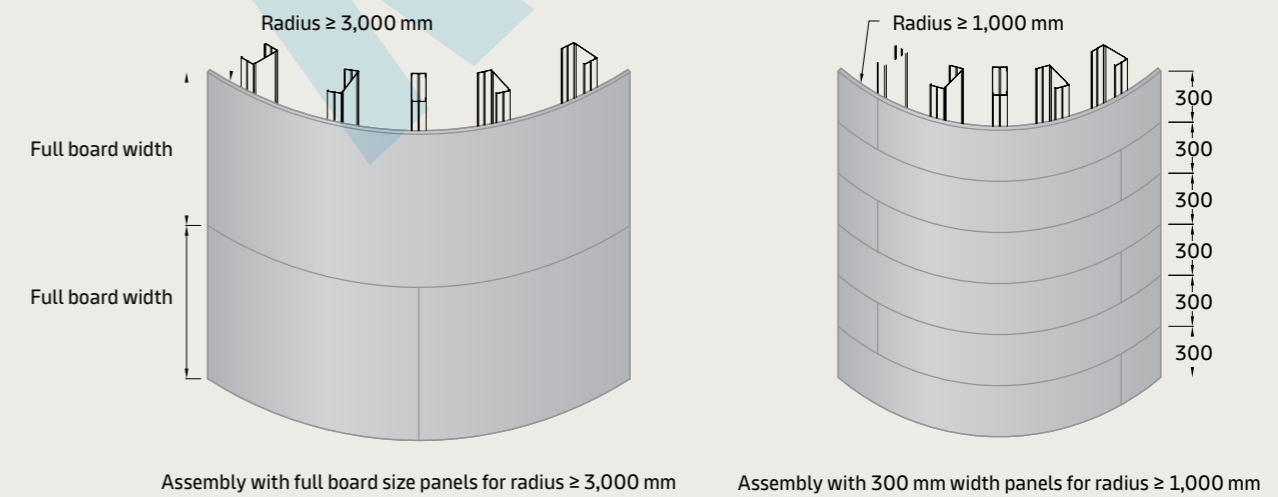
With a bending radius of 3 metres (full board) and 1 m (300 mm strips), AQUAPANEL® Cement Board Outdoor allows designers to introduce a variety of curved shapes and creative designs, including domes and arches. Moreover, by using double studs, it's possible to create different interiors and exteriors: for example, a wall that's concave on the outside, and convex on the inside.

F External Walls

F External Walls



### Arrangement of AQUAPANEL® Cement Board Outdoor with different radius



# KNAUF EXTERIOR WALL – THE ADVANTAGES

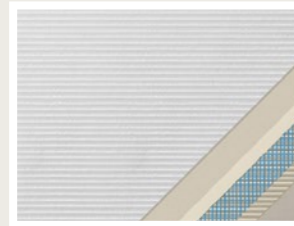
## Stunning Surfaces And Finishing Options

Compatible with an extensive range of surface finishes, from paint and renders, through to adhered materials like clinker bricks, tiles or glass elements, Knauf Exterior Wall solutions offer unlimited scope for creative expression. Even a variety of cladding systems can be realised, resulting in very thin ventilated constructions, because the required insulation is already integrated inside the drywall.

### Renders



Broom finish



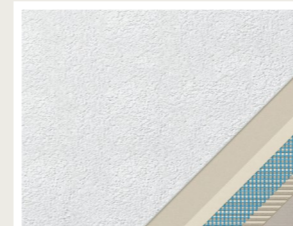
Combing technique



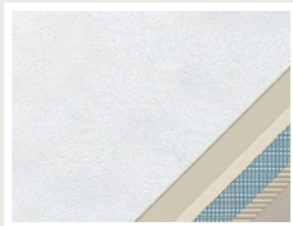
Concrete look



Fine sponged render



Floated render



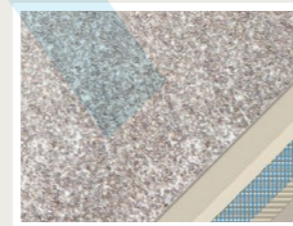
Groove render



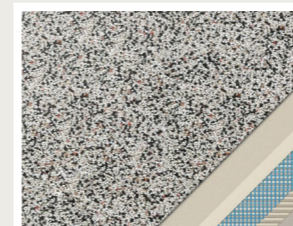
Modelling render



Paint finish



Pebble dash



Variegated stone wall render

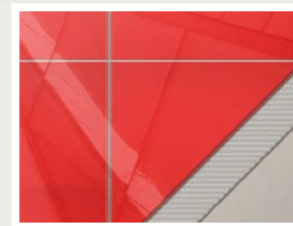
### Adhered materials



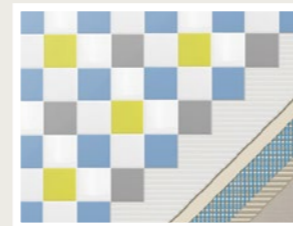
Ceramic facing bricks



Clinker bricks



Glass elements



Mosaic tiles



Sandstein design

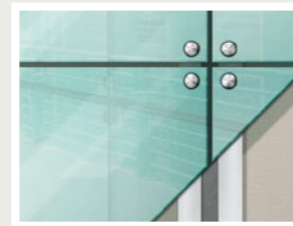
### Ventilated facades on drywall constructions



Aluminium panels



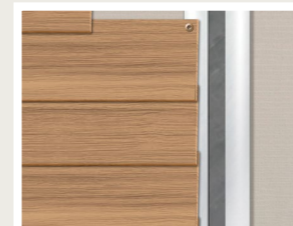
Ceramic tiles



Glass panels



Granite plates



High-pressure compact laminate

## Future-proofed and adaptable designs

The pressure on space, the protection of green land, the cost of materials and the demand for sustainability are all reasons why building redevelopment will increasingly gain importance in the future. And already now, architects are embracing the creative challenges of re-imagining and repurposing existing buildings to breathe new life into old stock. With its lightweight properties Knauf Exterior Wall is at the forefront of this movement.

Simple to remove and reconfigure, and giving easy access to electrics, pipework and trunking, Knauf Exterior Wall allows modifications and reutilisations to be carried out quickly and efficiently, helping change the look of buildings, as well as their function. This also includes measures during running operation of the building: for example, changing the layout of hospitals to accommodate changing need. Whether it's repair, modification, more energy-efficient renovation or creative remodelling, Knauf Exterior Wall provides a future-proofed and adaptable solution.

## Multifunctional and integrative compositions

Depending on the construction task and location, increasing demands are placed on building technology. It is responsible, for example, for measuring weather-related, daily and seasonal conditions on the outside and for harmonising ventilation, lighting and heating technology in a way that guarantees a comfortable environment on the inside. Such climatic and energy optimisation is often accompanied by technical solutions that normally take up space in the interior of the building.

With the help of Knauf Exterior Wall, such solutions can be integrated into the building envelope faster, more flexibly and more easily compared to solid construction methods. Wall openings or core hole drillings through the outer wall can be omitted and electrical connections are easy to install even in the event of a retrofitted installation. In this way – for example, due to the installation of decentralised heating and ventilation equipment inside Knauf Exterior Wall – the usable space in the interior is increased and construction costs are saved by reducing the floor heights. This is because suspended ceilings to accommodate an air distribution system are no longer required.



F External Walls

F External Walls

# KNAUF EXTERIOR WALL – THE ADVANTAGES

## Faster, Easier, More Efficiently

The installation of Knauf Exterior Wall is fast and efficient. It's components are light and easy to handle and due to the just in time window installation and the fast closing of the building envelope, the construction is largely weather-independent and interior works can begin significantly earlier than with conventional building methods.

### Simplified installation

Knauf Exterior Walls with AQUAPANEL® Technology are easy to use. All drywall and facade works – exterior, interior and finishing – can be carried out by a single trade, meaning fewer hands and less risk as well as a streamlined construction process. Only the cabling and pipework inside the interior stud frame as well as window and windowsill installation require the involvement of additional parties.

### Easier handling

The core component of Knauf Exterior Wall – AQUAPANEL® Cement Board Outdoor – is a lightweight board, making it much easier to handle. No pre-drilling is required, while a simple 'score and snap' technique means it can be cut quickly and efficiently. It also has a bending radius of up to 1 m in a dry state, further simplifying construction.

Similarly, Knauf's glass mineral wool with ECOSE® Technology delivers significant advantages in handling. As well as being odourless and generating significantly less dust, over 90% of professional installers state that glass mineral wool with ECOSE® Technology is softer and less itchy than conventional mineral wool. A majority of installers also say it's easier to cut.



### Digression: creating much needed living space

In times of increasing urbanisation worldwide, and at the same time scarce living space in the cities, calls for fast residential construction are becoming louder and louder. However, traditional solid construction methods do not seem to offer any solutions for the creation of timely and affordable housing for broad sections of the population. Many answers are therefore aimed at modular construction, which can be carried out quickly and weather-independently due to prefabrication in the factory. Mass production makes these offers affordable, but – depending on the supplier – may also entail compromises in terms of individuality.

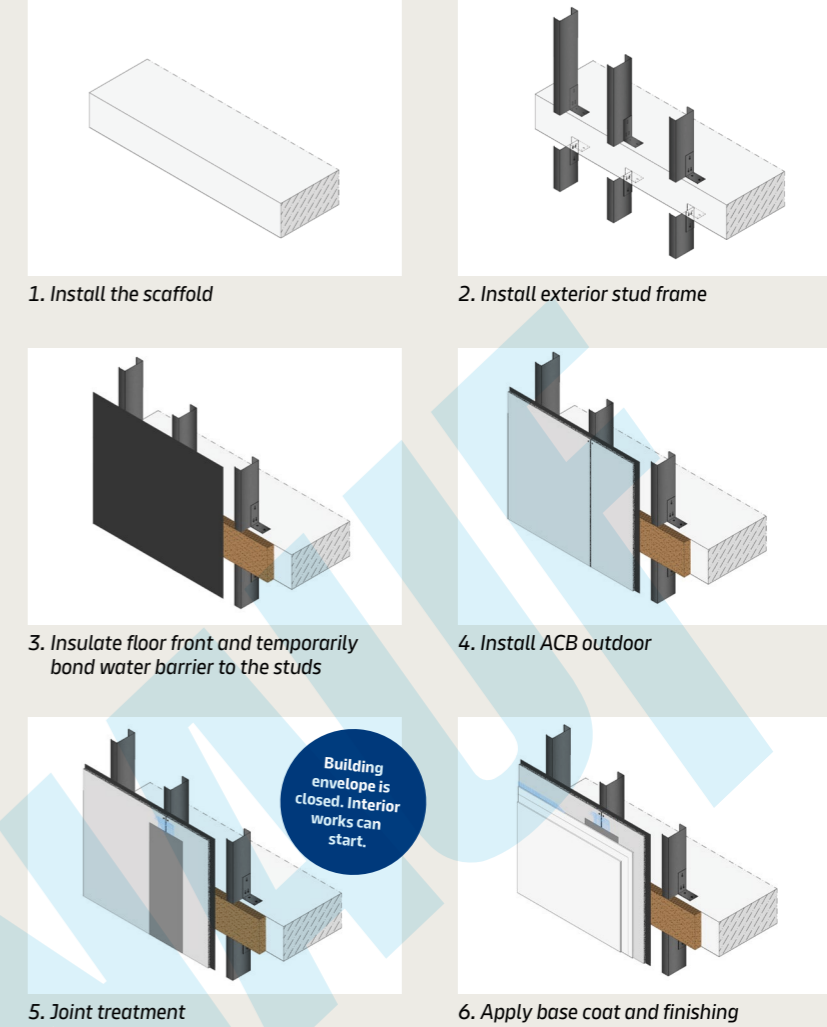
In addition, some municipalities and housing associations see a challenge in the compatibility at the modules' intersections (e.g. cable and pipe installation or joint treatment) and against the backdrop of resource efficiency, modular construction is not necessarily the first choice. Because, to withstand the high loads during transport, steel needs to be installed – more than necessary if assembled on site.

Here Knauf Exterior Wall forms a middle ground between usual solid construction methods on site and the modular design in the factory. Knauf Exterior Wall, like solid construction, can be designed individually, but is less fraught with risk due to fewer interfaces between individual trades. At the same time, like modular construction, it is efficient and largely weather-independent, and additionally offers compatibility due to the lack of intersection issues. Knauf Exterior Wall thus combines the advantages of both construction methods – modular and solid.

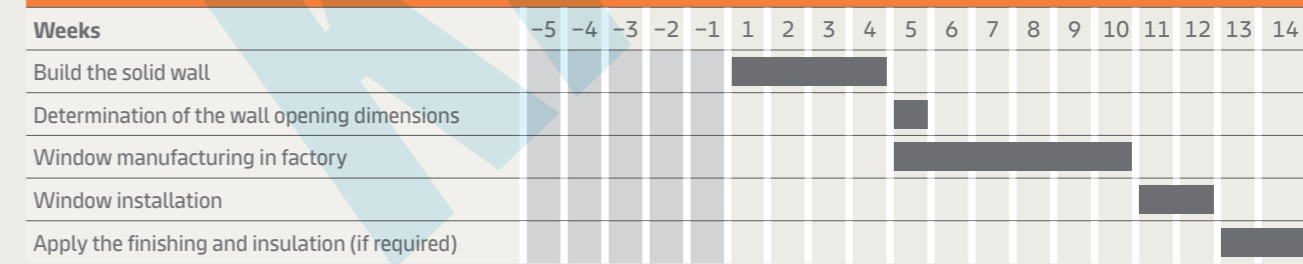
### Accelerated construction

The building envelope can be closed immediately after the joint treatment of the boards, significantly earlier than with conventional methods such as brick and block. (Once jointed, the boards can also be left for up to 6 months, providing added peace of mind). As a result, interior works (including screeding and the installation of stud frames, vapour barriers, lining and insulation) can progress simultaneously with exterior finishing, resulting in a more efficient construction.

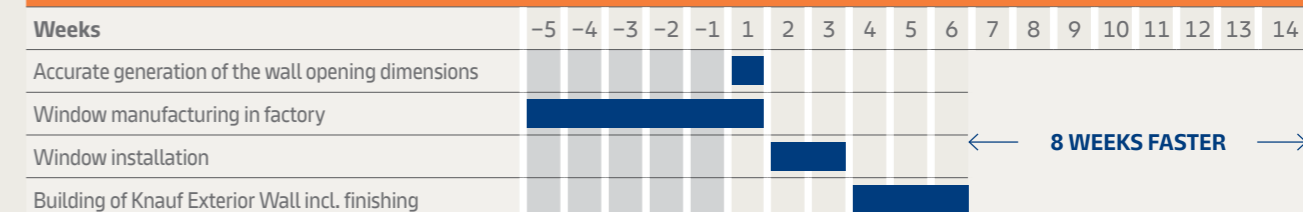
Working to precise plans and dimensions, manufacturers can build windows in advance and transport them to the site, ready for immediate installation. This adds reassurance to project delivery deadlines and significantly contributes to accelerated construction and weather independence compared to traditional ways of construction. In masonry variants, such as aerated concrete or sand lime brick, if the windows are not installed in the insulation layer, the openings must first be measured after erection of the exterior wall. Unlike Knauf Exterior Wall, this is a disadvantage which brings considerable time delays.



### Solid construction/traditional construction – example: office building 3,000 m<sup>2</sup> area



### Knauf Exterior Wall – example: office building 3,000 m<sup>2</sup> area



## KNAUF EXTERIOR WALL – THE ADVANTAGES

### Faster Payback And A Higher Return On Investment

The lightweight nature of Knauf Exterior Wall doesn't just help deliver efficient and economical builds, it delivers significant financial benefits too, both in terms of construction costs and rental or resale value.

#### Lower construction costs

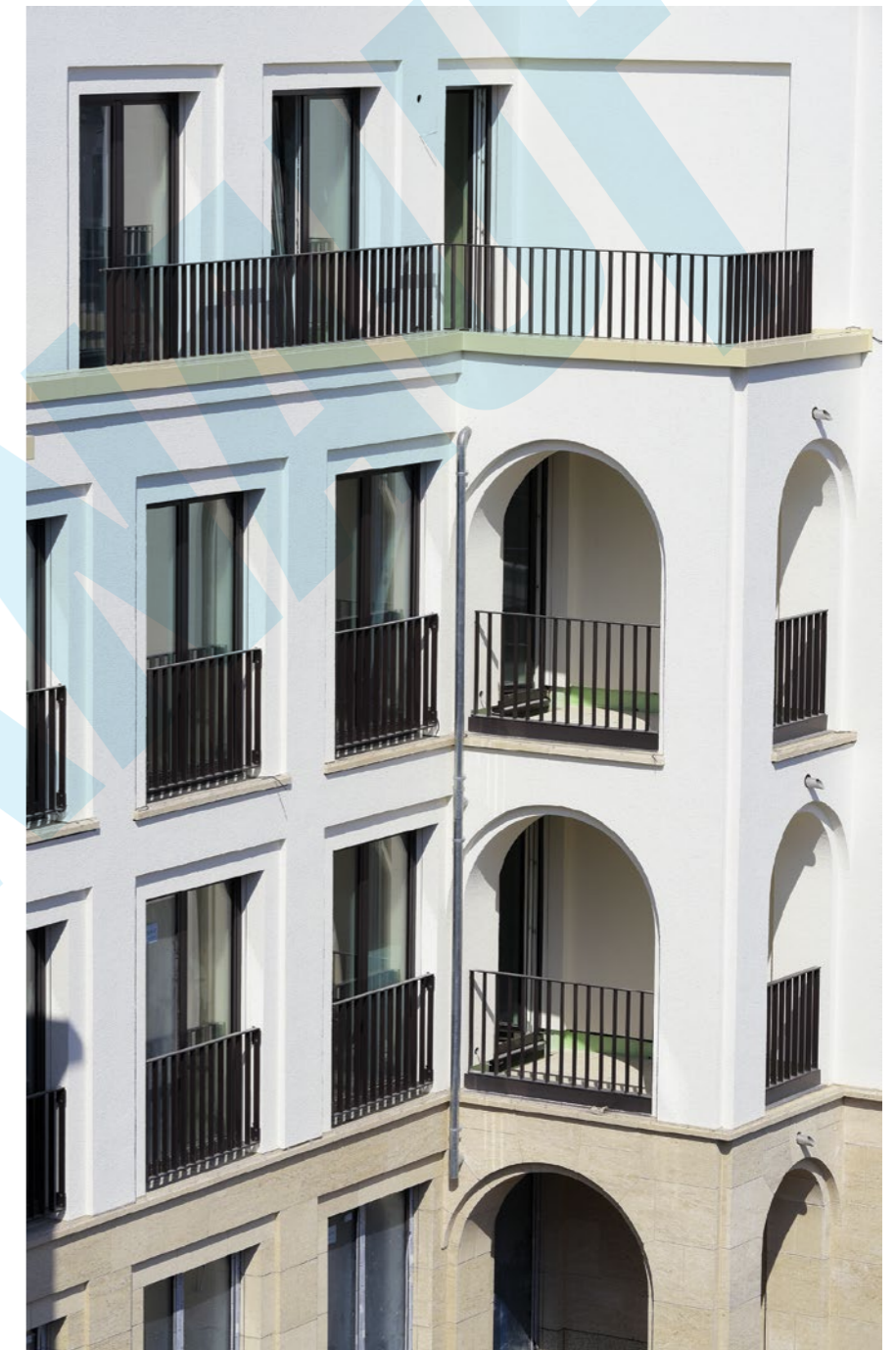
Because Knauf Exterior Wall with AQUAPANEL® Technology is a lightweight solution, there is significantly less bearing load in both primary construction and foundation works. How significant the weight difference between traditional construction methods and Knauf Exterior Wall can be, is shown in the graphs at the bottom of this page. As a result, the building design and its construction can be executed much more cost-effectively.

Weight for weight, Knauf Exterior Wall solutions also cost less to transport than traditional building materials such as brick, while the speed of installation reduces the extended need for scaffolding, helping cut rental costs. Equally, the use of drywall solutions eliminates water waste, while a faster drying time minimises the amount of energy needed to dry out the construction. These advantages drive cost benefit into the project right from the start.



#### Increased sale and rental value

With Knauf Exterior Wall, it is possible to achieve the same thermal performance as brick and block with a thinner wall thickness, meaning that more internal floor space is available for sale or for rent. The graphs at the bottom of this page show how much of the area occupied by the exterior wall in traditional ways of construction can be converted into usable, productive space by using Knauf Exterior Wall. Equally, speedy construction means that a sale – or rental return – can be achieved more quickly than with traditional construction methods. Both factors combine to ensure a faster and higher return on investment.



# KNAUF EXTERIOR WALL – THE ADVANTAGES

## Optimum Design, Minimum Impact

In today's construction environment, there is a drive to reduce the impact of the building on human health and the natural environment. This must be considered at every stage of the process, from planning and design through to construction, use, renovation and demolition. There are various ways this can be achieved, and Knauf Exterior Wall solutions offer strong capabilities in each case.

## Energy efficiency and CO<sub>2</sub> reduction

Energy is used both in the production, transportation and installation of building materials (the 'embodied' energy), as well as during habitation and use (the 'operating' energy).

## Embodied energy

This represents up to 30% of the overall life-cycle energy consumption of a building and is therefore a significant factor. The exact percentage varies based on factors including the age of building, the local climate and the exact nature of materials used. Historically, this percentage has been lower. However, the intensifying focus on minimising operational emissions – e.g. by driving efficiency improvements in heating and cooling – has meant both a relative increase in embodied energy, and in its importance as a measure.

Many of the products within Knauf Exterior Wall with AQUAPANEL® Technology possess an Environmental Product Declaration (EPD) as per ISO 14025 and EN 15804. In addition to referencing environmental impact and waste categories, these EPDs at least provide a product life cycle assessment from cradle-to-gate, including the energy resources needed to supply and transport raw materials and to manufacture the end product.

As a complete system, Knauf Exterior Wall has a 50% less primary energy requirement during manufacture than conventional brickwork construction. Equally, CO<sub>2</sub> output in material production for a Knauf Exterior Wall is 30% lower than brick and block construction. As a specific example, mineral wool with ECOSE® Technology from Knauf Insulation uses a formaldehyde free binding agent, reducing energy demand during manufacturing.

Additionally, because of its lightweight properties, Knauf Exterior Wall uses less energy and generates less CO<sub>2</sub> during transportation, while – because it is a drywall construction – the drying time of the building and therefore the energy required are significantly reduced during the construction phase.

## Operating energy

Buildings with a high-performance envelope in a cold climate require just 20% to 30% of the energy required to heat the current average building (source: the Organisation of Economic Co-operation and Development – OECD). The insulation within the walls is a critical factor, and Knauf Exterior Wall has many advantages in this respect – not least superior thermal insulation compared with traditional constructions of an equal thickness. This can be further enhanced by minimising thermal bridges. These advantages are at their biggest with the initial layer of insulation – especially in developing countries where insulation is often not being installed – but can also be significant in developed countries. This is especially the case in renovations of poorly insulated stone, masonry or concrete constructions, where Knauf's rear-ventilated rainscreen facade with insulation offers a smart and effective solution. The ability to install varying thicknesses of mineral wool in that system, means that the desired energy standard can be reached, even in the most demanding situations.

## KNAUF EXTERIOR WALL – THE ADVANTAGES

### Materials efficiency and waste reduction

Efficient building materials include products that are reusable, renewable, and/or recyclable. The reuse and recycling of these materials require that buildings at the end of their useful life are not demolished and hauled to landfills. 'Deconstruction' is a method of harvesting and reclaiming useful building materials. Selective demounting and separation of Knauf Exterior Wall with AQUAPANEL® Technology can be carried out easily, reducing the volume of waste while increasing the potential for recycling.

Simply re-imagining a building and extending its useful life also reduces waste. The adaptability of Knauf Exterior Wall facilitates modifications and reutilisations, even while the building is in use. Renovations with rear-ventilated facade systems guarantee continued use without being forced to make compromises in design or energy-efficiency. And once installed, a service life of approximately 50 years can be achieved (according to Environmental System Declaration).

Waste arising during production of AQUAPANEL® Cement Board Outdoor is fed back into the production process. The amount of recyclable materials in the composition of AQUAPANEL® Cement Board Outdoor is approximately 5-10% by mass.



### Protecting occupant health

In LEED standards, the Indoor Environmental Quality (IEQ) sets out to measure and improve the well-being and comfort of building occupants using five key categories – one of which is indoor air quality (IAQ). Here, the focus is on minimising the effects of air impurities – including volatile organic compounds (VOC) and other microbial contaminants – which are present in the majority of building materials and maintenance products, and which have the potential to negatively impact on occupant health and productivity. Choosing zero or low VOC emission materials and finishing products – such as those built in Knauf Exterior Wall – improves both the building's IAQ and the comfort of its occupants.

Most of the products of Knauf Exterior Wall are classified A+ according to French VOC regulation. As an example, the ECOSE® Technology from Knauf Insulation enables the production of natural mineral wool insulation materials bonded with a bio-based technology free from formaldehyde, phenols, acrylics and with no artificial colours, bleach or added dyes. These products passed a VOC emission chamber test, where the sum of VOC measured was below the limit values of 1,000 µg/m<sup>3</sup> after 3 days and 100 µg/m<sup>3</sup> after 28 days. The products were awarded with the Eurofins Indoor Air Comfort Gold Certificate.

The accumulation of moisture and the knock-on effects of damp – including mould, viruses and bacteria – are also contributing factors to poor IAQ. Using water and mould resistant products helps to minimise or eliminate these issues.

To achieve reliable moisture protection, Knauf Exterior Wall has a layered structure with a carefully designed sequence of vapour barring and breathable materials. In an unfavourable climate, this helps to diffuse condensate safely to the ambient air. To protect the insulation, the water and windproof AQUAPANEL® Water Barrier is installed behind the AQUAPANEL® Cement Board Outdoor, while to avoid condensate formation inside the wall, a vapour barrier is installed behind the interior lining.

### Quality certifications

#### Company:

- ISO 9001

#### Systems:

- Environmental System Declaration

#### Products:

- Declaration of Performance
- ETA-07/0173
- LEED Confirmation
- Certificate of Building Biology
- Environmental Product Declarations
- Safety Against Ball Throwing
- Blue Angel (Insulation)
- Eurofins Indoor Air Comfort Gold Certificate (Insulation)
- Certificate of Conformity (COC) in accordance with SCDF Fire Code 2018 requirements (Singapore)
- Singapore Green Building Product Certificate



Scan to get access to certificates



# KNAUF EXTERIOR WALL – THE ADVANTAGES

## Building engineering physics – a certain solution

The defining quality of Knauf Exterior Wall solutions is the ability to prevent water from entering the construction. Combined with moisture protection, thermal and acoustic performance and effective resistance to both fire and seismic activity, Knauf Exterior Wall with AQUAPANEL® Technology allows you to create the buildings you want, with the attributes you demand and the quality assurance you need.



## Moisture protection

Knauf Exterior Wall solutions feature a layer design which combines a sequence of vapour barring and breathable materials to enable moisture and condensate within the construction to be safely released. The result is reliable protection in even the most unfavourable climates.

## Corrosion protection

The Knauf Exterior Wall consists of a lightweight steel construction including fastener, connecting and anchoring materials. The steel components are to be protected against corrosion. The minimum corrosion protection category to be chosen is C3-high according to EN ISO 12944 (urban and industrial atmospheres with moderate air pollution) to ensure the serviceability and longevity of the Knauf Exterior Wall of 50 years. For higher requirements and the corrosion protection category to be chosen, a detailed analysis of the object-related atmosphere has to be carried out. Generally, the category of corrosion protection has to be determined by the planner on an object-related basis.

## Fire protection

All components within Knauf Exterior Wall are non-combustible, with the exception of the membranes which dissipate quickly without causing damage. By exchanging or adding components, Knauf Exterior Wall can meet a variety of fire safety requirements. For example, fire resistance class EI30 of an undisturbed wall construction can be achieved by lining the interior stud frame with two gypsum boards.

## Sound protection

Because of its construction and sequence of layers, Knauf Exterior Wall creates a spring-mass system which helps maximise sound reduction. Window installations and other penetrations of the wall can influence the sound protection of the exterior wall and have to be considered object-wise.

## Thermal insulation

Knauf Exterior Wall provides superior thermal insulation compared with traditional constructions of an equal thickness. And the thermal performance of each Knauf Exterior Wall can be further enhanced with various measures, each helping to minimise the impact of thermal bridging.

Examples include using:

- A second insulation layer, such as ETICS
- A double stud system instead of a single stud
- Intermediate insulation between the stud frames in a double stud system
- Offset/staggered profiles
- Ventilated construction or a construction in front of floors to minimise thermal bridges between Knauf Exterior Wall and the concrete slabs

With respect to thermal insulation, the construction related advantages of the rear-ventilated rainscreen facade are the heat insulation and the good room climate conditions in the summer. The discharge of hot air over the ventilation gap prevents a potential heat accumulation or a heat up between facade and insulation. Furthermore the exterior wall warms up to a lesser extent and more slowly than with direct contact with solar radiation. That way the temperature inside the building remains comfortable in the summer, the room climate is less vulnerable to variations in outdoor temperature, and the energy demand for cooling is reduced.

## Earthquake safety

During seismic activity, Knauf Exterior Wall experiences a lower risk of failure than traditional construction materials, thanks to its ductility and positive deformation behaviour. Moreover, in the event of actual failure, its lightweight properties are less potentially damaging to the surrounding area. Compared with most other building types, Knauf Exterior Wall is also easier to repair and rebuild, making it ideal for use in earthquake zones.

## Expansion joints

Expansion joints have to be provided at a distance of  $\leq 15$  m, in order to allow weather-related expansion and shrinkage. Building separation joints and expansion joints in the primary construction have to be incorporated into the facade. Some facade geometries such as complex surfaces and facades that are subject to increased stress may require additional expansion joints.



## KNAUF EXTERIOR WALL – THE ADVANTAGES

### Bringing excellence and expertise to your project

Knauf Exterior Wall encapsulates versatile components and features – but, more importantly, it embodies the expertise of our pioneering past. Because of this, we're able to help shape a better present and future. Our whole focus is on supporting our partners and customers, giving them the inspiration and solutions they need to create better buildings.

Established in 1932, Knauf is a global group employing over 27,000 people across 86 countries. Supported with an extensive distributor network, we deliver an exceptional local service across all territories – and all from one single source. A key part of this group – and of Knauf's Exterior Wall with AQUAPANEL® Technology – Knauf AQUAPANEL is based in Germany. Since 2002, Knauf AQUAPANEL has pioneered drywalling solutions and technology and applied its expertise to help create certainty in a changing world.

### AQUAPANEL® is the home of the Knauf Dry Exterior Wall Competence Centre

Knauf AQUAPANEL is also the home of the Knauf Dry Exterior Wall Competence Centre. Sitting at the heart of our innovation and technical expertise, this centre acts as a pivotal resource, gathering insight and best practice and offering advice and technical support at every stage of the process – from design, specification and planning through to installation and beyond, ensuring that the full benefits of Knauf Exterior Wall solutions are available to our customers.



### Our support includes:

- Local expertise delivered via country-based Specification Managers (with the back-up of an International Technical Support team)
- Project-related system recommendations including static pre-dimensioning, physical analyses, U-Value calculations and hygrothermal simulation
- Site visits and support, via an experienced team of Application Engineers
- Assistance with the certification of products and systems, including approval tests and building law examinations
- The supply of samples, mock-ups or demonstrations to aid decision-making
- Wide range of technical documentation including consumption tables, installation guides, leaflets and CAD Files
- Wide range of technical and practical training, available locally or at our International Training Centre in Dortmund
- ISO 9001 certified, ensuring Quality Control and high standards of service

# KNAUF EXTERIOR WALL – THE ADVANTAGES

## AQUAPANEL® Cement Board Outdoor

### Exceptional weatherproofing, outstanding benefits.

Knauf Exterior Wall with AQUAPANEL® Technology comprises comprehensive system solutions, made possible by a core product at the heart of each system – AQUAPANEL® Cement Board Outdoor. This key component is a premium product offering unrivalled performance in wet and humid conditions, helping to protect buildings quickly, effectively and permanently. Manufactured from aggregated Portland cement, AQUAPANEL® Cement Board Outdoor features coated glass fibre mesh in the back and front surfaces for added strength. The ends are square cut, and the edges reinforced with a smooth finish (EasyEdge™).



### Performance

- 100% water-resistant – dimensional stability
- Mould and mildew resistant
- Freeze-thaw cycle proven
- Non-combustible (A1) – complies with European standards
- Non-combustible – complies with Certificate of Conformity (COC) according to BS 476-4:1970 (Singapore)
- Robust and reliable, safe and hygienic material

### Installation

- Lightweight cement board – less effort in handling
- Easy to cut using a simple score and snap technique
- No pre-drilling required
- Bending radius of 3 m at full board size, and 1 m with 300 mm wide strips

### Finishing

The AQUAPANEL® portfolio includes mineral finish, dispersion plaster, and silicon synthetic resin plaster. Moreover it is compatible with...

- Paint
- Brick slips
- Tiles
- Claddings (e.g. aluminium, granite stone, glass and many more)

### Physical properties

Length (mm)	2,400
Width (mm)	1,200
Depth (mm)	12.5
Min. bending radius for 1,200 mm wide board	3
Min. bending radius for 300 mm wide strip	1
Weight (kg/m <sup>2</sup> )	approx. 16
Dry bulk density (kg/m <sup>3</sup> ) according to EN 12467	approx. 1,150
Bending strength (MPa) according to EN 12467	≥ 7
Tensile strength perpendicular to the plane of the board (N/mm <sup>2</sup> ) according to EN 319	0.65
Shearing strength (N) according to EN 520	607
pH-value	12
Thermal conductivity (W/mK) according to EN ISO 10456	0.35
Thermal expansion (10 <sup>-6</sup> K <sup>-1</sup> )	7
Water vapour diffusion coefficient (-) according to EN ISO 12572	66
Length variation 65% - 85% humidity (mm/m) according to EN 318	0.23
Thickness variation 65% - 85% humidity (%) according to EN 318	0.2
Building material class according to EN 13501	A1 non-combustible
Certificate of conformity (COC) according to BS 476-4:1970 (Singapore)	non-combustible
Fungus Resistance according to ASTM D3273-16	Rating 10 (0 defacement by mold growth)
Fungus Resistance according to ASTM G21-15	Rating 0 (No fungal growth)



# KNAUF EXTERIOR WALL – THE SOLUTIONS

Available in a multitude of modular, dedicated systems, Knauf Exterior Wall with AQUAPANEL® Technology can be quickly and easily configured to meet a range of design challenges in the planning phase – from complex physical requirements to commercial or economic considerations. The examples on the following pages represent just a small sample of possible permutations.

Knauf Exterior Wall with AQUAPANEL® Technology comes in two basic types: as drywall in skeleton constructions (e.g. reinforced concrete) or as a rear-ventilated rainscreen facade for use above solid substructures such as brick or concrete. In both cases, the primary construction is carrying the structural load, while the lightweight Knauf Exterior Wall solutions carry their own dead weight and the wind loads.

## Rear-ventilated rainscreen facade

With classic rear-ventilated rainscreen facades in front of massive constructions such as brick or concrete, thermal insulation is separated from the weather protection materials ensuring a constant flow of air in the ventilated space to remove moisture from the building. On projects where insulation is not required – typically during some purely cosmetic renovations – Knauf Exterior Wall can be used to create very thin facade constructions.

WL132C.1

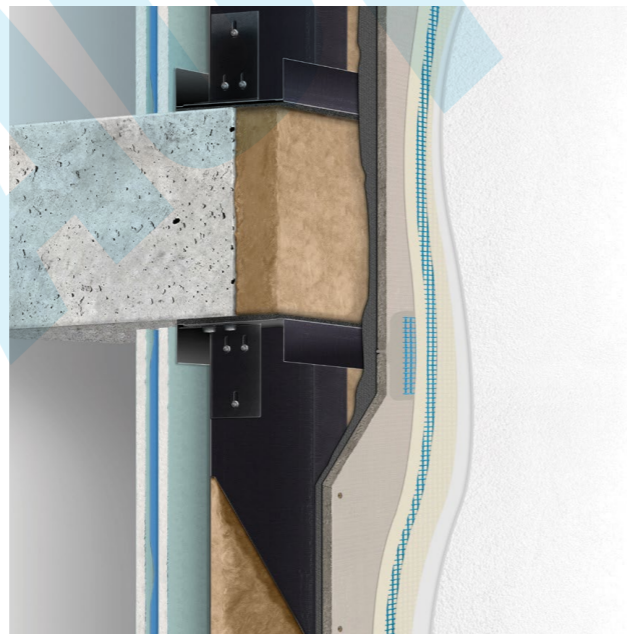


- Rear-ventilated rainscreen facade
- With thermal insulation
- See pages 26-27

## Single stud exterior wall

Where there are low or no special requirements for thermal and sound insulation, Knauf's single stud system is an ideal solution. Lightweight and with a thin profile, it is quick and easy to install. Extra insulation can be added by attaching an external thermal insulation composite system (ETICS) to the front of AQUAPANEL® Cement Board Outdoor.

WM111C.1



- Single stud
- See pages 29-31

F External Walls

F External Walls



# KNAUF EXTERIOR WALL – THE SOLUTIONS

## WL132C.1

### Rear-ventilated rainscreen facade

With classic rear-ventilated rainscreen facades in front of massive constructions such as brick or concrete, thermal insulation is separated from the weather protection materials ensuring a constant flow of air in the ventilated space to remove moisture from the building. The rear-ventilated rainscreen facade WL132C.1 with AQUAPANEL® Cement Board Outdoor is an ideal solution for new buildings or for renovations and upgrades. Capable of accommodating virtually any thickness of mineral wool insulation, it is able to meet even the most demanding energy standard. Moreover, because of the non-combustibility of the material, it is suitable for any height of building.

Scan to get more information about this system



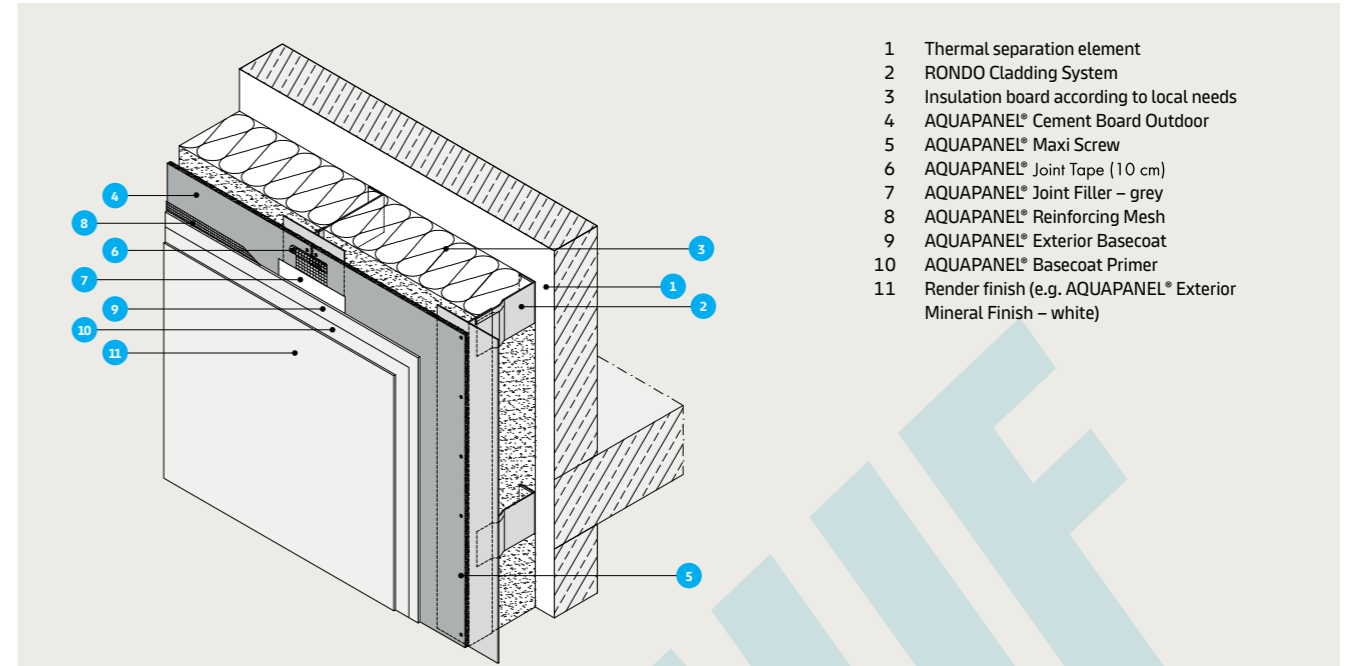
Eagle in Flight | Tirana, Albania



Gerber Quartier | Stuttgart, Germany



Piller Blowers and Compressors | Moringen, Germany



### Preliminary design acc. to BS 5950-1:2000 for RONDO Stud 681WF (92x50x1.15mm)

Design wind load (kN/m <sup>2</sup> )	3 Spans (m), 92x1.15mm		
	1.5m interval	3.0m interval	4.5m interval
0.4	600	400	300
0.5	600	400	300
0.6	600	400	300
0.7	600	400	300
0.8	600	400	300
0.9	600	400	300
1	600	400	300
1.1	600	400	300
1.2	600	400	300
1.3	600	400	300
1.4	600	400	300
1.5	600	400	300
1.6	600	400	300
1.7	600	400	300
1.8	600	400	300
1.9	600	400	300
2	600	400	300
2.1	600	400	300
2.2	600	400	300
2.3	600	400	300
2.4	600	400	300

The span table is used to show how the substructure needs to be dimensioned as a function of wind loads [kN/m<sup>2</sup>] according to the relevant national standards and the span widths of the profiles, which are determined (usually synonymous with floor height). The substructure shown in the table comprises only the RONDO Stud 681WF (92x50x0.15mm).

The fixing to the load-bearing structure is not considered. It is assumed that the profile is planked with AQUAPANEL® Cement Board Outdoor. An angle fixing of the profile to connect to the load-bearing structure is recommended in any case. This must be subsequently verified by an object-related structural calculation, according to the local standards and design guidelines. The choice of anchors and further fixing materials (e.g. angle fixing) to transfer the loads into the primary structure should only be made on the basis of this project-specific structural design.

Further profile solutions can be demonstrated by a simple proof of the fitness for use shown by a deformation limit of max.  $f = l/360$ .

- 600 mm stud spacing
- 400 mm stud spacing
- 300 mm stud spacing
- Please refer to Appendix, or contact our specification managers for further assistance



- Interval: Spacing between the brackets that fix the studs to the wall of the building or structure of the facade
- 3 Spans: The stud is fixed to 4 brackets



## KNAUF EXTERIOR WALL – THE SOLUTIONS

### WM111C.1

#### Single stud exterior wall

With Rondo metal profile systems and an installation time of 82 min/m<sup>2</sup>, the WM111C.1 system is a straightforward solution for buildings with no remarkably challenging requirements for sound and thermal insulation and for regions with low seasonal differences in temperature and humidity. It consists of a single metal stud frame planked with AQUAPANEL® Cement Board Outdoor on the outside and with a double layer of gypsum boards on the inside. For rooms with special priorities such as water resistance, acoustic control or fire resistance, those interior boards can easily be replaced by high-performance boards from Knauf's versatile range of wall linings.

Scan to get more information about this system



Suzhou Olympic Sports Centre | Suzhou, China



German Pavillon EXPO 2010 | Shanghai, China

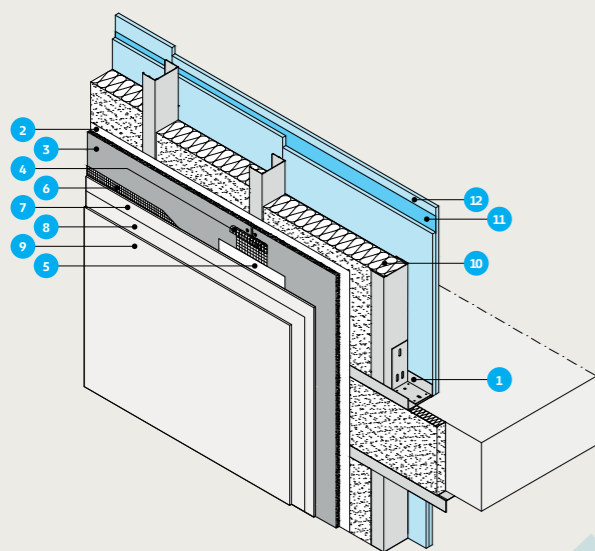


Car Park Utility Rooms | Stuttgart, Germany



Hunan Broadcasting System Program Production Center | Changsha, Hunan, China

# KNAUF EXTERIOR WALL – THE SOLUTIONS



- 1 RONDO Exterior Wall System
- 2 Vapour Barrier SD ≥50m according to the EN 13984\*
- 3 AQUAPANEL® Cement Board Outdoor
- 4 AQUAPANEL® Joint Tape (10 cm)
- 5 AQUAPANEL® Joint Filler – grey
- 6 AQUAPANEL® Reinforcing Mesh
- 7 AQUAPANEL® Exterior Basecoat
- 8 AQUAPANEL® Basecoat Primer
- 9 Render finish (e.g. AQUAPANEL® Exterior Mineral Finish – white)
- 10 Insulation board (thickness: 100 mm) according to local needs
- 11 Vapour Barrier: Knauf Insulation LDS 10 silk or similar (SD 5-10m according to EN 13984)\*
- 12 Knauf Gypsum board

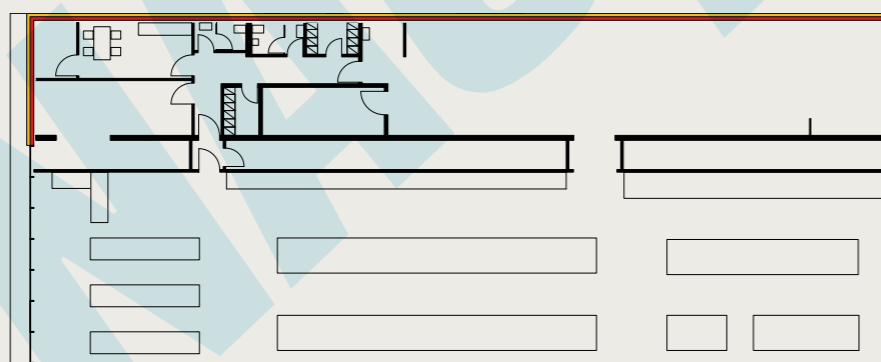
\*Note: Please be advised that under the local climate condition the vapour barrier specifications at the exterior and interior side of the wall to prevent accumulation of moisture within the wall construction could vary. Location and type of vapour barrier to be determined by the architect and a building physics expert.

## Economic advantages (example: retail shop)

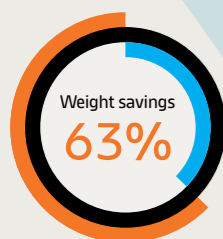
Building perimeter: 135 m  
 Floor height: 5.5 m  
 Exterior wall surface per floor: 742.5 m<sup>2</sup>  
 Number of floors: 1  
 Wall opening share: 50%  
 Opening surface: 371.25 m<sup>2</sup>  
 Net exterior wall surface: 371.25 m<sup>2</sup>

- Thickness: aerated concrete
- Thickness: WM111C.1
- Space gain

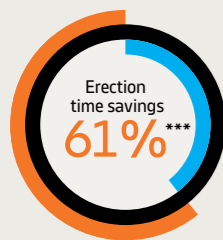
Only a part of the building is shown



## Cost-influencing factors\*



26 tons WM111C.1    70 tons Aerated concrete    44 tons Weight savings

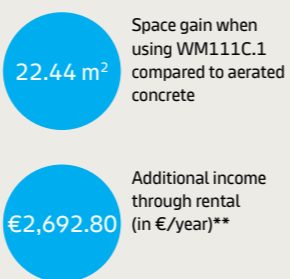


28 days WM111C.1    71 days Aerated concrete    43 days Erection time savings

Based on a specific intended use and location of a building, the dead weight is the most important factor of the total loads, which can be influenced by planning. Basically, lower loads enable a leaner structure and thus significant cost savings. The calculation of explicit cost saving amounts for load-bearing walls and ceilings as well as foundations achieved by the weight reduction when using Knauf Exterior Wall is generically not possible, since this is always to be calculated project specifically on the basis of floor plan geometries, spans and the load-bearing capacity of the building ground.

With a longer production time, considerable costs for personnel employment are involved. Additionally, a longer building process means a longer supply of building site facilities, where costs should be minimised. The efficient construction of Knauf Exterior Wall as well as the shorter drying times and the significantly lower weather dependency compared to massive constructions offer a considerable cost reduction potential and entails much less risk in the planning of the construction process.

## Revenue-influencing factors\*



By using Knauf Exterior Wall more space can be realised inside the building with a comparable thermal insulation value. Consequently, rentable space and resulting rental income are larger. For landlords and investors, the best possible use of the land area plays an important role. By using Knauf Exterior Wall, this area efficiency and land utilisation are significantly improved.

## Preliminary design acc. to BS 5950-1:2000 for RONDO Stud 681WF (92x50x1.15mm)

Design wind load (kN/m <sup>2</sup> )	Wall height, 92x1.15mm			
	2.4m	3.0m	3.6m	4.0m
0.4				
0.5				
0.6				●
0.7			●	●
0.8			●	●
0.9			●	●
1			●	●
1.1			●	
1.2			●	
1.3		●	●	
1.4		●		
1.5		●		
1.6		●		
1.7		●		
1.8		●		
1.9		●		
2		●		
2.1		●		
2.2		●		
2.3		●		
2.4	●	●		

The span table is used to show how the substructure needs to be dimensioned as a function of wind loads [kN/m<sup>2</sup>] according to the relevant national standards and the span widths of the profiles, which are determined (usually synonymous with floor height). The substructure shown in the table comprises only the RONDO Stud 681WF (92x50x01.15mm).

The fixing to the load-bearing structure is not considered. It is assumed that the profile is planked with a suitable board both sides (AQUAPANEL® Cement Board Outdoor on the exteriors and a gypsum based board on the interiors). An angle fixing of the profile to connect to the load-bearing structure is recommended in any case. This must be subsequently verified by an object-related structural calculation, according to the local standards and design guidelines. The choice of anchors and further fixing materials (e.g. angle fixing) to transfer the loads into the primary structure should only be made on the basis of this project-specific structural design.

Further profile solutions can be demonstrated by a simple proof of the fitness for use shown by a deformation limit of Max. f = l/360.

- 600 mm stud spacing
- 400 mm stud spacing
- Please refer to Appendix, or contact our specification managers for further assistance
- Back to back

\*Figures are based on a study by Prof. Dr. Bert Bielefeld of the University of Siegen, Germany. All measurements use comparable U-values.  
 \*\*Rental income based (in €/m<sup>2</sup> per month): €10.00    \*\*\* The time saved due to the immediate window installation is taken into account (see page 11).




# KNAUF EXTERIOR WALL – THE PRODUCTS





## Product Range

### Stud framework

Easy to work with and install, the components used to create our stud frames include profiles, bracket, screws and sealing strips, all available in a wide range of specifications and geometries to meet any design requirement. All profiles have Galvanized corrosion protection AZ150 g/m<sup>2</sup> according to AS1397 and ASTM A653 to ensure long-term protection.

Profiles		Part number	Web height (mm)	Flange width (mm)	Nominal thickness BMT(mm)	Weight (approx. kg/m)
<b>RONDO Stud</b> 	<ul style="list-style-type: none"> <li>Point of use: Exterior Stud Frame</li> <li>Designed to absorb and transmit wind and dead loads</li> <li>Enables a preliminary static design according to BS5950-1</li> <li>Galvanized AZ150 g/m<sup>2</sup> according to AS1397 and ASTM A653</li> <li>High corrosion resistance and long-term durability</li> </ul>	493WF	76	50	0.75	1.064
		671WF	76	50	1.15	1.608
		495WF	92	50	0.75	1.158
		681WF	92	50	1.15	1.752
		511WF	150	50	0.75	1.499
		691WF	150	50	1.15	2.274
		C15216	152	64	1.60	3.850
<b>RONDO Track</b> 	<ul style="list-style-type: none"> <li>Point of use: Exterior Stud Frame</li> <li>Designed to absorb and transmit wind and dead loads</li> <li>Enables a preliminary static design according to BS5950-1</li> <li>Galvanized AZ150 g/m<sup>2</sup> according to AS1397 and ASTM A653</li> <li>High corrosion resistance and long-term durability</li> </ul>	494	76	32	0.75	0.869
		670	76	32	1.15	1.258
		496	92	32	0.75	0.956
		680	92	32	1.15	1.513
		512	150	32	0.75	1.738
		692	150	32	1.15	2.516
		<b>RONDO Nogging Track</b> 	<ul style="list-style-type: none"> <li>Point of use: Exterior Stud Frame</li> <li>Designed to absorb and transmit wind and dead loads</li> <li>Enables a preliminary static design according to BS5950-1</li> <li>Galvanized AZ150 g/m<sup>2</sup> according to AS1397 and ASTM A653</li> <li>High corrosion resistance and long-term durability</li> <li>Pre-punched at 400 or 600mm centers</li> </ul>	505WF-406	76	32
505WF-610	76			32	0.75	0.887
506WF-406	92			32	0.75	0.976
506WF-610	92			32	0.75	0.976
507WF-406	150			32	0.75	1.344
507WF-610	150			32	0.75	1.344
<b>RONDO Slotted Deflection Head Track</b> 	<ul style="list-style-type: none"> <li>Point of use: Exterior Stud Frame</li> <li>Designed to absorb and transmit wind and dead loads</li> <li>Enables a preliminary static design according to BS5950-1</li> <li>Galvanized AZ150 g/m<sup>2</sup> according to AS1397 and ASTM A653</li> <li>High corrosion resistance and long-term durability</li> </ul>	5673	76	50	1.15	1.372
		5683	92	50	1.15	1.516
		5690	150	50	1.15	2.039



Connecting angles		Part number	Size (mm)	Thickness (mm)	Weight
<b>RONDO Slotted Web Cleat 80mm</b> 	<ul style="list-style-type: none"> <li>Used to transfer loads where a deflection allowance is needed</li> <li>3mm thick coated steel</li> </ul>	SWC3	80 x 75 x 50	3.0	0.190 kg/pc
<b>RONDO Slotted Web Cleat 125mm</b> 	<ul style="list-style-type: none"> <li>Used to transfer loads where a deflection allowance is needed</li> <li>3mm thick coated steel</li> </ul>	SWC3a	125 x 75 x 50	3.0	0.340 kg/pc
<b>RONDO L-Bracket</b> 	<ul style="list-style-type: none"> <li>Used to transfer loads where a deflection allowance is needed</li> <li>1.5mm thick coated steel</li> </ul>	545	75 x 75 x 55	1.5	0.090 kg/pc

Screws and anchors		Part number	Size (mm)	Thickness (mm)	Weight
<b>HILTI Stud Anchor</b> 	<ul style="list-style-type: none"> <li>Zinc Plated</li> </ul>	MHSA650 MHSA1090	M6 x 50 M10 x 90	-	0.002 kg/pc
<b>RONDO Hex Head Screw</b> 	<ul style="list-style-type: none"> <li>Zinc plated with ceramic coating</li> </ul>	MHHDPS	12- 14 x 25mm 12-24 x 25mm	-	0.002 kg/pc
<b>RONDO Wafer Head Self-Drilling Screw</b> 	<ul style="list-style-type: none"> <li>Zinc plated with ceramic coating</li> </ul>	MWHS1016-16	10-16 x 16mm	-	0.002 kg/pc
<b>RONDO Flat Head Self-Drilling Screw</b> 	<ul style="list-style-type: none"> <li>Zinc plated with ceramic coating</li> </ul>	MFHS1016-20	10-16 x 20mm	-	0.002 kg/pc



# KNAUF EXTERIOR WALL – THE PRODUCTS


## Insulation

Available in panels and rolls for easy installation, mineral wool from Knauf Insulation is suitable for a wide range of applications, including inside stud frames, in the space between interior and exterior frames, as well as in front of floors to reduce thermal bridges between Knauf Exterior Wall with AQUAPANEL Technology® and concrete slabs. It is also used as an insulation board in rear-ventilated rainscreen facade systems. In addition, Knauf's MW Volamit 040 is widely used for ETICS applications and is available in easy to handle lamella formats and does not require the use of dowelling.

Insulation for metal constructions		Width (mm)	Length (mm)	Thickness (mm)	m <sup>2</sup> /package
<b>Knauf Insulation Metallbau-Dämmplatte FCB 035</b> 	<ul style="list-style-type: none"> <li>Insulation board</li> <li>Thermal conductivity rating: 035</li> <li>Glass mineral wool</li> <li>ECOSE® Technology</li> <li>Non-combustible</li> </ul>	625	1,250	50	9.38
				75	6.25
				150	3.13
<b>Knauf Insulation Universalrolle Classic 035</b> 	<ul style="list-style-type: none"> <li>Insulation roll</li> <li>Thermal conductivity rating: 035</li> <li>Glass mineral wool</li> <li>ECOSE® Technology</li> <li>Non-combustible</li> </ul>	1,200	13,000	40	15.60
			10,500	50	12.60
			8,700	60	10.44
			6,300	80	7.56
			5,200	100	6.24
			4,400	120	5.28
			3,700	140	4.44
			3,300	160	3.96
			2,900	180	3.48
			2,600	200	3.12
			2,900	220	3.48
	2,700	240	3.24		








Insulation board for ventilated facades		Width (mm)	Length (mm)	Thickness (mm)	m <sup>2</sup> /package
<b>Knauf Insulation Fassaden-Dämmplatte TP 435 B</b> 	<ul style="list-style-type: none"> <li>Facade insulation board</li> <li>Thermal conductivity rating: 035</li> <li>Glass mineral wool</li> <li>ECOSE® Technology</li> <li>With glass fleece backing on one side</li> <li>Non-combustible</li> </ul>	600	1,250	40	9.00
				60	6.00
				80	4.50
				100	3.75
				120	3.00
				140	2.25
				160	
				180	
<b>Knauf Insulation Fassaden-Dämmplatte FPL-035</b> 	<ul style="list-style-type: none"> <li>Facade insulation board</li> <li>Thermal conductivity rating: 035</li> <li>Stone mineral wool</li> <li>Suitable for areas of fire flashover</li> <li>Non-combustible</li> </ul>	625	1,200	30	12.00
				50	7.50
				60	6.00
				80	4.50
				100	3.75
				120	3.00
				140	2.25
				160	
				180	
				200	1.50


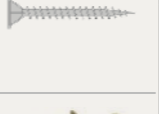


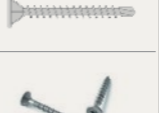





Insulation fasteners for ventilated facades		Diameter (mm)	Length (mm)	For insulation board thickness (mm)
<b>Knauf Insulation Dämmstoffhalter</b> 	<ul style="list-style-type: none"> <li>For fixing of facade insulation boards made of glass or stone mineral wool in concrete or brickwork in rear-ventilated rainscreen facade constructions</li> </ul>	90	90	60
			110	80
			130	100
			150	120
			170	140
			190	160
			210	180
			230	200

# KNAUF EXTERIOR WALL – THE PRODUCTS

## Exterior lining

To ensure that Knauf Exterior Wall acquires its water resistant properties, AQUAPANEL® Cement Board Outdoor is fitted on top of AQUAPANEL® Water Barrier, a highly windproof, rainproof and permeable layer which can be easily fixed on exterior studs by using adhesive tape. Complemented with specially developed system accessories including AQUAPANEL® Joint Filler, AQUAPANEL® Tape as well as AQUAPANEL® Maxi Screws with special coatings for added corrosion protection, the result is a complete – and completely reliable – lining system of AQUAPANEL® products.

Water barrier		Width (mm)	Roll length (mm)		
<b>AQUAPANEL® Water Barrier</b>	<ul style="list-style-type: none"> <li>Water resistant and wind tight membrane</li> <li>Used as a water conducting layer directly behind AQUAPANEL® Cement Board Outdoor</li> <li>Diffusion equivalent air layer thickness (sd): 0.0025 m</li> </ul>   <p>Scan for datasheet</p>	1,500	50,000		
Adhesives tapes		Width (mm)	Roll length (mm)		
<b>Knauf Insulation LDS Solitop</b>	<ul style="list-style-type: none"> <li>One-sided reinforced adhesive tape made of polyethylene</li> <li>Specially developed for outdoor use</li> <li>Used for bonding overlaps and penetrations of AQUAPANEL® Water Barrier</li> </ul> 	60	40,000		
		150	25,000		
Cement boards					
<b>AQUAPANEL® Cement Board Outdoor</b>	<ul style="list-style-type: none"> <li>Cement board</li> <li>Easy Edge™</li> <li>Building material class: A1, non-combustible</li> <li>100% water resistant</li> <li>Bending radius 1-3 m (in dry state)</li> </ul>   <p>Scan for datasheet</p>	1,200	2,400	12.5	16

Screws			Length (mm)
<b>AQUAPANEL® Maxi Screw SN25</b>		<ul style="list-style-type: none"> <li>With countersunk head and nail tip</li> </ul>	25
<b>AQUAPANEL® Maxi Screw SN39</b>		 <p>Scan for datasheet</p>	39
<b>AQUAPANEL® Maxi Screw SN55</b>			55
<b>AQUAPANEL® Maxi Screw SB25</b>		<ul style="list-style-type: none"> <li>With countersunk head and drill tip</li> </ul>	25
<b>AQUAPANEL® Maxi Screw SB39</b>		 <p>Scan for datasheet</p>	39
<b>AQUAPANEL® Rustproofed Screw SN40</b>			<ul style="list-style-type: none"> <li>With countersunk head and nail tip</li> <li>Stainless steel</li> </ul>
<b>AQUAPANEL® Rustproofed Screw SB40</b>		<ul style="list-style-type: none"> <li>To fix AQUAPANEL® Cement Board Outdoor on aluminium substructure</li> <li>With countersunk head and drill tip</li> <li>Stainless steel</li> </ul>  <p>Scan for datasheet</p>	40



Material of substructure	Steel framework					Aluminium framework
	0.6mm ≤ x ≤ 1.0mm			1.0mm < x ≤ 2.0mm		
<b>Metal thickness</b>						≤ 2.0 mm
<b>Amount of board layers</b>	Single layer	Double layer	Triple layer	Single layer	Double layer	Single layer
<b>AQUAPANEL® Maxi Screw SN25</b>	x					
<b>AQUAPANEL® Maxi Screw SN39</b>	x	x				
<b>AQUAPANEL® Maxi Screw SN55</b>			x			
<b>AQUAPANEL® Maxi Screw SB25</b>				x		
<b>AQUAPANEL® Maxi Screw SB39</b>				x	x	
<b>AQUAPANEL® Rustproofed Screw SN40</b>						
<b>AQUAPANEL® Rustproofed Screw SB40</b>						x

\*only necessary in ventilated constructions

# KNAUF EXTERIOR WALL – THE PRODUCTS

Joint filler		Coverage (ca. kg/m <sup>2</sup> )	Storage life (approx month)	Weight (kg/bag)
<b>AQUAPANEL® Joint Filler – grey</b>	 <ul style="list-style-type: none"> <li>› Cement-bound joint filling material</li> <li>› Full-surface skimcoating of joints</li> <li>› Reinforced with AQUAPANEL® Tape 10 cm</li> </ul>	0.7	12	20




  



Joint tapes		Width (mm)	Roll length (mm)
<b>AQUAPANEL® Tape 10 cm</b>	 <ul style="list-style-type: none"> <li>› Glass fabric joint tape</li> <li>› Alkali-resistant coating</li> <li>› Colour: blue</li> <li>› Mesh size: 4x4 mm</li> </ul>	100	50,000
		100	20,000
<b>AQUAPANEL® Exterior Reinforcing Tape</b>	 <ul style="list-style-type: none"> <li>› Glass fabric joint tape</li> <li>› Alkali-resistant coating</li> <li>› Colour: blue</li> <li>› Mesh size: 4x4 mm</li> </ul>	200	50,000



## Exterior finishing

Knauf Exterior Wall is able to accommodate a wide range of finishes, so whatever you want to create, it's achievable. In terms of render, AQUAPANEL® has a range of products in its portfolio, including AQUAPANEL® Exterior Basecoat, AQUAPANEL® Reinforcing Mesh, AQUAPANEL® Basecoat Primer and a range of finishing renders. In addition, Knauf offers a selection of renders to increase choice and design possibilities. Knauf Exterior Wall is also compatible with a wide range of third-party finishes, including cladding, brick slips, tiles and paint, so there is no limit on design potential.









Basecoats		Coverage (ca. kg/m <sup>2</sup> )	Storage life (approx month)	Weight (kg/bag)
<b>AQUAPANEL® Exterior Basecoat</b>	 <ul style="list-style-type: none"> <li>› Cement-based, synthetic resin-enhanced basecoat</li> <li>› Colour: grey</li> <li>› Used for basecoating AQUAPANEL® Cement Board Outdoor when finishing with a thin layer of finishing plaster, decorative render or paint</li> </ul>	7.8 (with 5 mm layer thickness)	12	25
<b>AQUAPANEL® Exterior Basecoat – white</b>	 <ul style="list-style-type: none"> <li>› Cement-based, synthetic resin-enhanced basecoat</li> <li>› Colour: white</li> <li>› Used for basecoating AQUAPANEL® Cement Board Outdoor when finishing with a thin layer of finishing plaster, decorative render or paint</li> </ul>	6.3 (with 5 mm layer thickness)	12	25
<b>SM700 Pro</b>	 <ul style="list-style-type: none"> <li>› Mineral basecoat</li> <li>› Fibre-reinforced</li> <li>› Used as a basecoat in External Thermal Insulation Composite Systems (ETICS) – e.g. Knauf WARM WALL Plus</li> <li>› Colour: white (special colours available on request)</li> </ul>	7.0-13.0 (5-10 mm layer thickness)	12	25

Reinforcing mesh		Width (mm)	Roll length (mm)
<b>AQUAPANEL® Reinforcing Mesh</b>	 <ul style="list-style-type: none"> <li>› Alkali-resistant coating</li> <li>› Colour: blue</li> <li>› Used to reinforce AQUAPANEL® Exterior Basecoat and AQUAPANEL® Exterior Basecoat – white</li> <li>› Mesh size: 4x4 mm</li> <li>› Initial tear strength: approx. 2,000 N/5 cm</li> <li>› Approx. 160 g/m<sup>2</sup></li> </ul>	1,000	50,000
<b>Armiergewebe 4x4 mm</b>	 <ul style="list-style-type: none"> <li>› Alkali-resistant coating</li> <li>› Colour: white with blue markings</li> <li>› Used as a reinforcing mesh in External Thermal Insulation Composite Systems (ETICS) – e.g. Knauf WARM WALL Plus</li> <li>› Mesh size: 4x4 mm</li> <li>› Initial tear strength: approx. 2,000 N/5 cm</li> <li>› Approx. 150 g/m<sup>2</sup></li> </ul>	1,000	50,000

F External Walls

F External Walls

## KNAUF EXTERIOR WALL – THE PRODUCTS



Basecoat primer		Coverage (approx kg/m <sup>2</sup> )	Storage life (approx month)	Weight (kg/bucket)
<b>AQUAPANEL® Basecoat Primer</b>	 <ul style="list-style-type: none"> <li>› Synthetic dispersion</li> <li>› Alkali-resistant</li> <li>› Colour: white</li> <li>› Used as a primer on AQUAPANEL® Exterior Basecoat and AQUAPANEL® Exterior Basecoat – white where AQUAPANEL® render finishes are used</li> <li>› Reduces suction variations</li> </ul>  <p>Scan for datasheet</p>	7.8 (with 5 mm layer thickness)	12	15
Finishing renders		Coverage (approx kg/m <sup>2</sup> )	Storage life (approx month)	Weight (kg/unit)
<b>AQUAPANEL® Exterior Mineral Finish – white</b>	 <ul style="list-style-type: none"> <li>› Mineral finishing render</li> <li>› For use on top of AQUAPANEL® Exterior Basecoat and AQUAPANEL® Exterior Basecoat – white</li> <li>› Grain size: 2 mm</li> <li>› Can be used as a smooth floating finishing render or freely structured using different tools and designs</li> </ul>  <p>Scan for datasheet</p>	3.0 (with 2 mm layer thickness)	12	30
<b>AQUAPANEL® Exterior Dispersion Plaster – white</b>	 <ul style="list-style-type: none"> <li>› Ready-to-use</li> <li>› Pasty consistency</li> <li>› Water-repellent</li> <li>› Allows diffusion</li> <li>› Prevents fungal attack</li> <li>› For application on AQUAPANEL® Exterior Basecoat and AQUAPANEL® Exterior Basecoat – white</li> <li>› Grain size: 2 mm</li> </ul>  <p>Scan for datasheet</p>	3.1	24	25
<b>AQUAPANEL® Exterior Silicon Synthetic Resin Plaster – white</b>	 <ul style="list-style-type: none"> <li>› Ready-to-use</li> <li>› Pasty consistency</li> <li>› Water-repellent</li> <li>› Allows diffusion</li> <li>› Prevents fungal attack</li> <li>› For application on AQUAPANEL® Exterior Basecoat and AQUAPANEL® Exterior Basecoat – white</li> <li>› Grain size: 2 mm</li> </ul>  <p>Scan for datasheet</p>	3.1	24	25


### Interior lining




Knauf Exterior Wall systems include an unrivalled choice of fully compatible lining boards to meet any specification need, including moisture rating, impact resistance, fire rating and sound reduction. For specialist applications in wet and humid areas, AQUAPANEL® Cement Board Indoor has been specifically developed to provide a robust and reliable solution, including in swimming pools and steam saunas. All boards come with comprehensive accessories including vapour control layers, sealant tapes, joint fillers, adhesives and screws.


Vapour barriers		Width (mm)	Roll length (mm)
<b>Knauf Insulation LDS 10 Silk</b>	 <ul style="list-style-type: none"> <li>› Vapour control membrane made of high strength polypropylene spun-bonded fabric</li> <li>› Diffusion equivalent air layer thickness (sd): 10 m</li> <li>› Approx 140 g/m<sup>2</sup></li> </ul>	3,000	50,000
Adhesive tapes		Width (mm)	Roll length (mm)
<b>Trenn-Fix</b>	 <ul style="list-style-type: none"> <li>› Special coated paper strip</li> <li>› Adhesive along one edge</li> <li>› Used as separation strip between dry-built surfaces and other constructional elements</li> <li>› Used between dry-built surfaces to generate a sliding separation</li> </ul>	65	50,000
<b>Knauf Insulation LDS Soliplan</b>	 <ul style="list-style-type: none"> <li>› One-sided adhesive tape made of kraft paper</li> <li>› Used for durable air-tight bonding of vapour barrier overlaps and fitting edges</li> </ul>	60	40,000
<b>Knauf Insulation LDS Solitwin</b>	 <ul style="list-style-type: none"> <li>› One-sided reinforced adhesive tape made of low-density polyethylene (LDPE)</li> <li>› With centre-slit backing paper</li> <li>› Used for durable and elastic air-tight bonding of the vapour barrier in corner areas and window connections</li> </ul>	60	25,000
<b>Knauf Insulation LDS Solifit</b>	 <ul style="list-style-type: none"> <li>› One-sided reinforced adhesive tape made of low-density polyethylene (LDPE)</li> <li>› Used for durable and elastic air-tight bonding of vapour barrier overlaps and penetrations, when flexible connections are necessary (e.g. pipes, beams, etc.)</li> </ul>	60	25,000
<b>Knauf Insulation LDS Solifit S</b>	 <ul style="list-style-type: none"> <li>› One-sided reinforced adhesive tape made of low-density polyethylene (LDPE)</li> <li>› Used for durable and elastic air-tight bonding of vapour barrier overlaps and penetrations, when flexible connections are necessary (e.g. pipes, beams, etc.)</li> <li>› No peeling, collection and disposal of the release paper required</li> <li>› Easy handling by finger lift</li> <li>› Tape tears by hand</li> </ul>	60	25,000
<b>Knauf Insulation LDS Kleberaube</b>	 <ul style="list-style-type: none"> <li>› Elastic, double-sided adhesive tape</li> <li>› Used for safe, durable and elastic bonding of the vapour barrier to flanking building parts</li> </ul>	25	8,000

## KNAUF EXTERIOR WALL – THE PRODUCTS


Liquid adhesive			Capacity (ml)	Storage life (approx month)
Knauf Insulation LDS Solimur		<ul style="list-style-type: none"> <li>› Elastic, durably strong special adhesive</li> <li>› Used for safe, durable and elastic bonding of the vapour barrier to flanking building parts</li> </ul>	600	24
			310	24


Adhesive primer			Coverage (approx m)	Storage life (approx month)
Knauf Insulation LDS Primer		<ul style="list-style-type: none"> <li>› Dispersion-based adhesive primer</li> <li>› To enhance adhesion of LDS adhesive tapes and LDS Solimur to porous substrates to guarantee a durable adhesive bond</li> </ul>	25-30 (100 mm application width)	18

Air-tight sleeves			Diameter (mm)	Width (mm)	Length (mm)
Knauf Insulation LDS Universalman-schette		<ul style="list-style-type: none"> <li>› Multi-purpose sleeve</li> <li>› Two-layer polypropylene spun-bonded fabric</li> <li>› For fast and professional, in particular retrospective, sealing of pipe openings in the vapour barrier</li> </ul>	75-125	400	400
Knauf Insulation LDS Leitungsmann-schette		<ul style="list-style-type: none"> <li>› Cable sleeve</li> <li>› Self-adhesive kraft paper</li> <li>› For professional sealing of cable feed-throughs</li> </ul>	8-12	150	150
Knauf Insulation LDS Leitungsmann-schette 6-fach		<ul style="list-style-type: none"> <li>› Cable sleeve</li> <li>› Non-woven polyethylene</li> <li>› For professional sealing of up to 6 cable feed-throughs</li> </ul>	4-11	230	230

Gypsum boards			Width (mm)	Length (mm)	Thickness (mm)	Weight (kg/m <sup>2</sup> )
Knauf Fireshield (Vietnam)		<ul style="list-style-type: none"> <li>› Used for ceilings &amp; drywall</li> <li>› Non-combustible</li> <li>› Fire, smoke and heat resistant</li> </ul>	1,220	2,440	12.7	11.3
					15.9	14.1

## KNAUF EXTERIOR WALL – THE PRODUCTS

Drywall screws			Width (mm)	Length (mm)
Plasterboard Screw		<ul style="list-style-type: none"> <li>› To fix impregnated gypsum boards to metal substructures</li> <li>› Bugle head</li> <li>› Nail tip</li> <li>› Double, fine-pitched thread</li> <li>› Metal thickness ≤ 0.7 mm</li> <li>› Incl. one bit/package</li> </ul>	3.5	25
				35

Comboard			Coverage (approx. kg/m <sup>2</sup> )	Storage life (approx month)	Weight (kg/bag)
Knauf Easyjoint 90		<ul style="list-style-type: none"> <li>› Excellent bond</li> <li>› Premium grade lightweight, all-purpose and finishing compound</li> <li>› May be used for all three coats or as a finishing coat</li> <li>› Excellent workability, easy application by hand or with mechanical tools</li> <li>› Minimal mixing and cleaning of tool</li> <li>› Sandable by hand or with mechanical sanding tools</li> <li>› Smooth finish</li> <li>› Excellent surface for painting</li> </ul>	0.61 ~ 0.73	9	5
					28

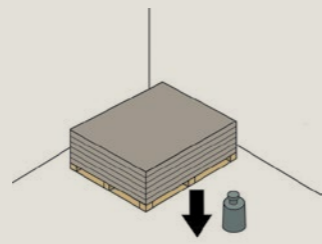
# KNAUF EXTERIOR WALL – THE PRODUCTS

## Product Handling

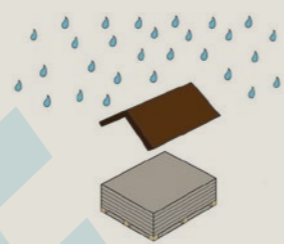
### Boards



- › Always carry the boards upright, or use board rollers. Handle with fork lift or crane as palletted goods. Take care not to damage corners and edges when setting the boards down. Place boards down on their long edge before laying them flat.



- › Ensure that the base is strong enough to support the boards.



- › Protect boards from moisture and weathering before they are installed. Boards which have become damp must be dried on both sides on a flat surface prior to fitting. Before installing, condition the boards to the ambient temperature and humidity.

### Profiles



- › Protect profiles from moisture and weathering before they are installed. Products should not be left permanently exposed to the elements.

### Powder materials



- › Store bags in a dry place and in original packaging.



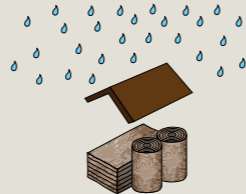
- › Do not apply joint fillers, basecoat or finishing materials in temperatures less than +5°C.

### Health and safety

- › Avoid unnecessary dust on job site when using electrical saw. Keep sanding and other dust generation to a minimum. Maintain adequate ventilation and/or wear suitable protection.
- › Exercise care when using power tools and take all necessary precautions.
- › Follow instructions on packaging when applying system accessories.
- › When using powdered products, mix with water in well-ventilated conditions. Avoid contact with eyes and skin. In the event of contact with the eyes, irrigate with plenty of clean water immediately.
- › When handling insulation or cutting boards which contain glassfibre, wear suitable protection including face mask and gloves. Wear protective glasses when working overhead.
- › Follow national health and safety regulations at all times.

Product data sheets and material safety data sheets are available on our website [www.AQUAPANEL.com/downloads](http://www.AQUAPANEL.com/downloads).

### Insulation

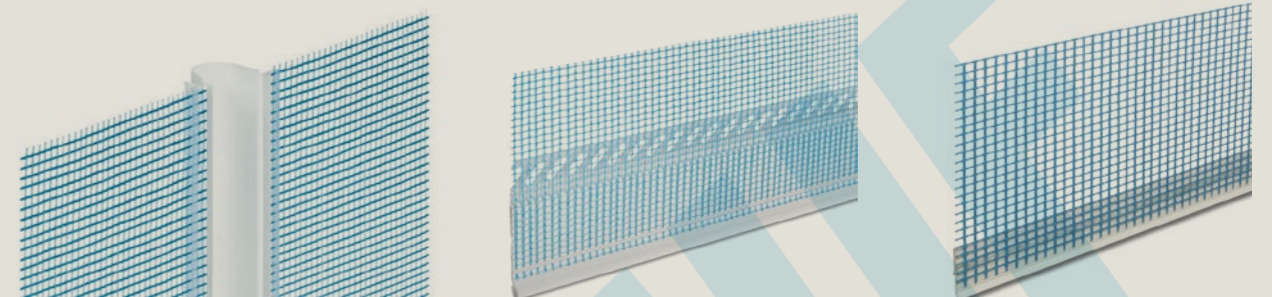


- › Insulation materials are supplied enclosed in packaging which is designed for short term protection only. For longer term protection on site, the product should be stored either indoors, or under cover and off the ground. Products should not be left permanently exposed to the elements.

## Further Information

### Plaster profile overview

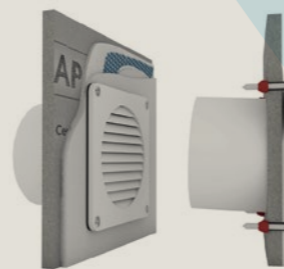
The profile overview represents a selection of applicable plaster profiles for Knauf Exterior Wall with AQUAPANEL® Technology. It shows areas of application, product names and material numbers of Knauf profiles and other selected manufacturers.



Scan to get more information

### Fasteners and penetrations

Knauf Exterior Wall with AQUAPANEL® Technology can be penetrated by fastenings, pipe penetrations or electrical cable installations on the interior as well as on the exterior stud frame of the wall construction. For further information, please refer to the corresponding instructions.



Scan to get more information

### References

A selection of worldwide references of Knauf Exterior Wall with AQUAPANEL® Technology as well as details on individual projects can be found on our website. Here you will find the latest inspirations for your next construction project.



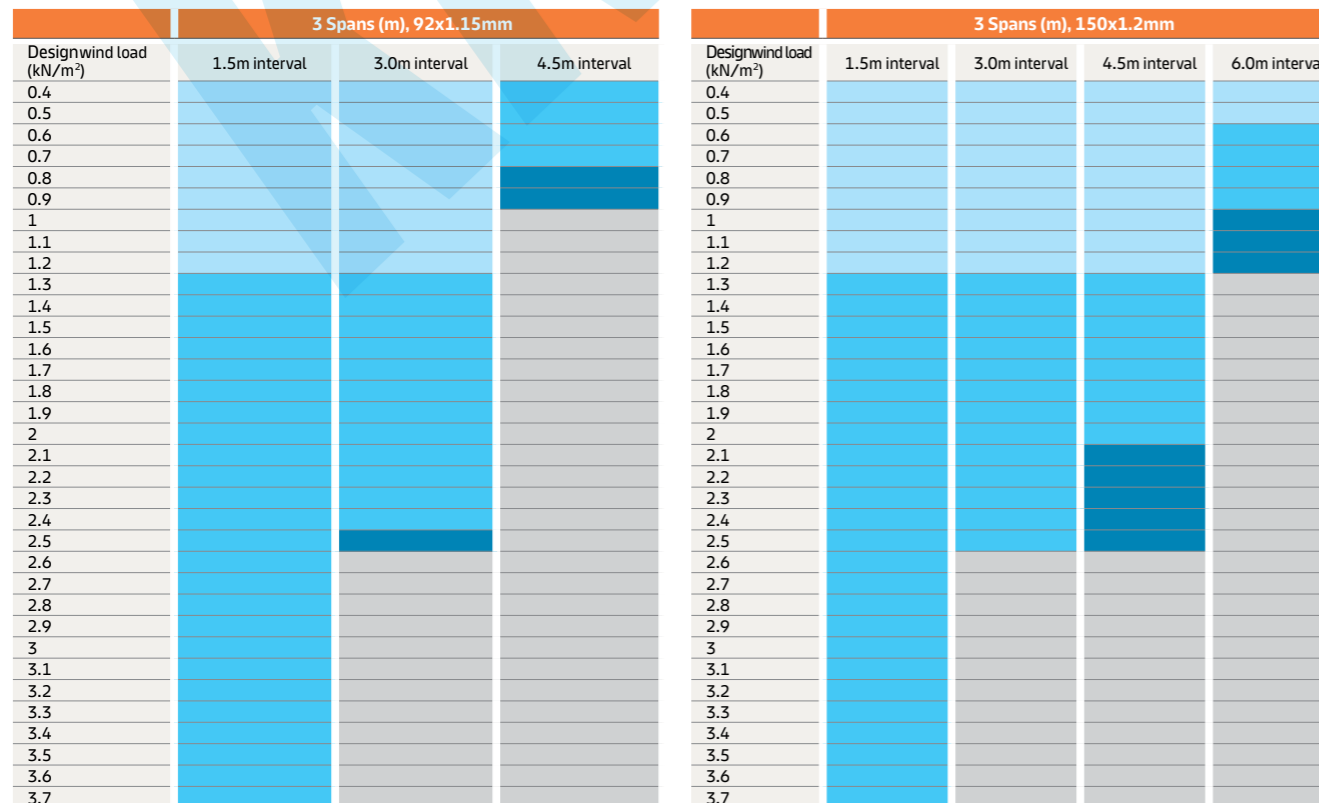
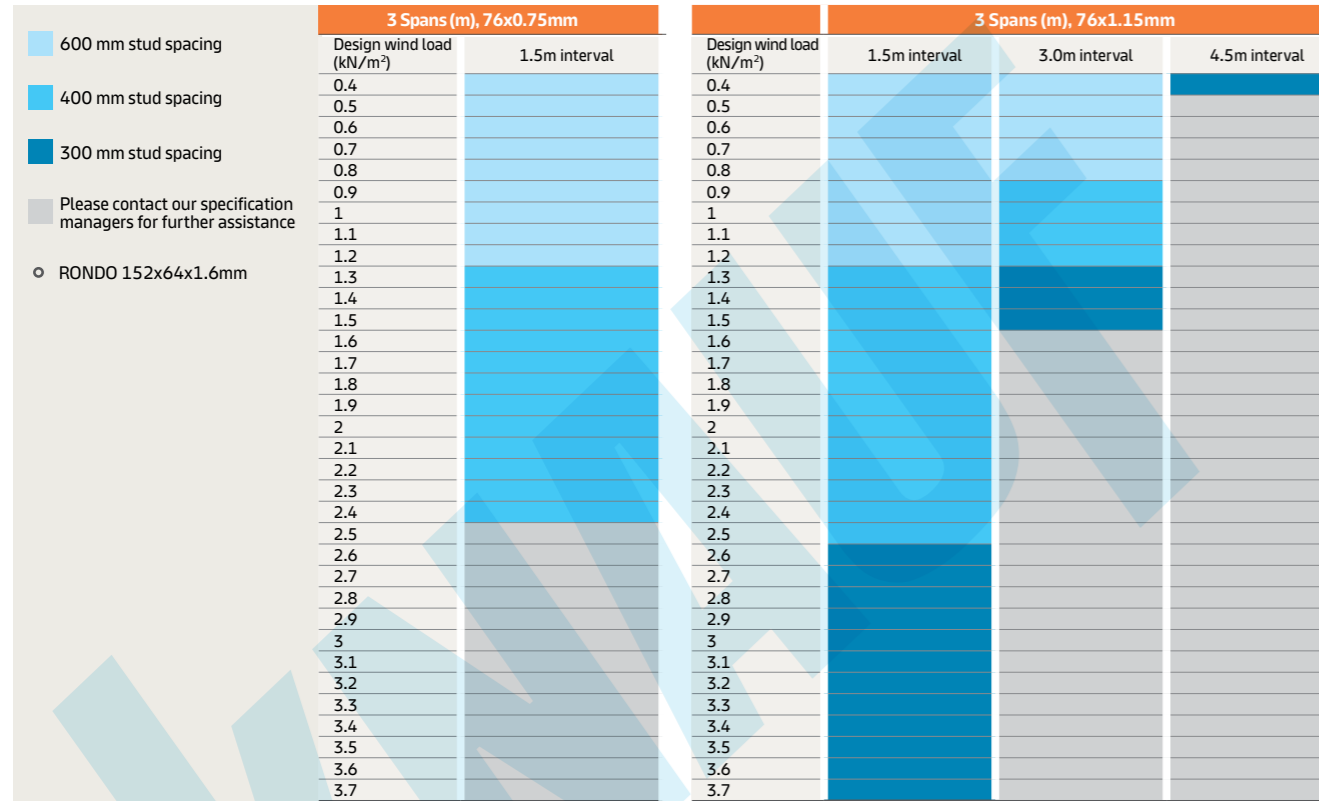
Scan to get more information

**WL132C.1 | Rear-ventilated rainscreen facade**

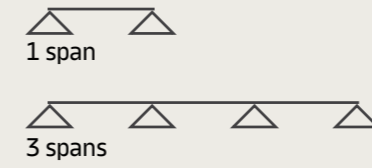
**Preliminary design acc. to BS 5950-1:2000 for RONDO profiles**

The span table is used to show how the substructure needs to be dimensioned as a function of wind loads [kN/m<sup>2</sup>] according to the relevant national standards and the span widths of the profiles, which are determined (usually synonymous with floor height).

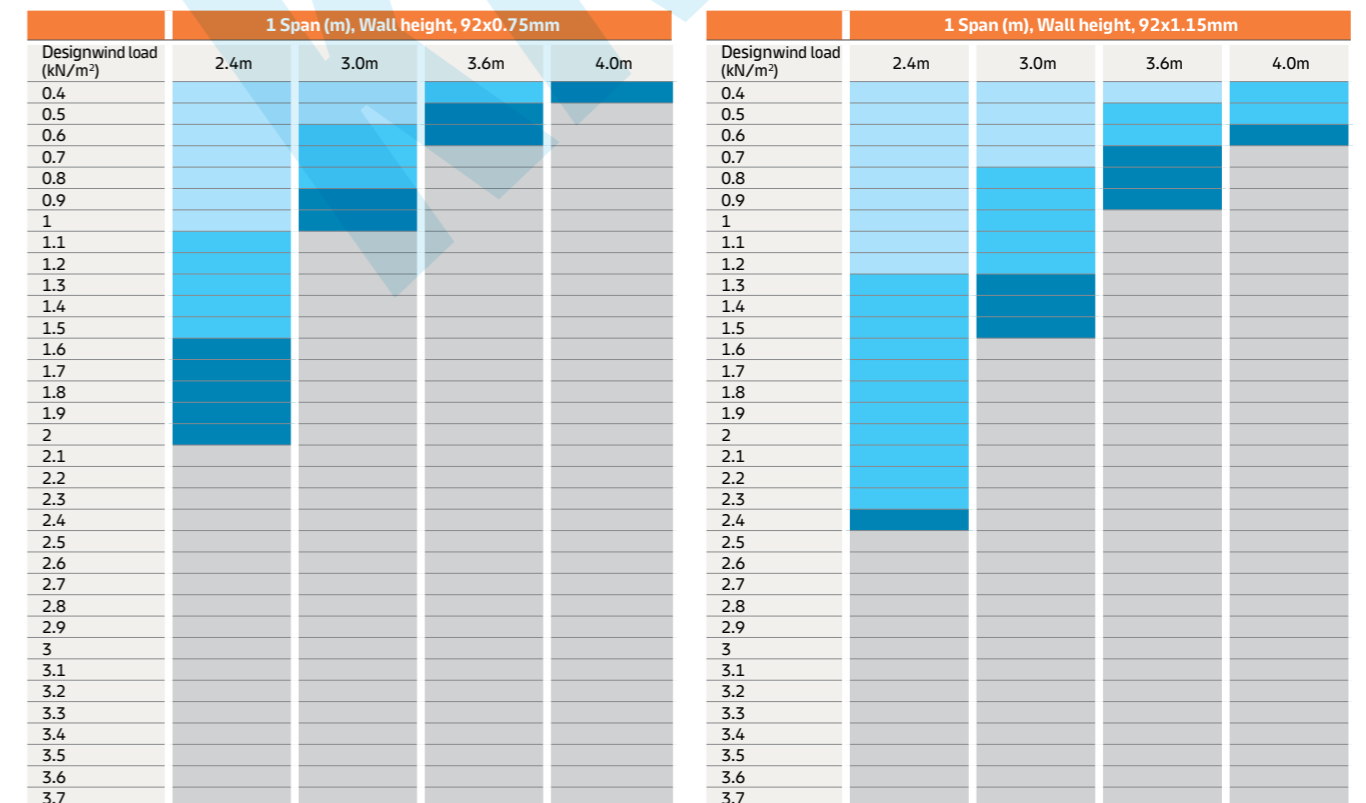
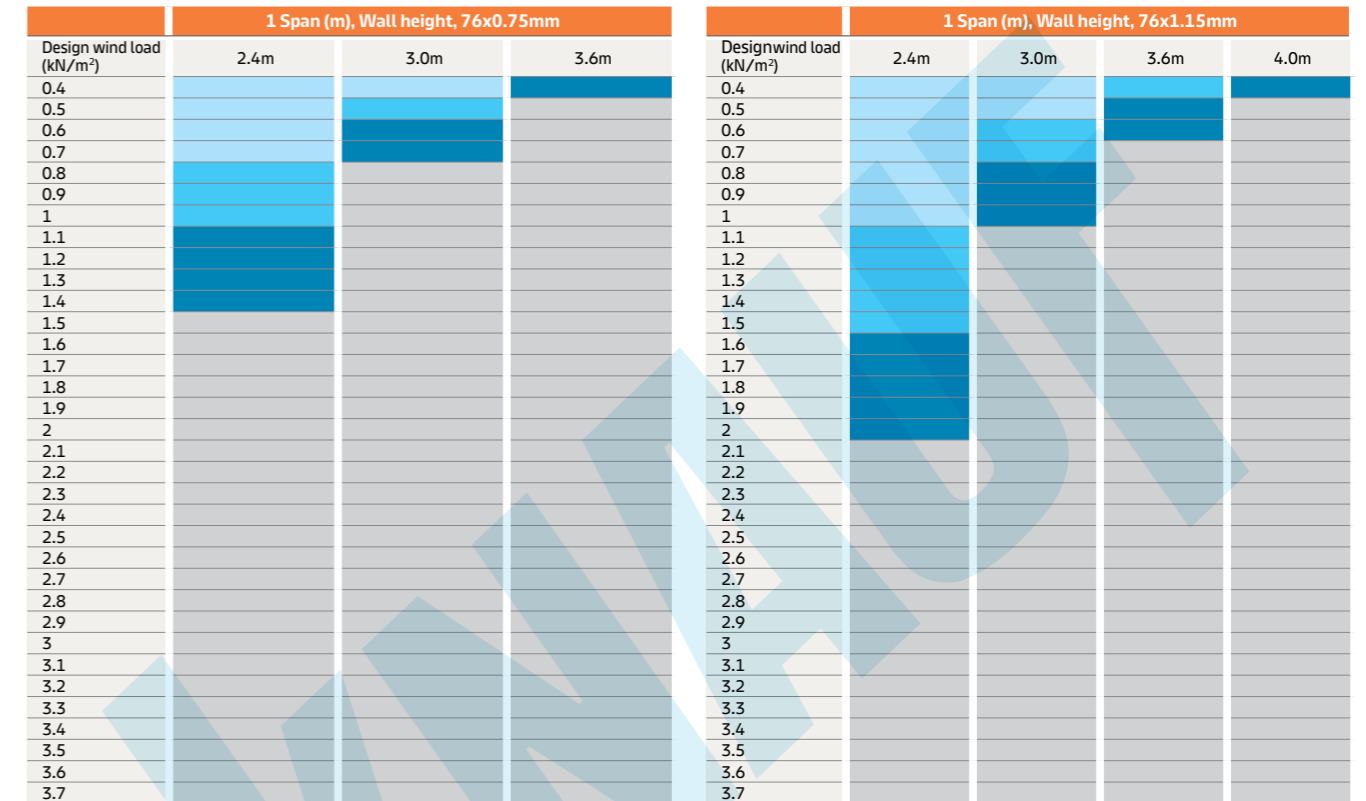
The fixing to the load-bearing structure is not considered. It is assumed that the profile is planked with AQUAPANEL® Cement Board Outdoor. An angle fixing of the profile to connect to the load-bearing structure is recommended in any case. This must be subsequently verified by an object-related structural calculation, according to the local standards and design guidelines. The choice of anchors and further fixing materials (e.g. angle fixing) to transfer the loads into the primary structure should only be made on the basis of this project-specific structural design. Further profile solutions can be demonstrated by a simple proof of the fitness for use shown by a deformation limit of max.  $f = l/360$ .



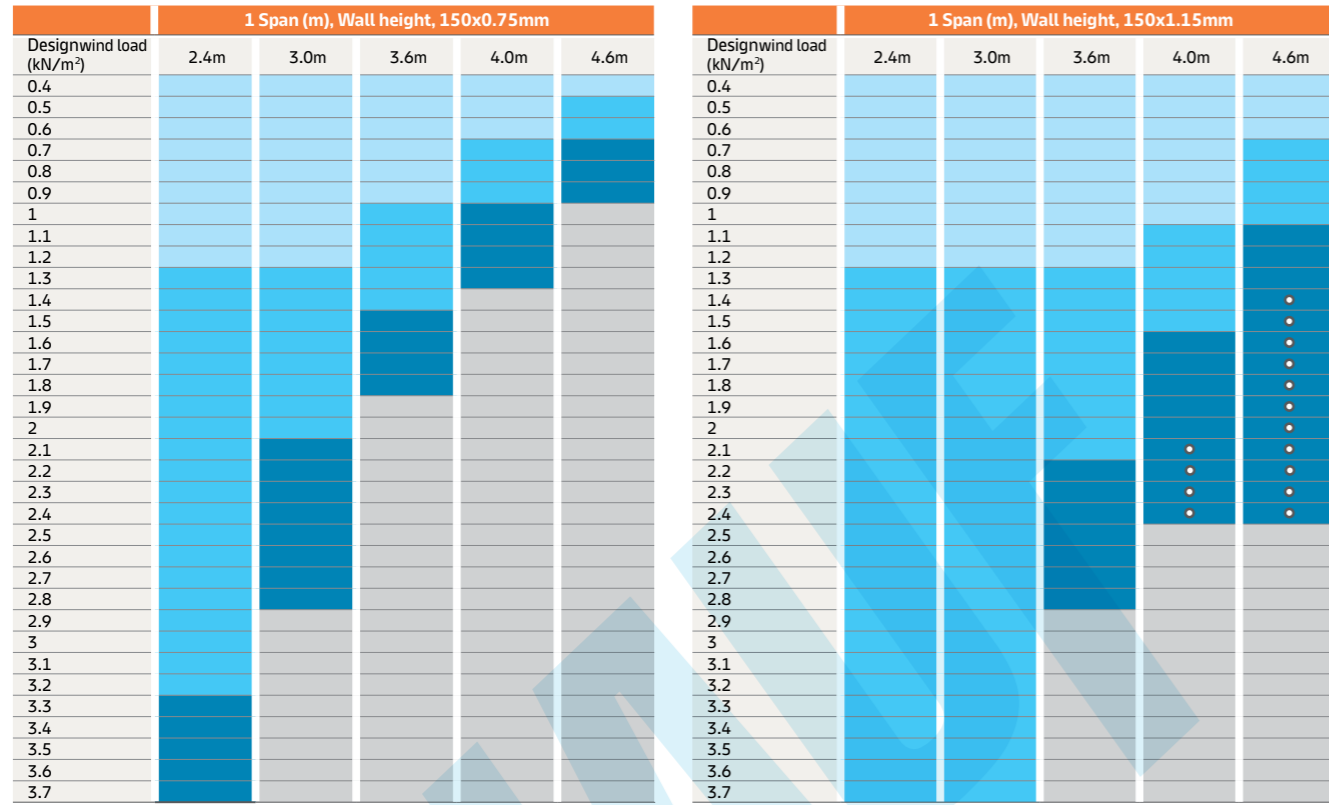
**WL132C.1 | Rear-ventilated rainscreen facade**



- Interval: Spacing between the brackets that fix the studs to the wall of the building or structure of the facade
- 1 span: The stud is fixed to 2 brackets
- 3 spans: The stud is fixed to 4 brackets

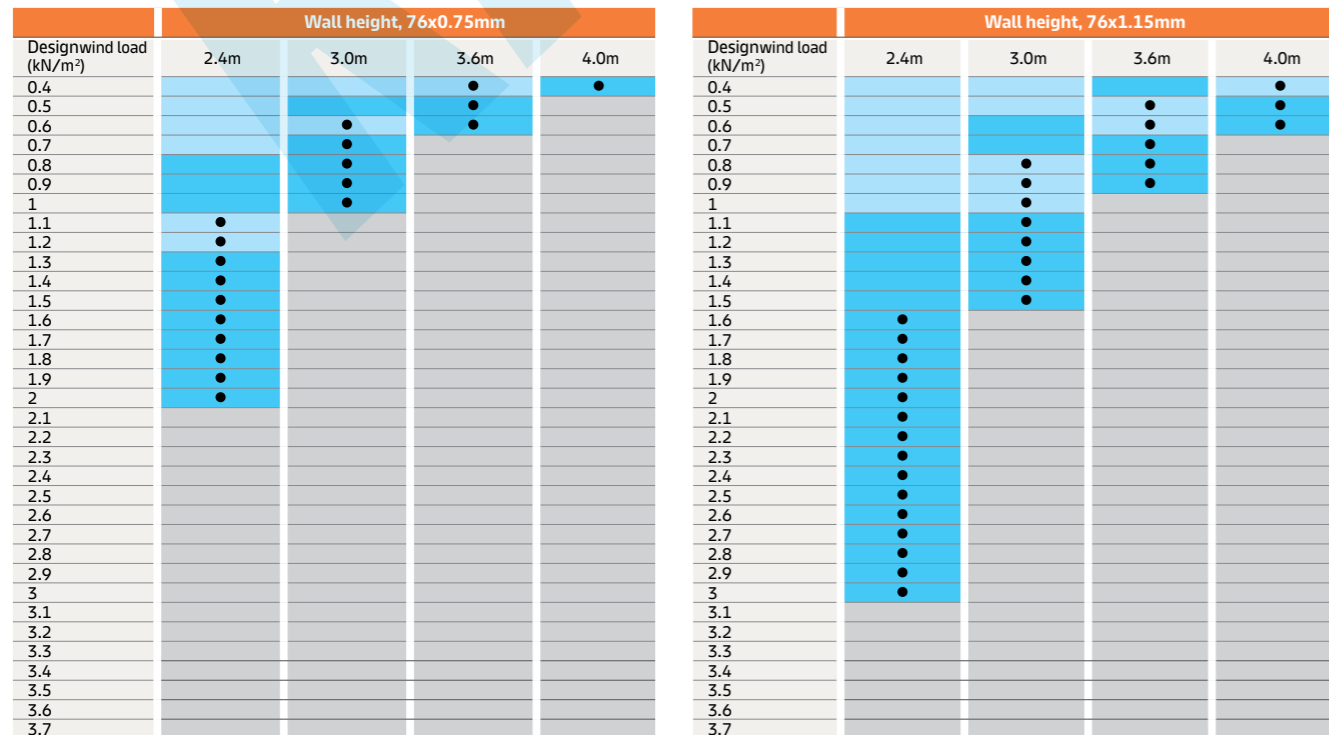


**WL132C.1 | Rear-ventilated rainscreen facade**

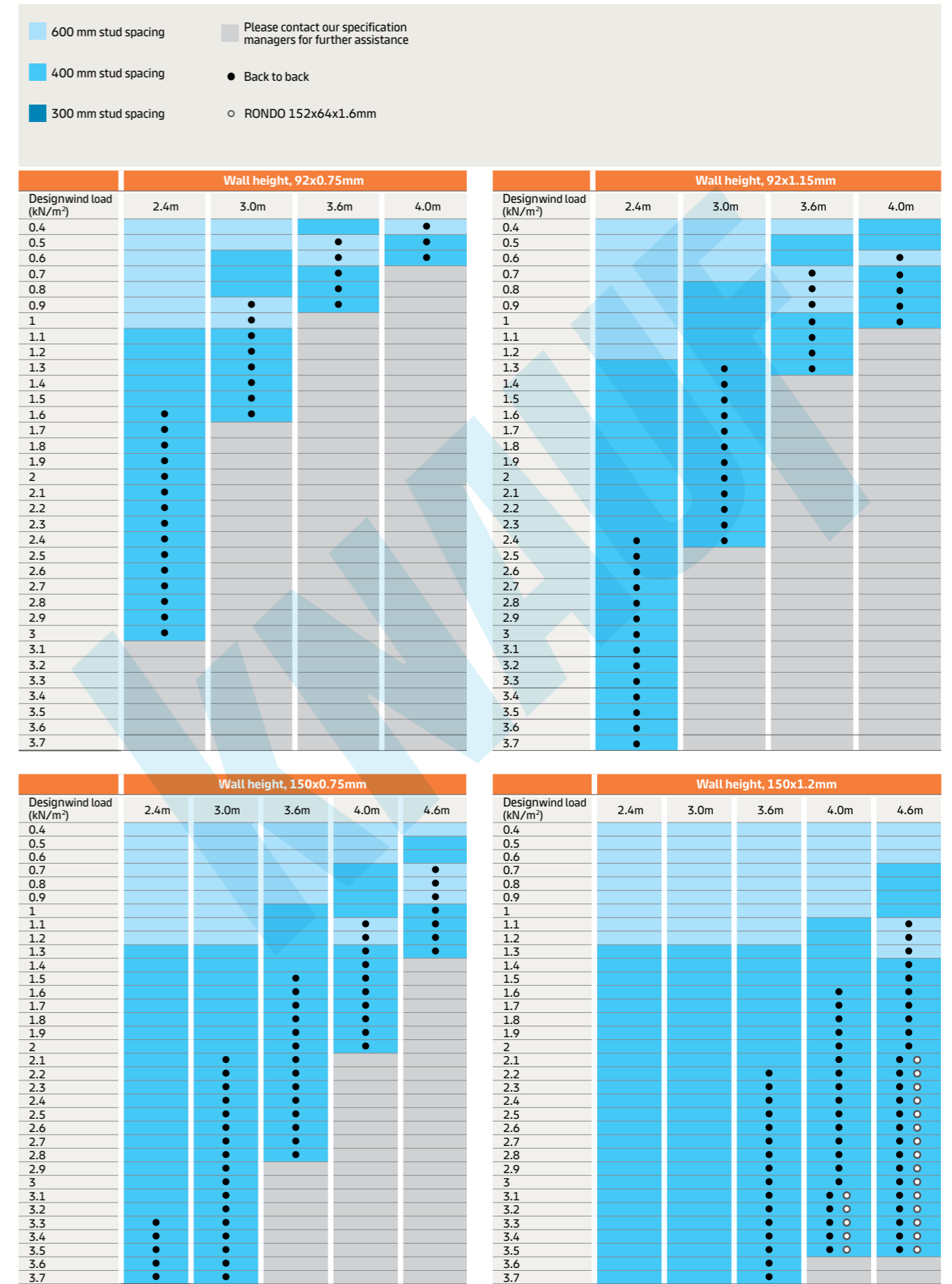


**WL132C.1 | Rear-ventilated rainscreen facade**

**Preliminary design acc. to BS 5950-1:2000 for RONDO profiles**  
 The span table is used to show how the substructure needs to be dimensioned as a function of wind loads [kN/m²] according to the relevant national standards and the span widths of the profiles, which are determined (usually synonymous with floor height).  
 The fixing to the load-bearing structure is not considered. It is assumed that the profile is planked with a suitable board both sides (AQUAPANEL® Cement Board Outdoor on the exteriors and a gypsum based board on the interiors). An angle fixing of the profile to connect to the load-bearing structure is recommended in any case. This must be subsequently verified by an object-related structural calculation, according to the local standards and design guidelines. The choice of anchors and further fixing materials (e.g. angle fixing) to transfer the loads into the primary structure should only be made on the basis of this project-specific structural design.  
 Further profile solutions can be demonstrated by a simple proof of the fitness for use shown by a deformation limit of max.  $f = l/360$ .



**WM111C.1 | Single stud exterior wall**



## Section G

Special Systems

01/2025

### ***G/ SPECIAL SYSTEMS***

- G 2 Column & Beam Encasement
- G 9 Fire Ventilation Duct System
- G 11 Fire Solution

# COLUMN & BEAM ENCASEMENT

## Introduction

### Knauf Column and Beam Clip System

The Knauf Column and Beam Clip system is a high performance system providing fire protection to structural steel I section columns and beams. Systems have been tested and shown to provide up to 180 minutes fire resistance.

The Knauf Column and Beam Clip system has been designed to enhance speed and simplicity of installation using normal plasterboard methods. No special installation techniques are required.

The system features a special Knauf CB Clip which when used together with Knauf CB Channel and Knauf Wall Angle provides a strong, rigid metal structure onto Knauf Fireshield board.

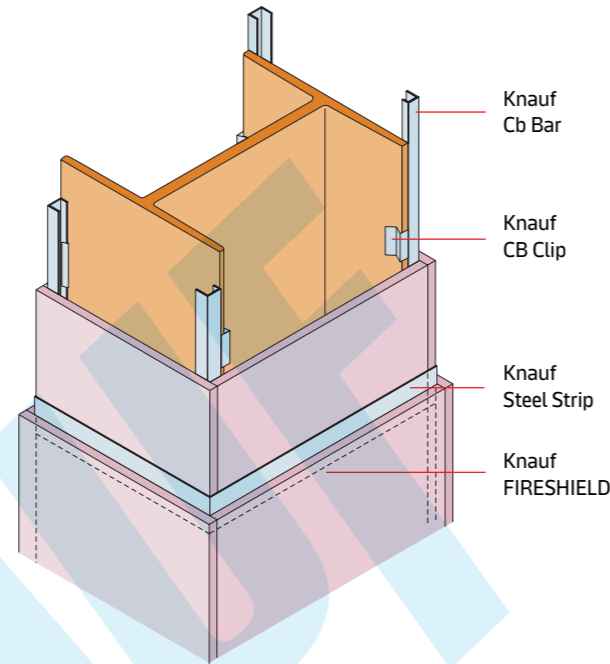
Completed column and beam linings provide a strong, impact resistant, smooth surface which accepts most types of decoration and makes the system particularly suitable for use in conjunction with Knauf partitions and ceilings. Common materials and fixings allow increased site efficiency and considerable time saving over traditional methods.

## Performance

The selection of system and boarding will depend on the performance required for fire resistance and the Hp/A for the steel to be protected. Refer to performance tables on pages 5.4 to 5.7

For further information or advice contact Knauf Technical Support Centre

### Column and beam encasement

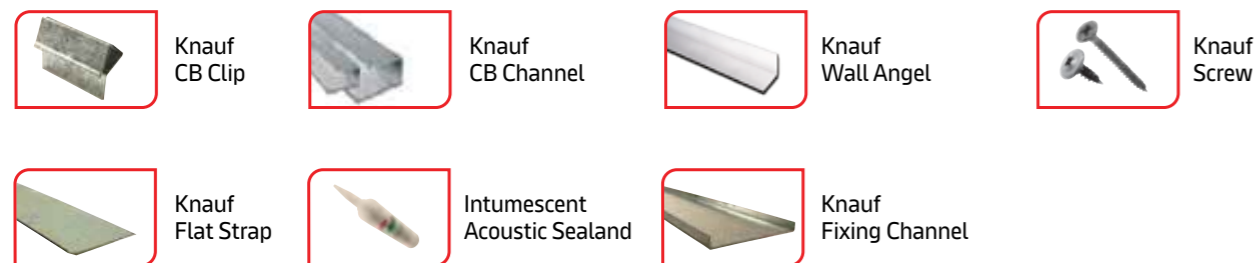


Knauf CB Clips are lightweight steel clips friction fitted at the flange of columns and beams to provide main fixing for Knauf CB Channels. Three sizes of CB Clip are available to accommodate different column and beam flange sizes.

CLIP	To fit steel flange size (mm)
CB 17	1-17
CB 27	17-27
CB 40	24-40

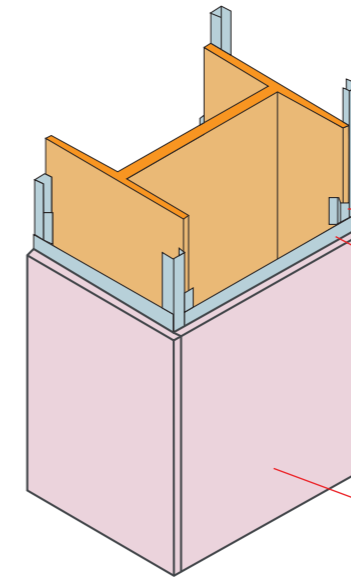


## The Main Supplies

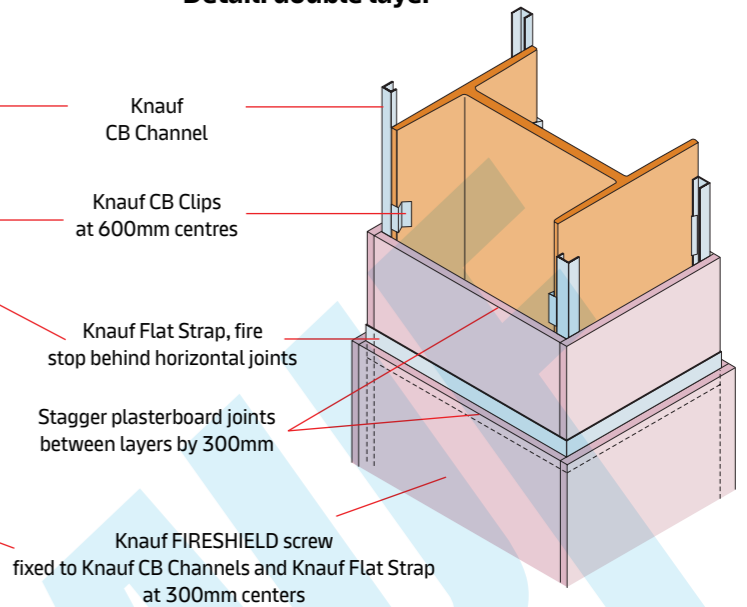


# COLUMN & BEAM ENCASEMENT

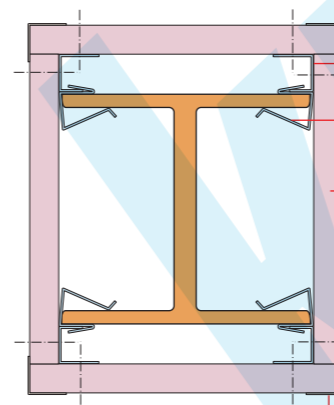
## Typical steel column encasement Detail: single layer



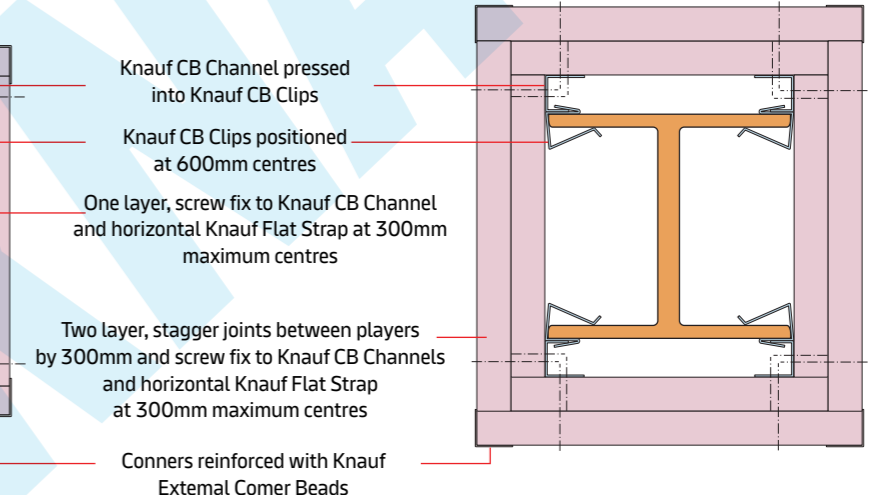
## Typical steel column encasement Detail: double layer



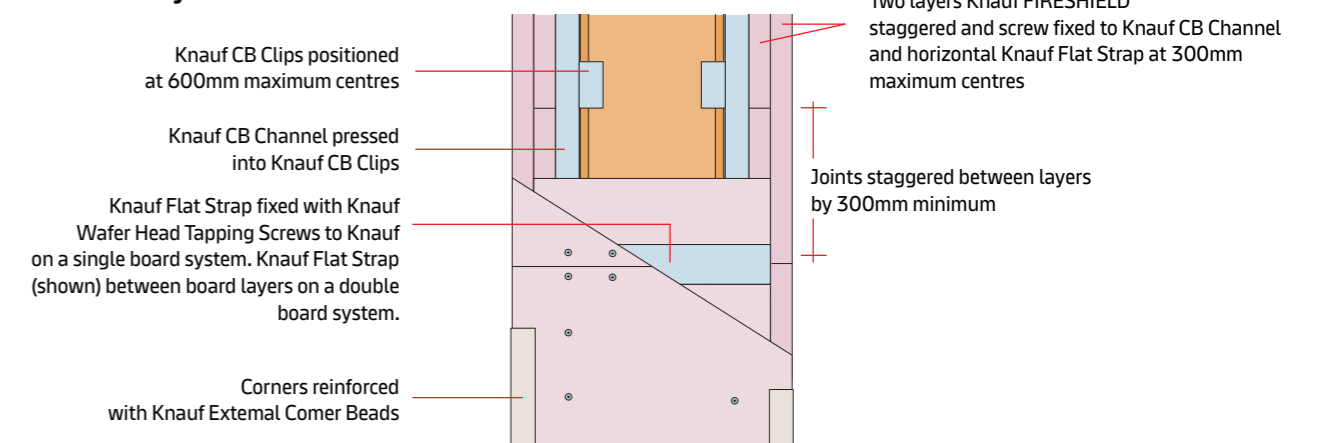
## Column encasement boarding Detail: single layer



## COLUMN ENCASEMENT BOARDING DETAIL: DOUBLE LAYER

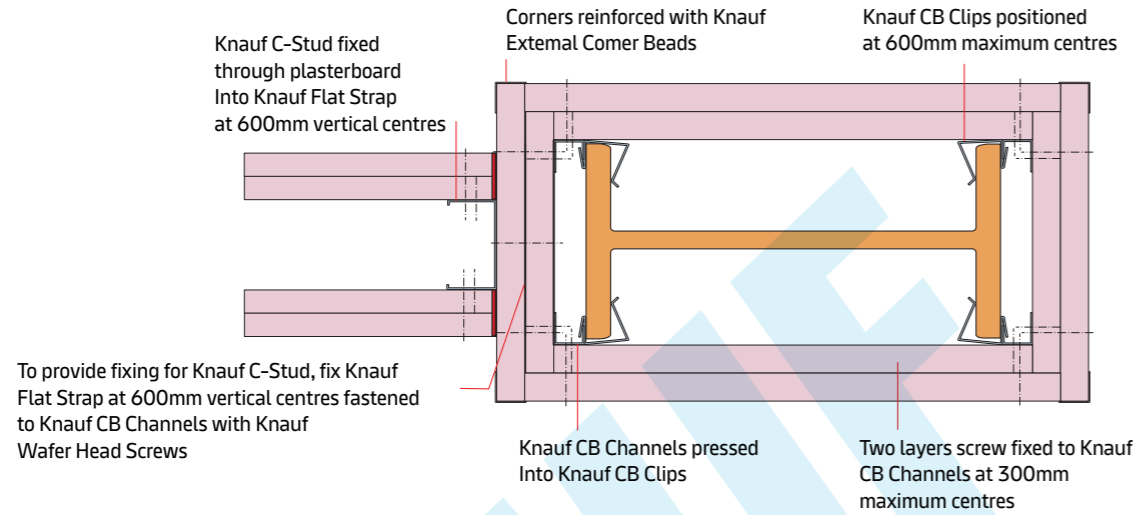


## Cut-away column elevation Detail: double layer

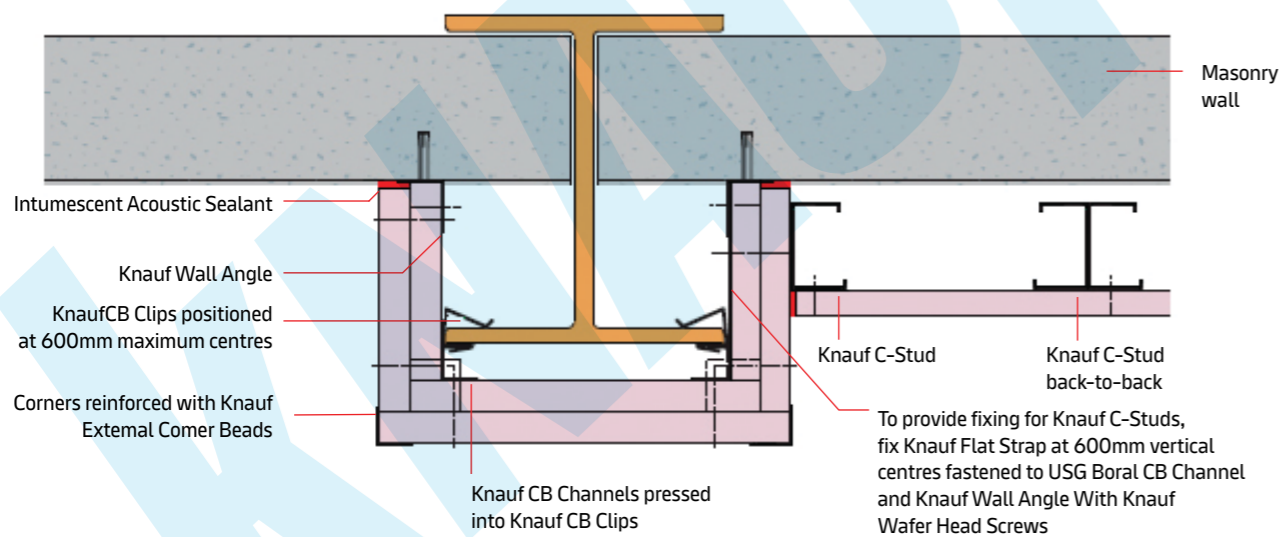


# COLUMN & BEAM ENCASEMENT

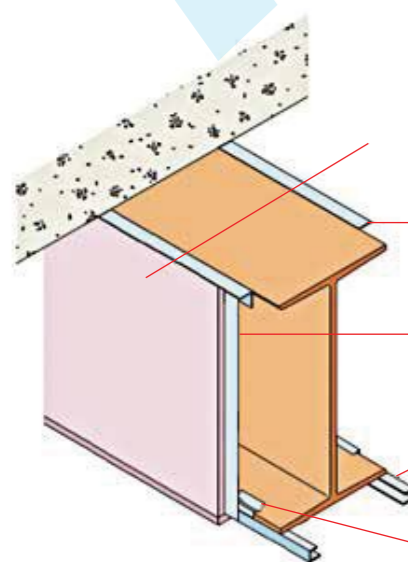
## Column encasement: partiton abutment



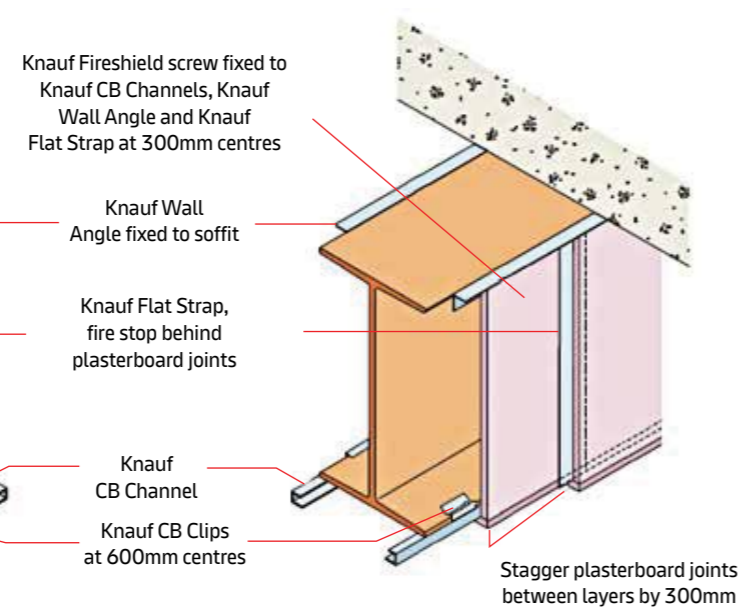
## Column encasement: junction with masonry wall



## Typical beam encasement Detail: single boarded

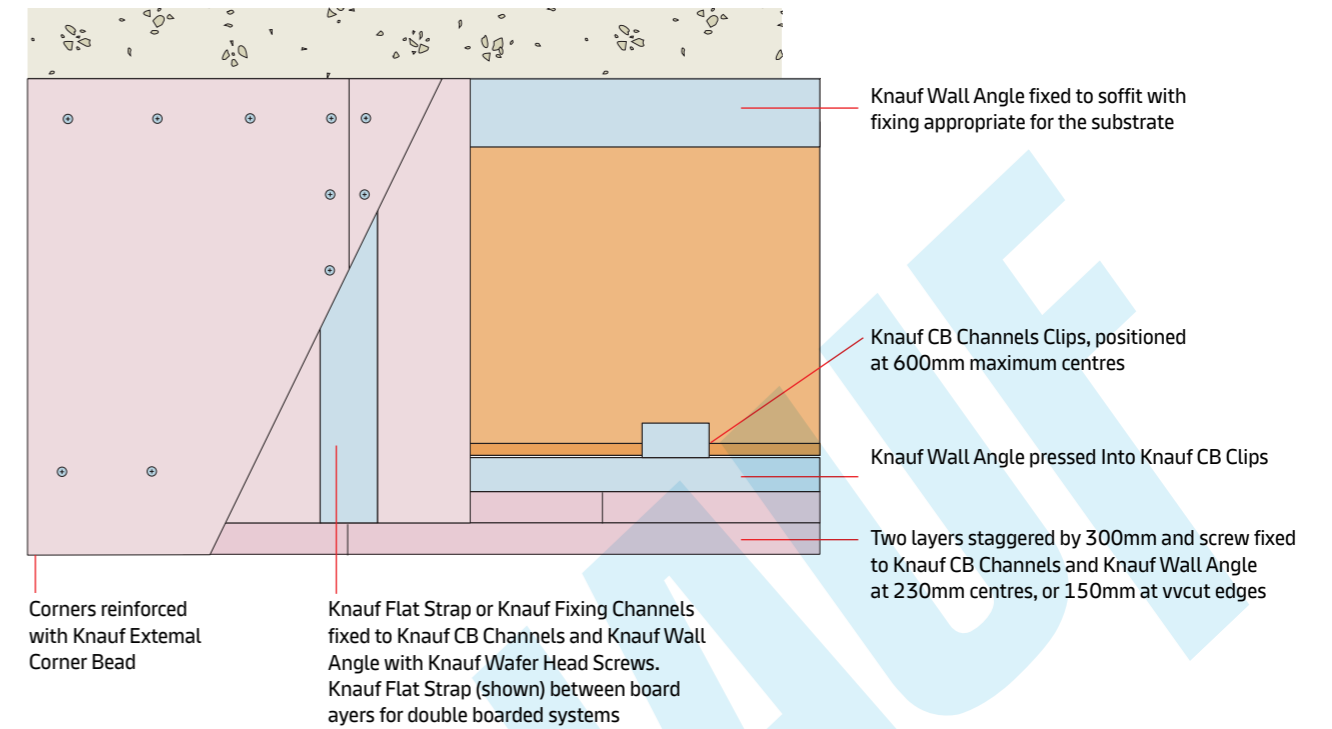


## Typical beam encasement Detail: double boarded

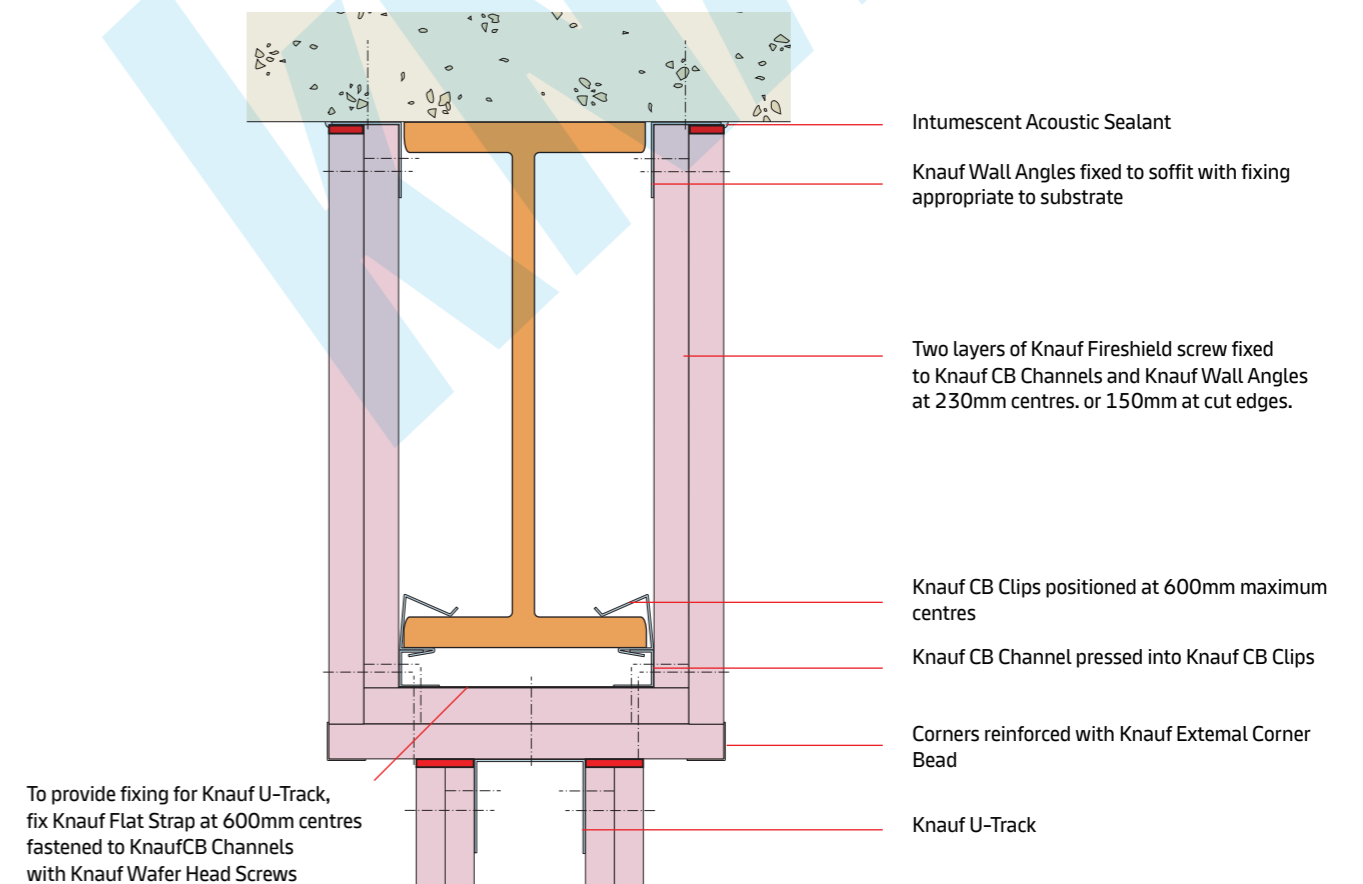


# COLUMN & BEAM ENCASEMENT

## Cut-away beam elevation: double layers



## Beam encasement: Partition abument



# COLUMN & BEAM ENCASEMENT

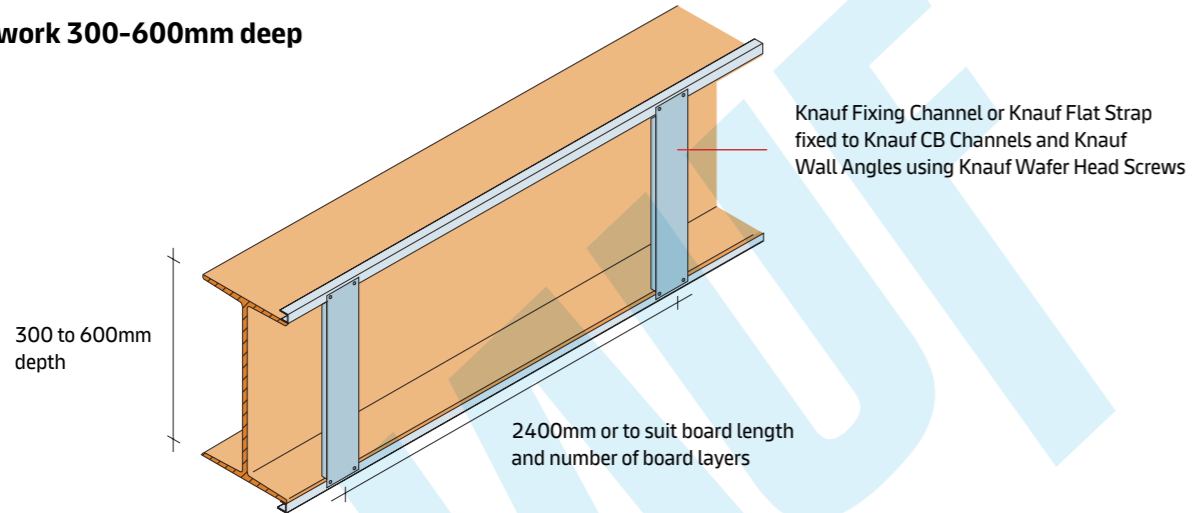
## Steel Beams

For beams up to 300mm deep no reinforcement is required to support the plasterboard.

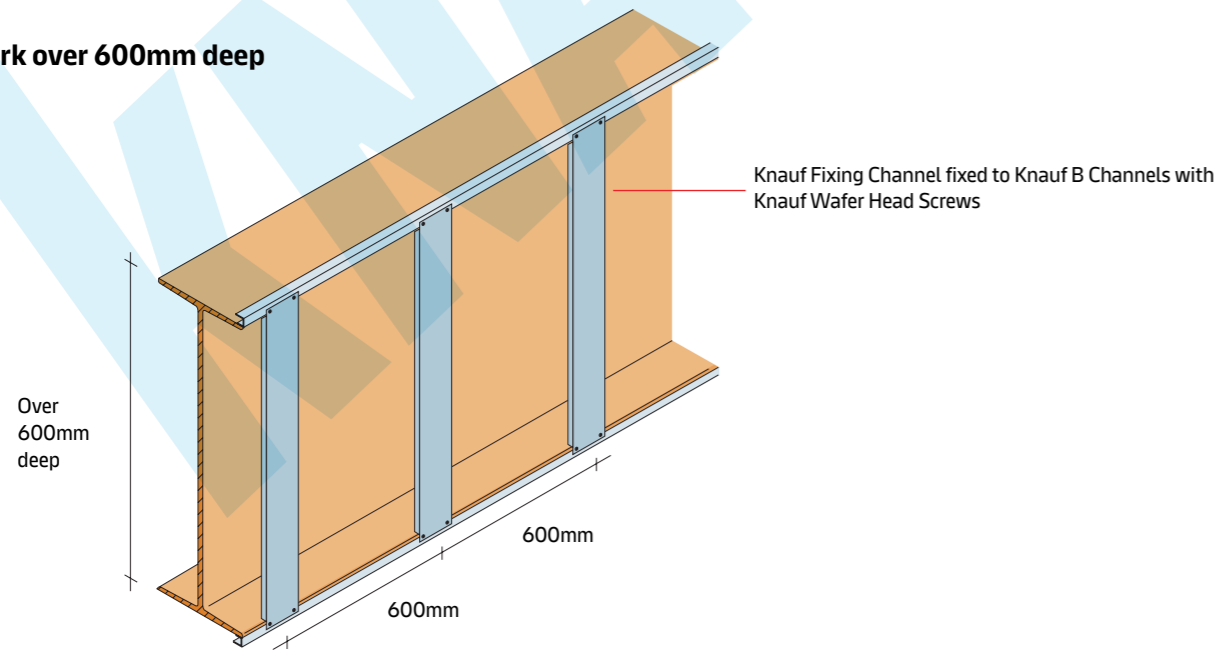
Where any face exceeds 300mm the vertical joints in the plasterboard must be supported by Knauf Fixing Channel (in double boarded systems support outer layer only with Knauf Flat Strap between board layers).

Where any face exceeds 600mm Knauf Fixing Channel must be provided at maximum 600mm centres and to coincide with board edges.

### Steelwork 300-600mm deep

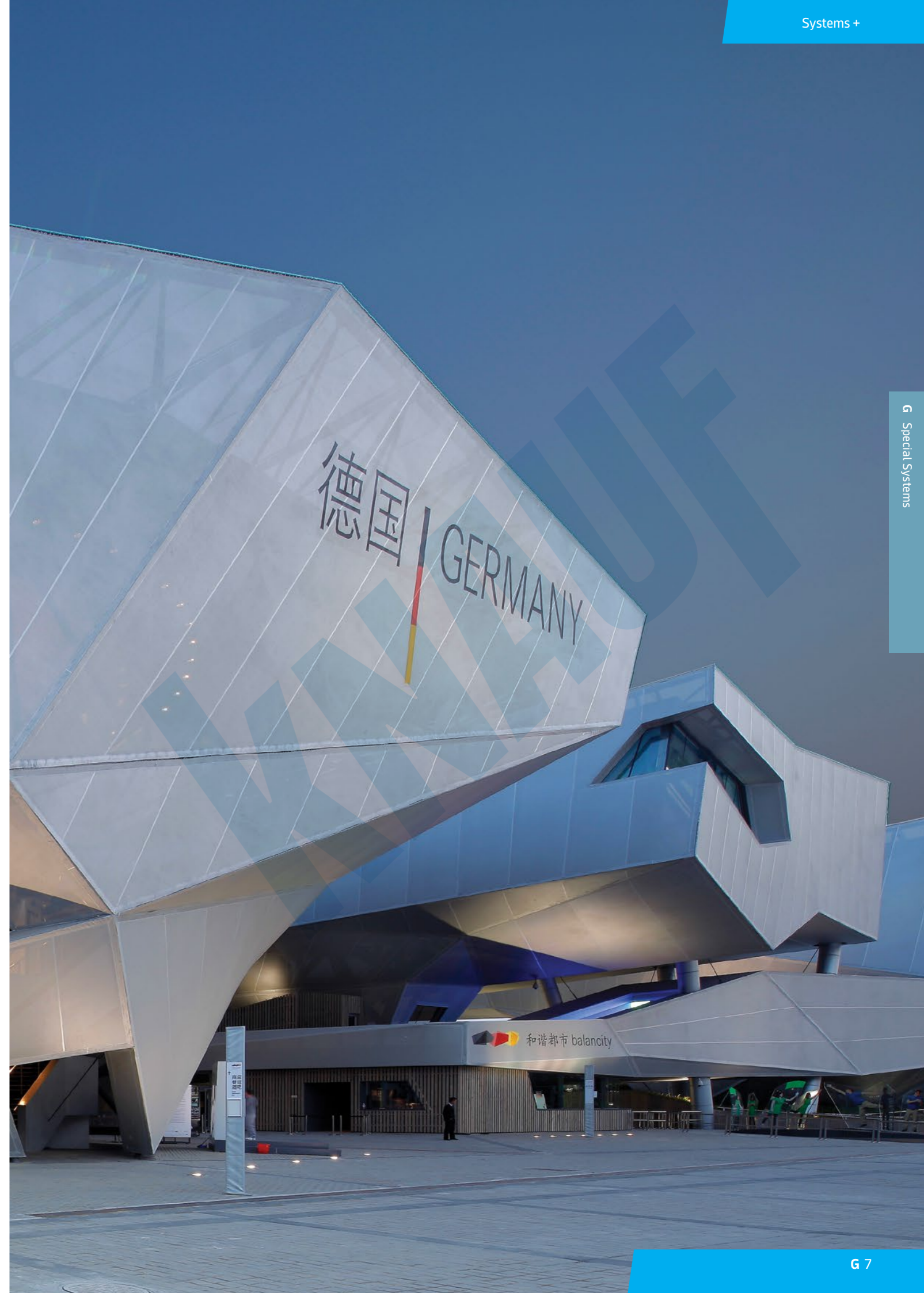


### Steelwork over 600mm deep



PLASTERBOARD	TIME (MINUTES)	TEMPERATURE(°C)	RESIDUAL STRENGTH (%)
1 x 12.7mm FIRESHIELD	30	381	76
2 x 12.7mm FIRESHIELD	60	189	100
2 x 15.9mm FIRESHIELD	90	404	73
3 x 12.7mm FIRESHIELD	120	380*	76

\* This value interpolated from measured test result








## FIRE VENTILATION DUCT

### Fireshield - Fireproof Solution For Ventilation Ducts

#### FIRESHIELD Resistant Gypsum board

FIRESHIELD Fire resistant Gypsum Board is designed and manufactured using advanced technology, providing fire resistant cover solutions for ventilation ducts.

#### Advantages

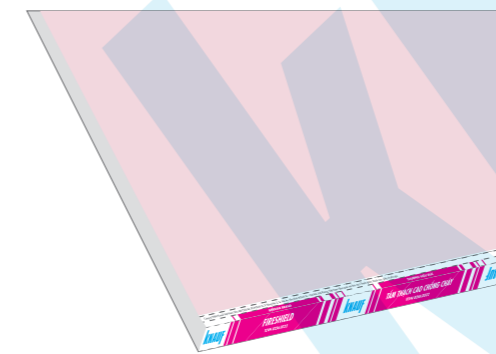
-  Superior fire resistance provides comprehensive protection for ductwork
-  Core reinforced with mold-resistant additives according to ASTM D3273-16
-  German brand

#### Product Specifications

THICKNESS (mm)	WIDTH (mm)	Length (mm)	WEIGHT AVERAGE (kg/m <sup>2</sup> )	EDGE TYPE
9.5	1090	2440	6.4	SE/ TE(*)
12.7	1220	2440	11.3	TE/ SE(*)
15.9	1220	2440	14.1	TE/ SE(*)

Values in above table are nominal and for indicative purposes only  
Edge type: SE - Square Edge/ TE- Tapered Edge  
(\*) Products are made to order.

#### Front



#### Backside



#### Standard

- QCVN 06:2022/ BXD
- QCVN 16:2023/ BXD
- TCVN 8256
- ASTM 1396
- ASTM D3273-16t

#### Application

FIRESHIELD fire resistant gypsum board is a suitable material for covering ventilation ducts because it is a non-combustible material according to QCVN 06:2022/BXD

- Non-flammable
- No smoke
- Non-fire spreading
- Non-toxic

#### Maintenance & Installation

Store and install in dry, non-humid conditions (affected by rain, poor ventilation in conditions of prolonged high humidity).



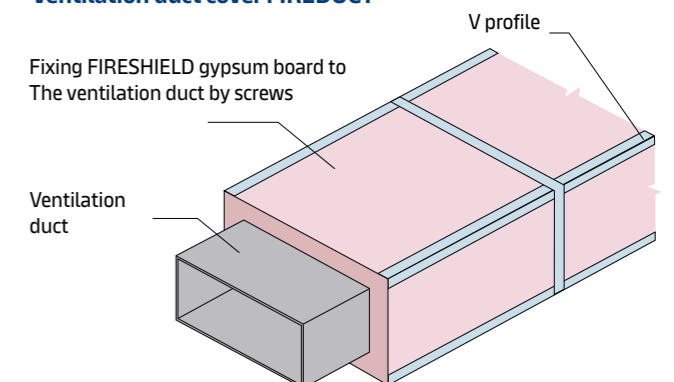
#### Fire Ventilation Duct with gypsum board

##### Structure:

- Inner layer: Galvanized steel
- Fire resistant gypsum board FireShield
- Outer layer: Galvanized steel
- Galvanized TDF/ TDC steel flange

#### Ventilation duct cover FIREDUCT

Fixing FIRESHIELD gypsum board to the ventilation duct by screws





## FIRE SOLUTION

### Gypsum - Leading Material For Fire Resistant Solutions

#### Fire Theory

For a long time now, all materials used in the construction sector have been required to meet varying levels of performance, mainly in two main areas: Reactivity and Fire Resistance.

#### Fire Reaction

Fire reaction regulations are related to factors that contribute to creating a fire from materials such as combustible materials and fire spread. This factor is evaluated directly on each product according to BS 476 or ISO 1182:2010 standards.

#### Fire Protection

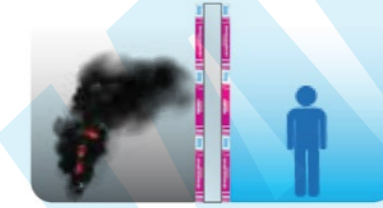
Fire regulations relate to how long a building structure can delay the spread of any burned area to an adjacent area or property. The normal time is calculated in minutes and only evaluates the fire resistance for the entire solution system, not on a single type of material that complies with QCVN 06:2022/BXD standards, BS 746 or BSEN 1364 or ASTM standards. E119 or TCVN 9311.



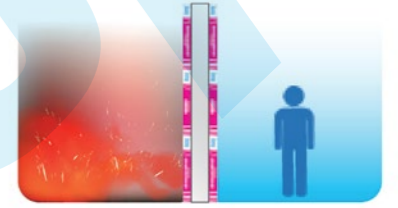
#### Important Parameters To Evaluate A Fire System



**Load-bearing capacity (R):** The system's load-bearing capacity during fire. Keep the system structure from collapsing when a fire is occurring.



**Integrity (E):** The system has the ability to prevent smoke, toxic gases, etc. from spreading through the fire area. When a fire occurs, most casualties come from smoke inhalation, before being affected by other factors.

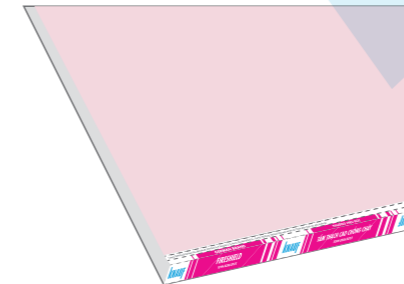


**Thermal insulation (I):** The system has the ability to prevent high temperatures from transmitting from the fire area to the adjacent area. Control surface temperature, prevent fire spread.  
 <140°C (Average)  
 <180°C (Max).

#### FIRESHIELD - The Top Choice For Fire Protection Solutions

FIRESHIELD Board is designed and manufactured using advanced technology, providing Fire Resistant solutions for ceilings and partitions in the home.

#### Front



#### Backside



#### Advantage

- Non - Combustible
- Effectively prevents smoke and heat
- Environmental friendliness
- Does not generate toxic fumes

# FIRE SOLUTION

## Fire Protection Solutions From Knauf



GERMAN brand



Synchronized Solution



Fire Resistant 200 minutes

### Details Of Fire Protection Solutions

Fire protection system	Fire resistance	Describe	Illustration
Ceiling system FireCEIL	EI 60	Frame : Supa V Channel frame, man runner @600, Cross runner @305 thread D8 Weight : 28 kg/m <sup>2</sup>	
	EI 90	Frame : Supa V Channel frame, man runner @600, Cross runner @305 thread D8 Weight : 42 kg/m <sup>2</sup>	
	EI 120	Frame : 2 layers Supa V Channel frame, man runner @600, Cross runner @305 thread D8 Weight : 56 kg/m <sup>2</sup>	
Wall system FireWALL	EI 45	Frame : Suprawall stud with 610mm center distance Board : 1 layer FireShield 12.7mm both sides Weight : 23.2 kg/m <sup>2</sup>	
	EI 60	Frame : Suprawall stud with 610mm center distance Board : 1 layer FireShield 15.9mm both sides Weight : 28 kg/m <sup>2</sup>	
	EI 120	Frame : Suprawall stud with 610mm center distance Board : 2 layer FireShield 12.7mm both sides Weight : 46.4 kg/m <sup>2</sup>	
	EI 150	Frame : Suprawall stud with 610mm center distance Board : 2 layer FireShield 15.9mm both sides Weight : 56 kg/m <sup>2</sup>	
	R 30	Frame : Suprawall Frame and CB Clip Board : 1 layer FireShield 12.7mm (Depends on Hp/A coefficient) Weight : 11.6 kg/m <sup>2</sup>	
Column/beam cladding system FireCASE	R 60	Frame : Suprawall Frame and CB Clip Board : 2 layer FireShield 12.7mm (Depends on Hp/A coefficient) Weight : 23.2 kg/m <sup>2</sup>	
	R 90	Frame : Suprawall Frame and CB Clip Board : 2 layer FireShield 15.9mm (Depends on Hp/A coefficient) Weight : 28 kg/m <sup>2</sup>	
	EI 30	Frame : Fire duct 2200 x 1000, minimum thickness of 0.75mm Board : 1 layer FireShield 9.5mm Weight : 6.4 kg/m <sup>2</sup>	
Air Duct Covering System FireDUCT	EI 45	Frame : Fire duct 2200 x 1000, minimum thickness of 0.75mm Board : 1 layer FireShield 12.7mm Weight : 11.6 kg/m <sup>2</sup>	
	EI 60	Frame : Fire duct 2200 x 1000, minimum thickness of 0.75mm Board : 1 layer FireShield 15.9mm Weight : 14 kg/m <sup>2</sup>	
	EI 120	Frame : Fire duct 2200 x 1000, minimum thickness of 0.75mm Board : 2 layer FireShield 15.9mm Weight : 28 kg/m <sup>2</sup>	

Test report are available

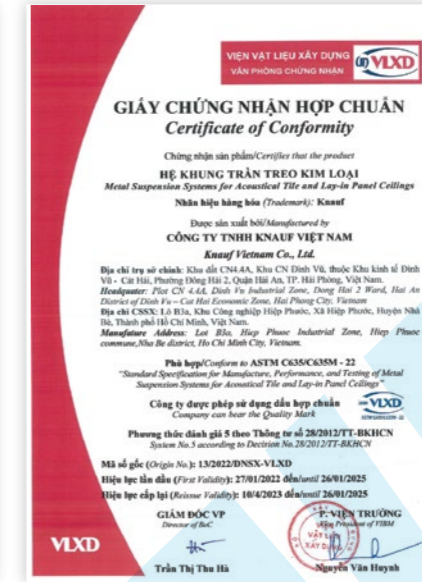
Have fire protection certificate

# FIRE SOLUTION

## Test Results And Inspection Certification



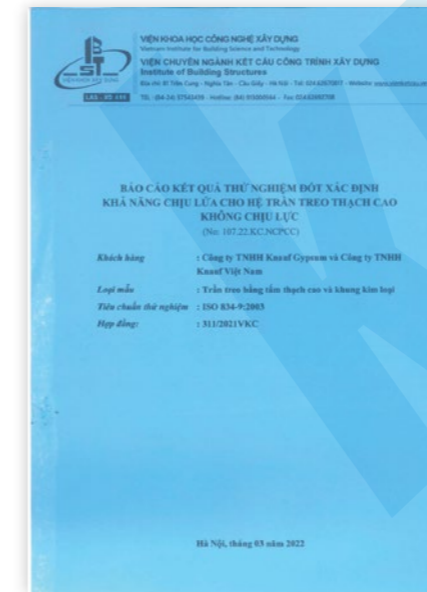
Certification Of Conformity Plasterboard



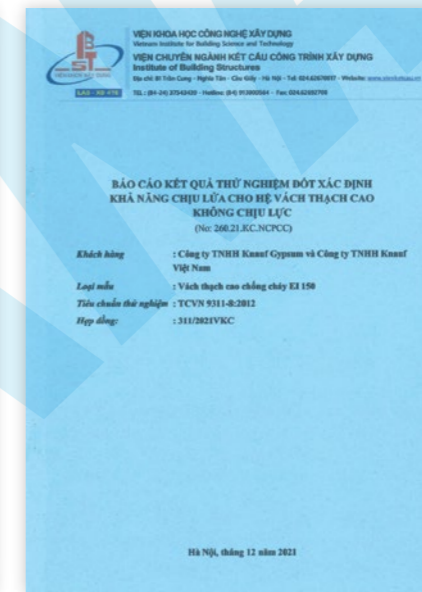
Certificate of conformity Metal frame



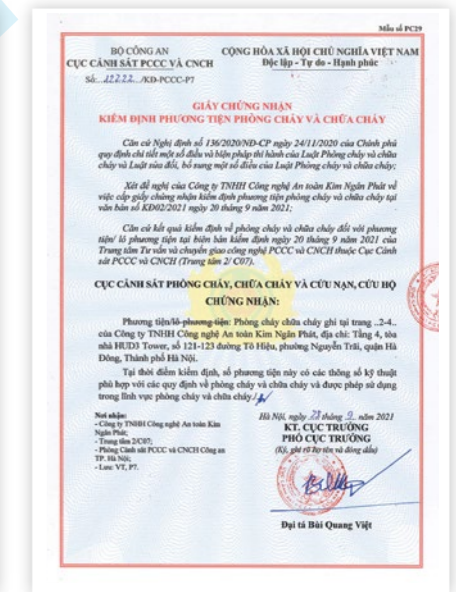
Test results of FireShield board



Test results of EI60 Fire resistant ceiling system



Test results of EI150 Fire resistant wall system



Fire prevention inspection certificate

# FIRE SOLUTION

Knauf Fireproofing Solutions Have Been Used In Projects



**CENTRAL CHILDREN'S HOSPITAL, HANOI - 2016  
FIRESHIELD**



**NESTLE FACTORY, DONG NAI - 2017  
FIRESHIELD**



**SAMSUNG FACTORY, HCM - 2017  
FIRESHIELD**



**SAMSUNG FACTORY, THAI NGUYEN - 2019  
FIRESHIELD**



**HOIANA RESORT, QUANG NAM - 2020  
FIREBLOC**



**LG DISPLAY FACTORY, HAI PHONG- 2020  
FIREBLOC**



**VINCOM MEGANALL OCEAN PARK, HA NOI - 2020  
FIRESHIELD**

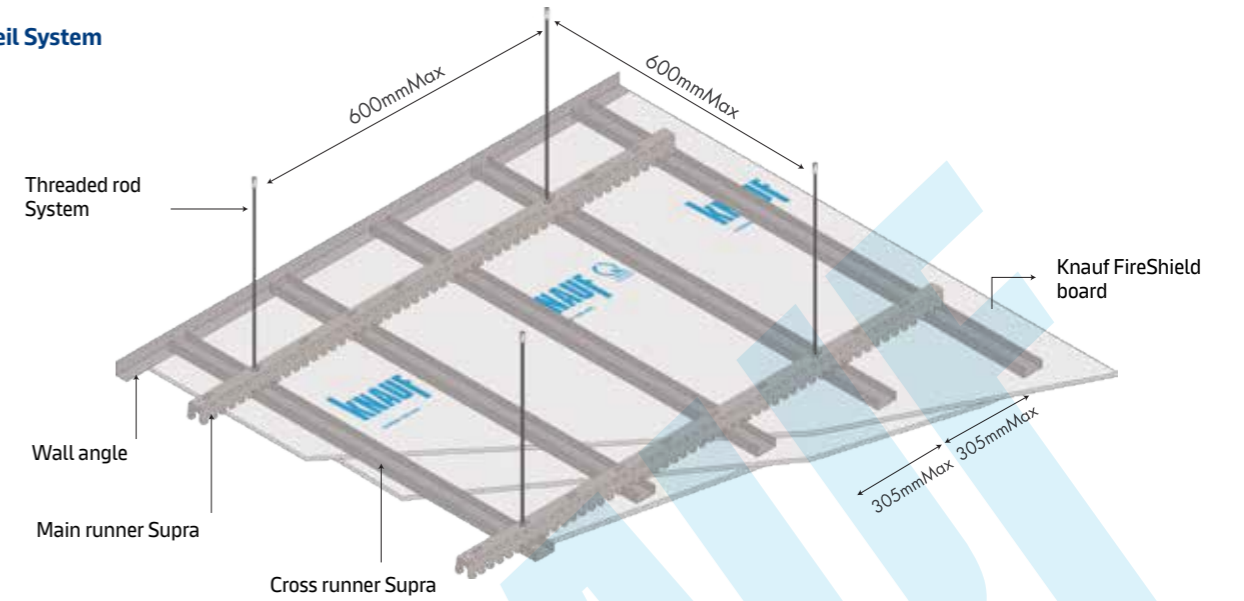


**TECHNO PARK TOWER VINGROUP, HA NOI - 2021  
FIRESHIELD**

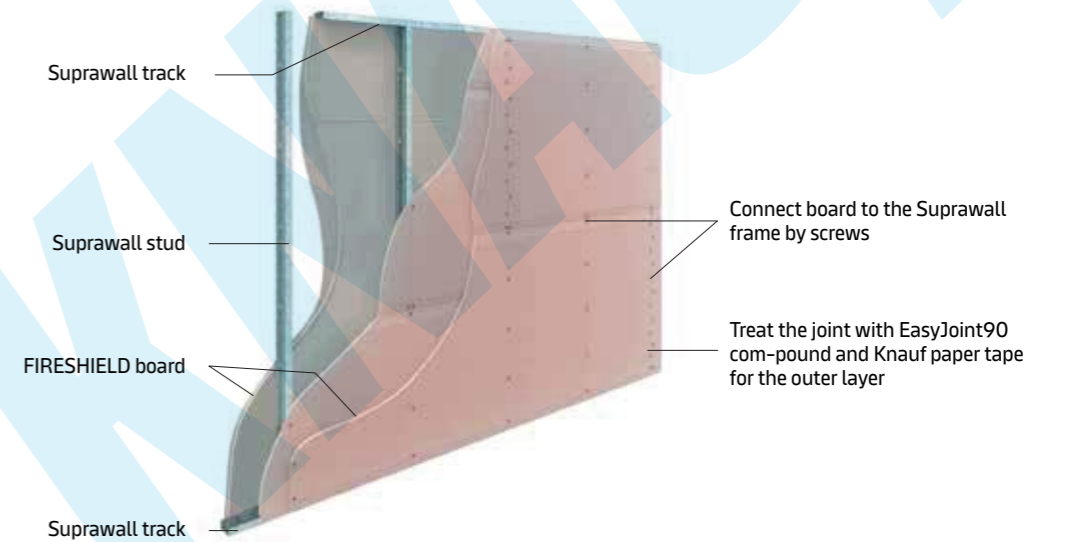
# FIRE SOLUTION

Typical Details

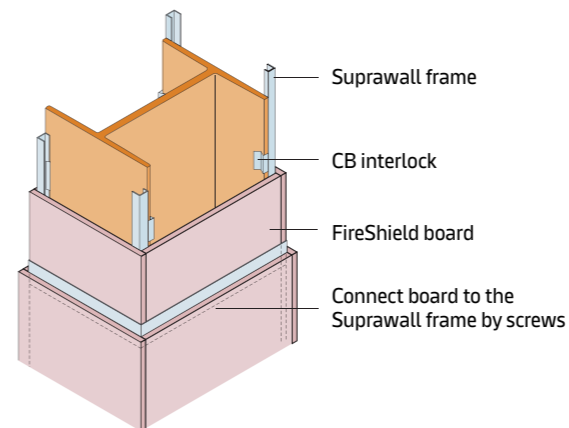
## Fireceil System



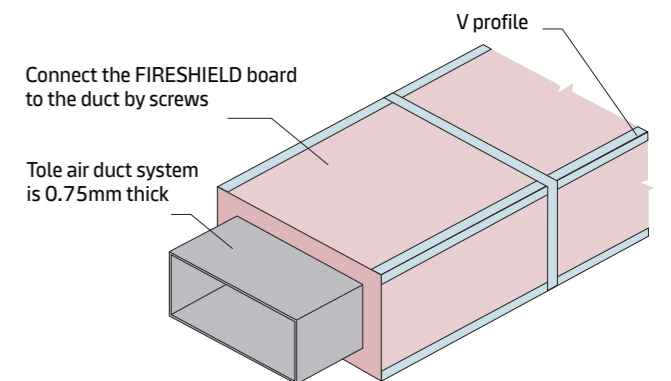
## Firewall System



## Firecase Column/beam System



## Fire Ventilation Duct Covering System





# Section H

Juntions &amp; Penetrations

01/2025

## ***H/ JUNCTIONS & PENETRATIONS***

- H 2 Introduction
- H 4 Fire Rated Steel Stud Walls
- H 22 Non-Fire Rated Steel Stud Walls

# INTRODUCTION

## Description

This section contains the most common junctions and penetrations details in conventional plasterboard systems, including:

- Fire rated and non-fire rated Steel Stud Walls
- Fire rated Ceilings
- Non-fire rated suspended ceilings.

Refer to Knauf for installation details not covered in this manual. Refer to Knauf Installation Manual for junctions in non-fire rated steel framed walls and ceilings.

Refer to relevant Knauf publications and [knauf.com](http://knauf.com) for construction details of the following specialty systems:

## Design Options

The following types of details can be found in this section:

### Wall Junctions

- X, T and L intersections
- Base and Head details
- Movement/Control Joints
- Typical door details.

### Wall Penetrations

- uPVC Pipe penetration
- Copper/Steel Pipe penetration
- Typical Plumbing penetration
- GPO details
- Cable penetrations
- HVAC penetrations
- Access Panel.

### Ceiling Junctions

- Back-blocking
- Perimeter details
- Bulkhead
- Movement/Control Joints
- Recessed Lights
- Beam Protection.

### Ceiling Penetrations

- Electrical penetrations
- Loaded penetration
- uPVC Pipe penetration
- Copper Pipe penetration
- Sprinkler Pipe penetration.

# INTRODUCTION

## Materials

Refer to General Information and other relevant system sections of this manual for information on the following materials utilised in Knauf systems:

- Linings
- Metal components
- Insulation
- Fasteners
- Jointing tapes
- Jointing compounds
- Sealants
- Proprietary components.

Refer to junctions and penetrations details for materials used in specific details.

## Design Considerations

Refer to the General Information section for general design considerations and design notes on:

- Structural
- Fire
- Acoustics
- Wet Area
- Thermal Insulation
- Appearance.

Refer to the Steel Stud Walls section for:

- System configurations required to achieve specified fire and acoustic ratings
- Maximum wall heights for various system configurations and stud sizes
- Head track requirements to satisfy design vertical deflection and head reaction
- Load bearing walls
- Movement/Control Joint requirements.

## Installation

Refer to General Information and the relevant sections in this manual for:

- General construction notes
- Plasterboard fixing instructions
- Frame installation instructions
- Perimeter caulking
- Movement/Control Joint locations
- Jointing and Finishing.

Refer to various junctions and penetrations details for detail-specific installation instructions.

## Penetrations

Penetrations in a fire rated system must be treated strictly in accordance with relevant test reports and approved installation details in order to maintain the system's Fire Resistance Level. Where components by others are specified in Knauf fire rated penetration details (ie. dampers, GPO's, fire collars, etc), such components must be installed in accordance with the manufacturer's specifications. It is the responsibility of the component manufacturer to ensure that the fire rating performance of the system is not affected.

# FIRE RATED STEEL STUD WALLS

## Terminals and Junctions

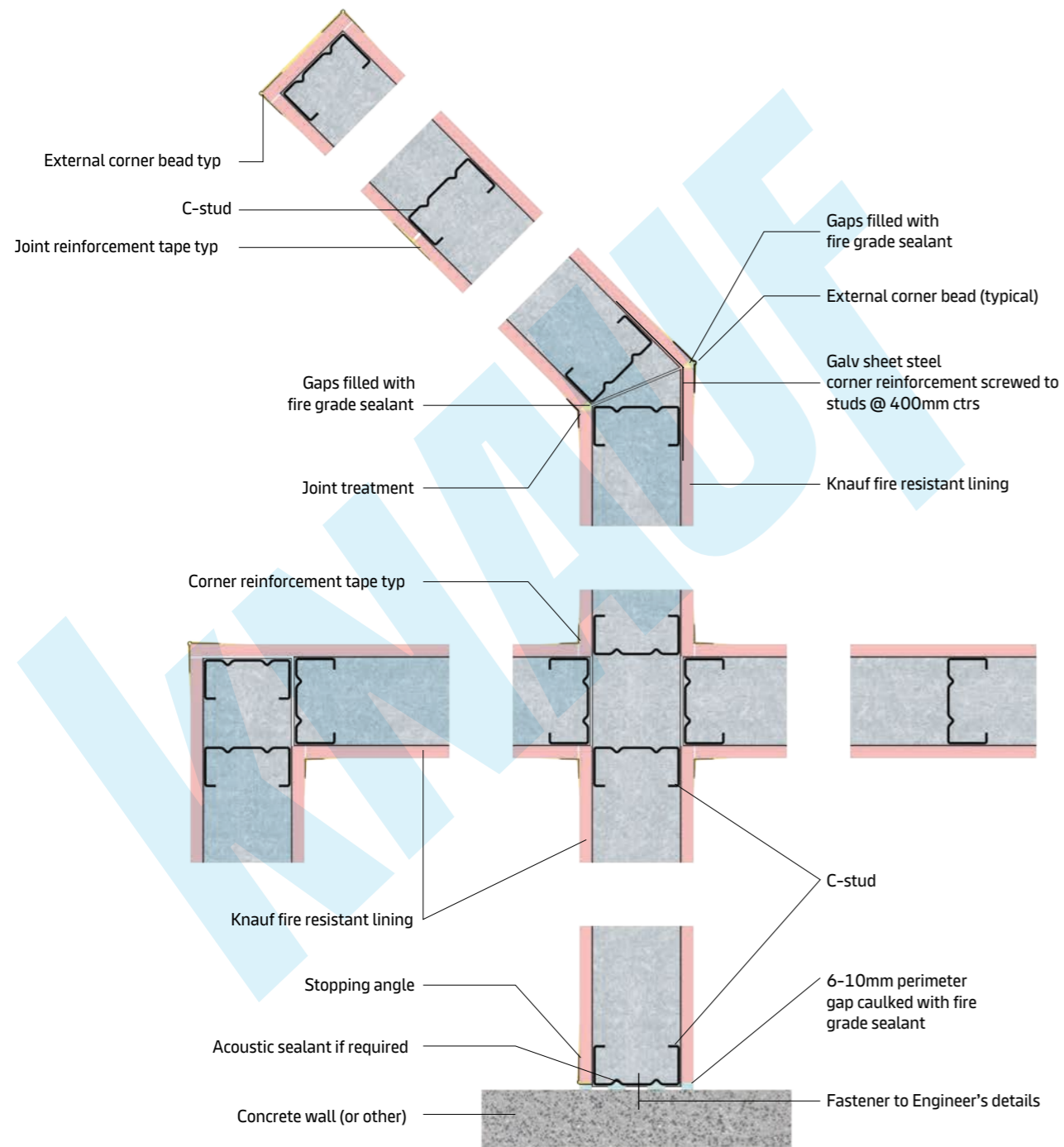


Figure H1: Single Stud Terminal and Junction Details (Twin stud, staggered stud layout similar)

**NOTES:**

- Control joints must coincide with those occurring in the main building structure and/or at maximum 12 metre centres.
- Location of control joints should be verified with Structural Engineer.

# FIRE RATED STEEL STUD WALLS

## Terminals and Junctions

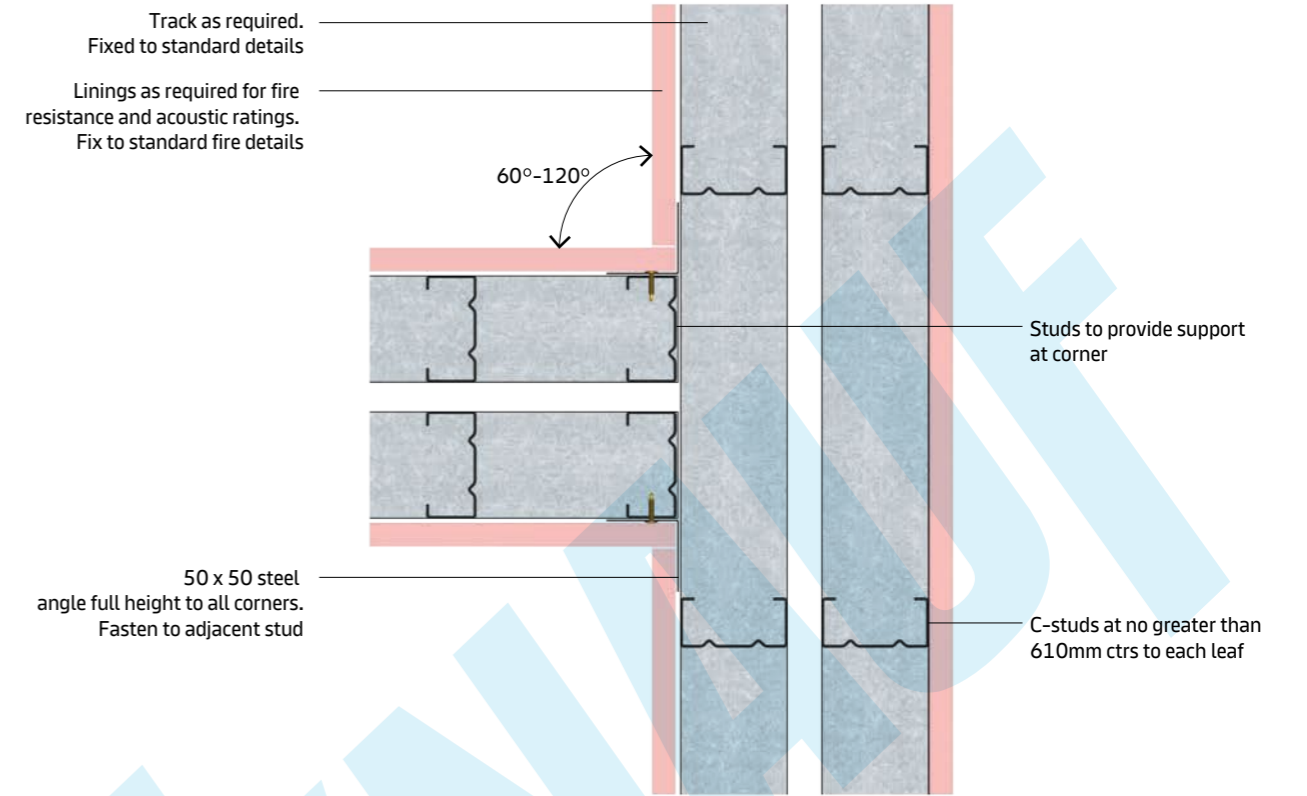


Figure H2: Twin Steel Stud T-Junction Detail

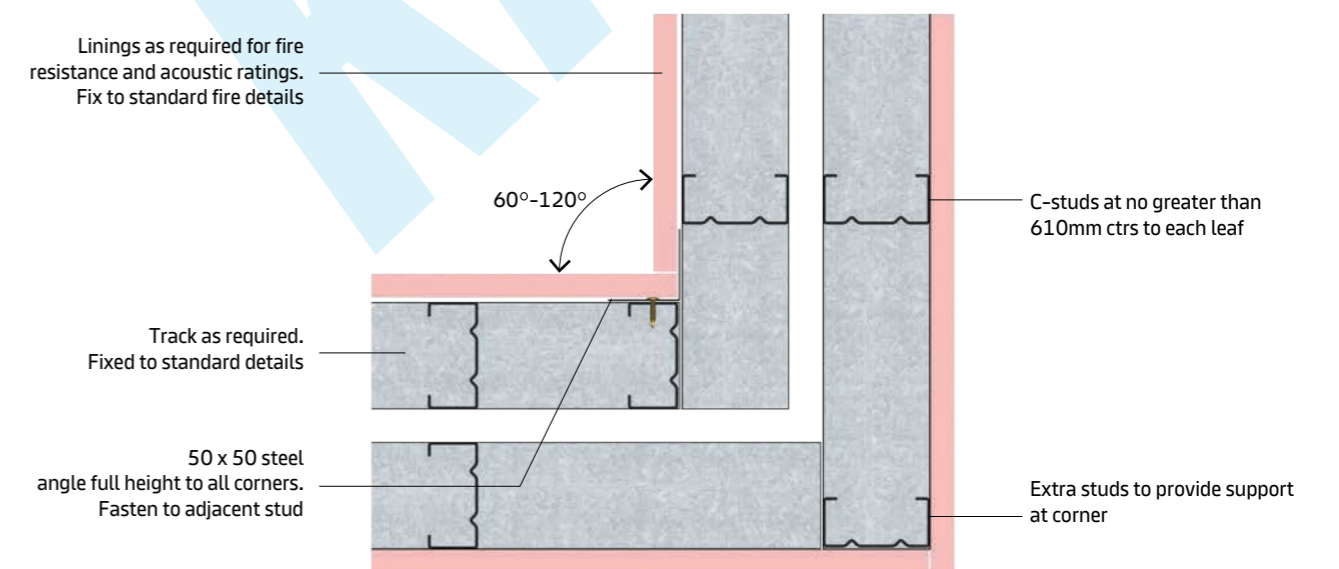


Figure H3: Twin Steel Stud Corner Detail

# FIRE RATED STEEL STUD WALLS

## Terminals and Junctions

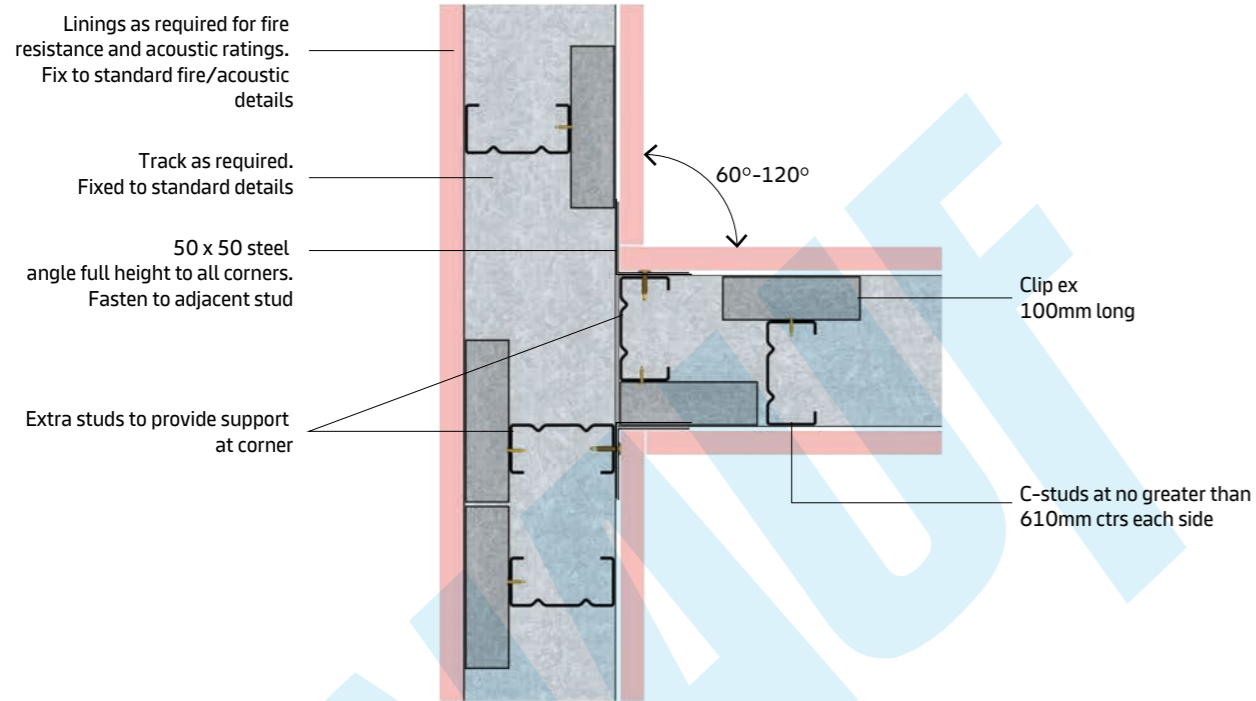


Figure H4: Staggered Steel Stud T-Junction Detail

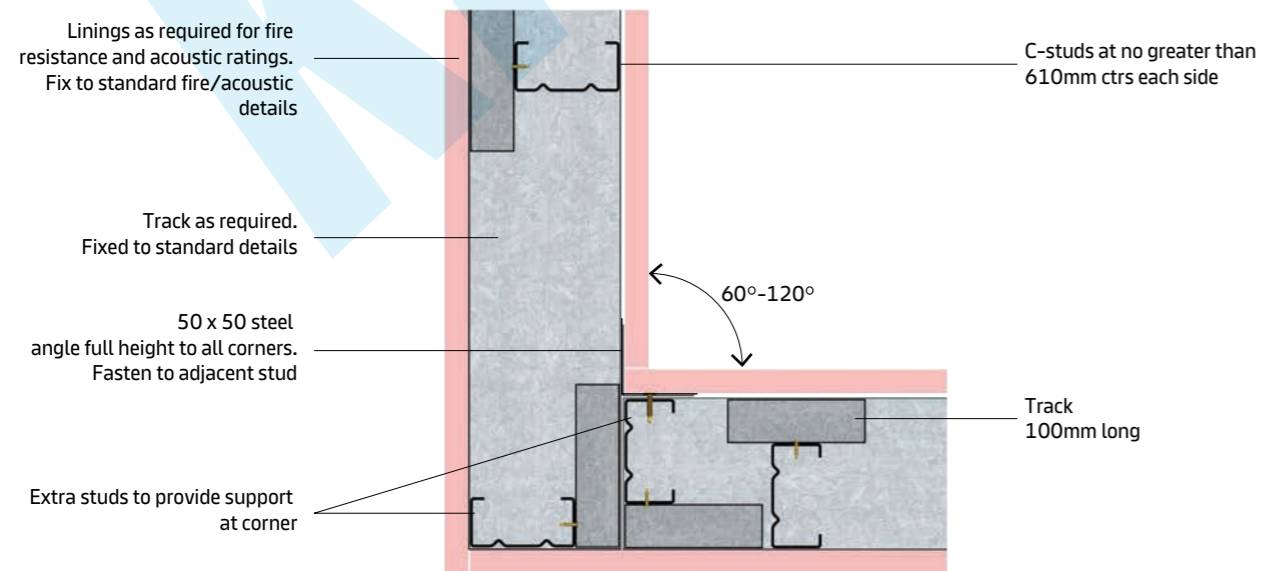


Figure H5: Staggered Steel Stud Corner Detail

# FIRE RATED STEEL STUD WALLS

## Base Details

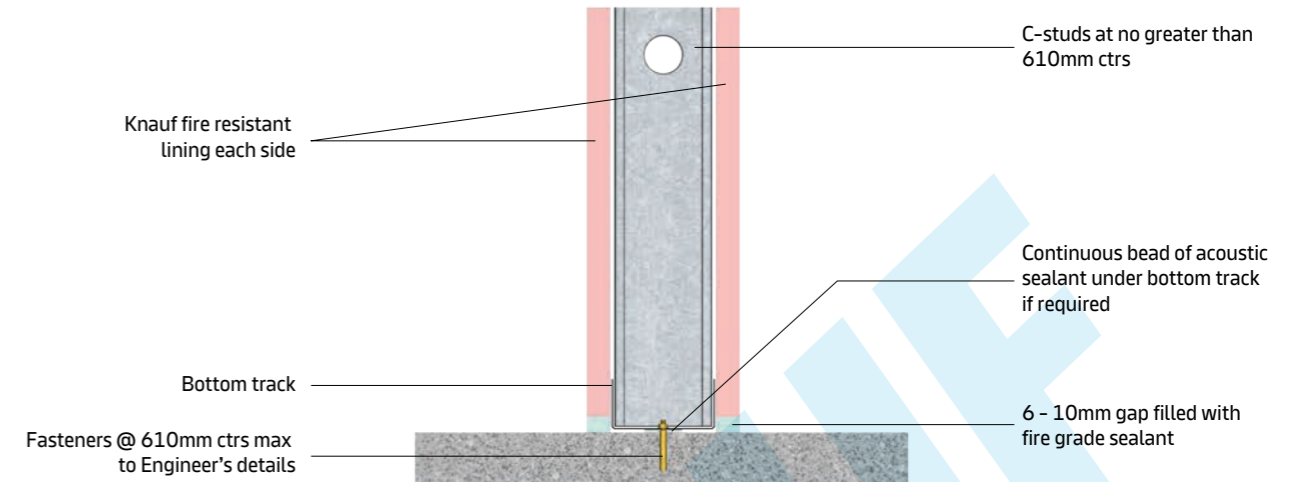


Figure H6: Partition Base Detail

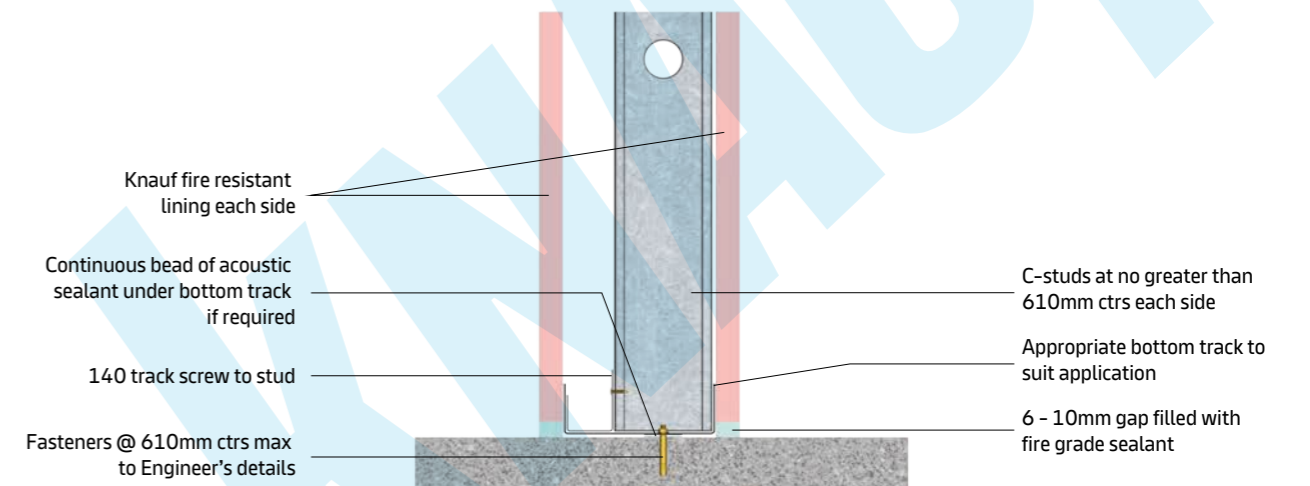


Figure H7: Staggered Stud Base Detail

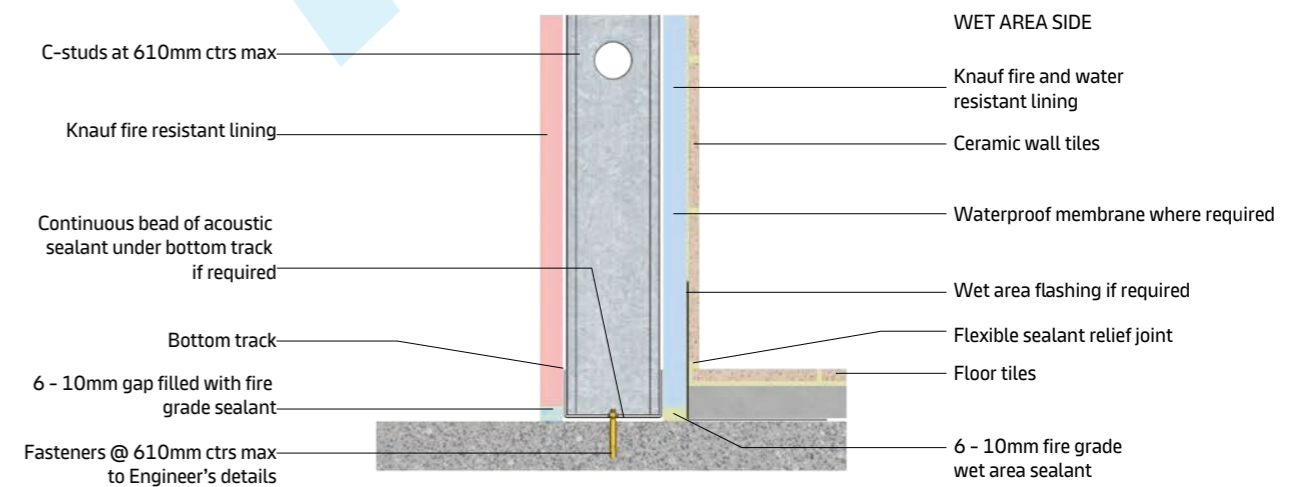


Figure H8: Partition Wet Area Base Detail

# FIRE RATED STEEL STUD WALLS

## Head Details

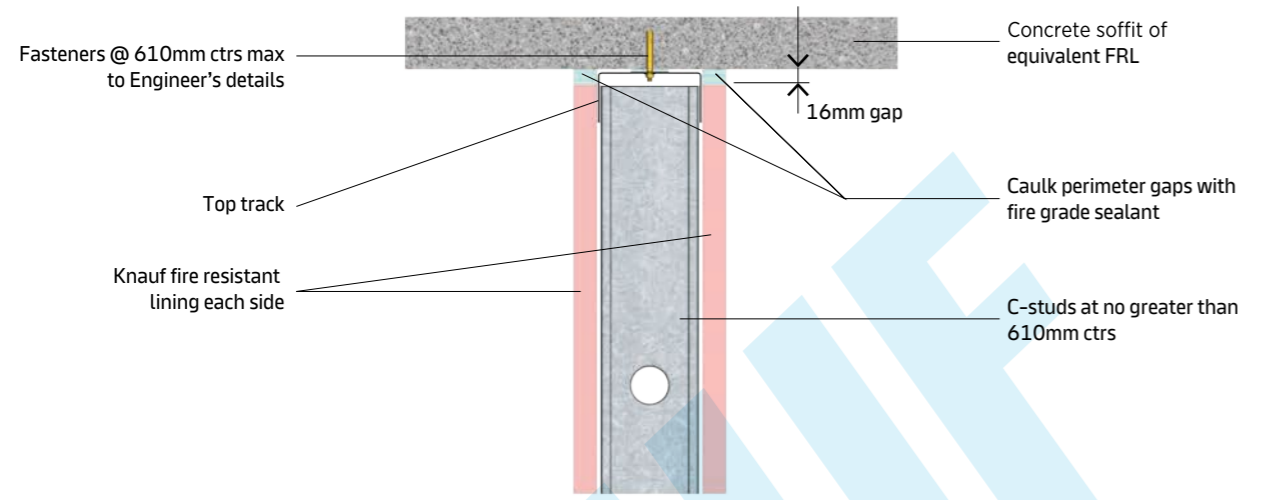


Figure H9: Partition Head Detail

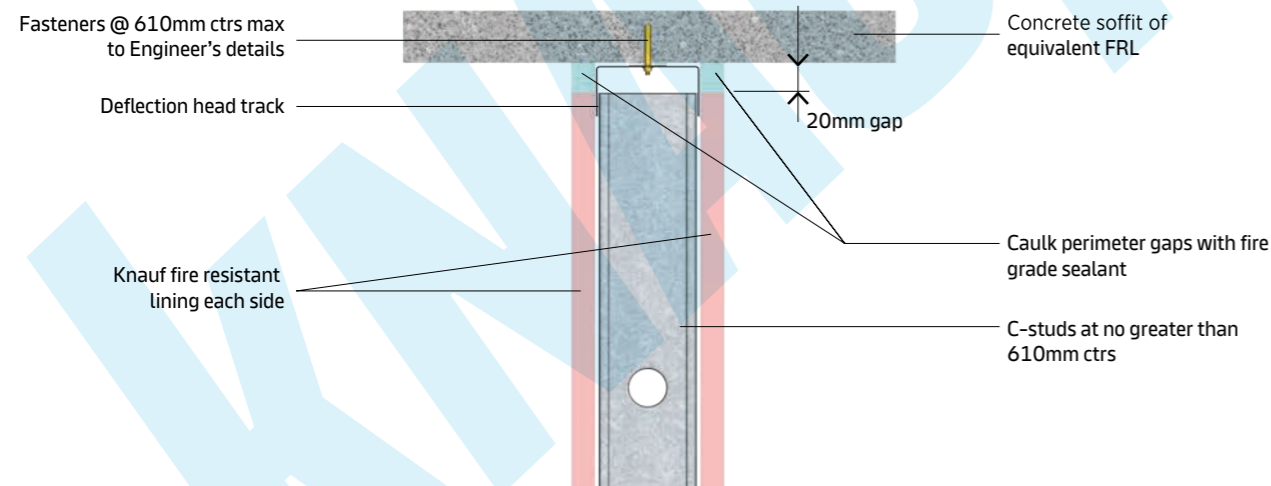


Figure H10: Deflection Head Detail

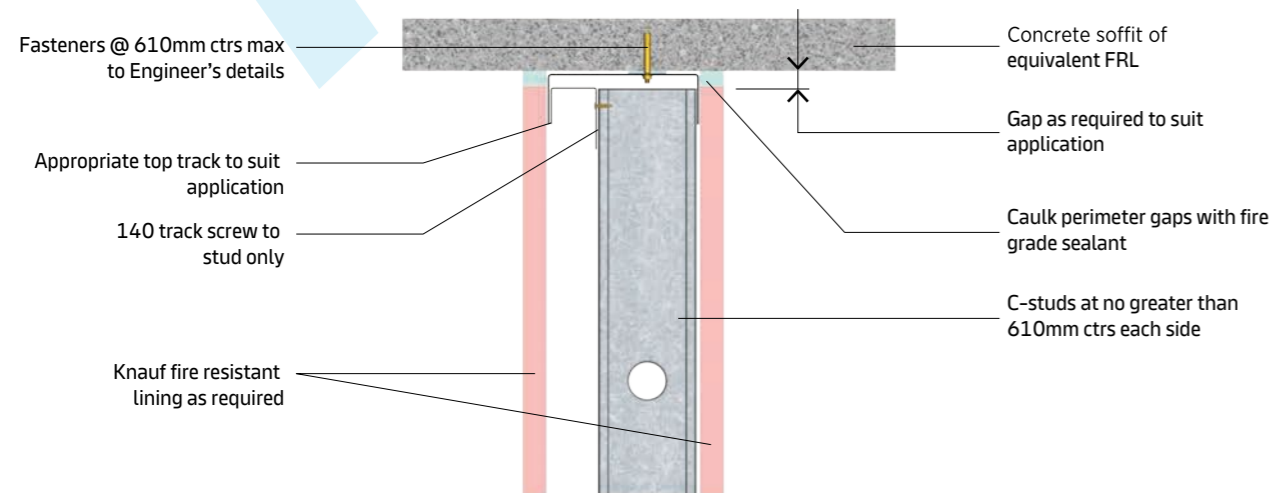


Figure H11: Staggered Stud Head Detail

# FIRE RATED STEEL STUD WALLS

## Head Details

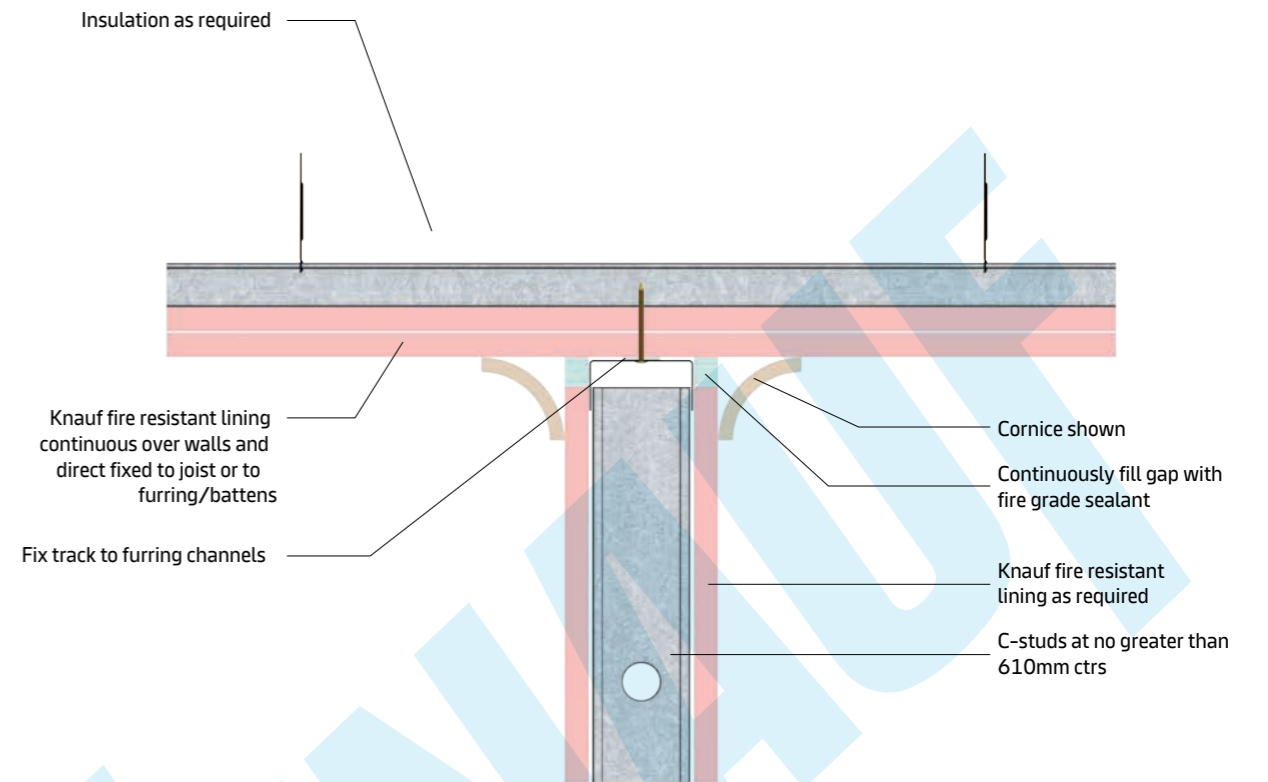


Figure H12: Fire Rated Wall to Fire Rated Ceiling Detail

# FIRE RATED STEEL STUD WALLS

## Control / Movement Joints

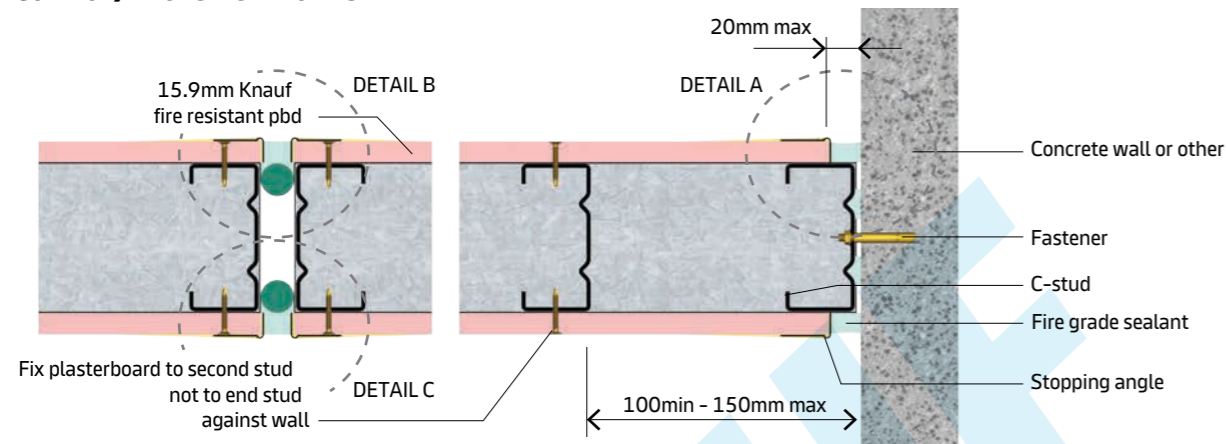


Figure H13: Control Joint Details FRL -/90/90 (also available in other FRLs)

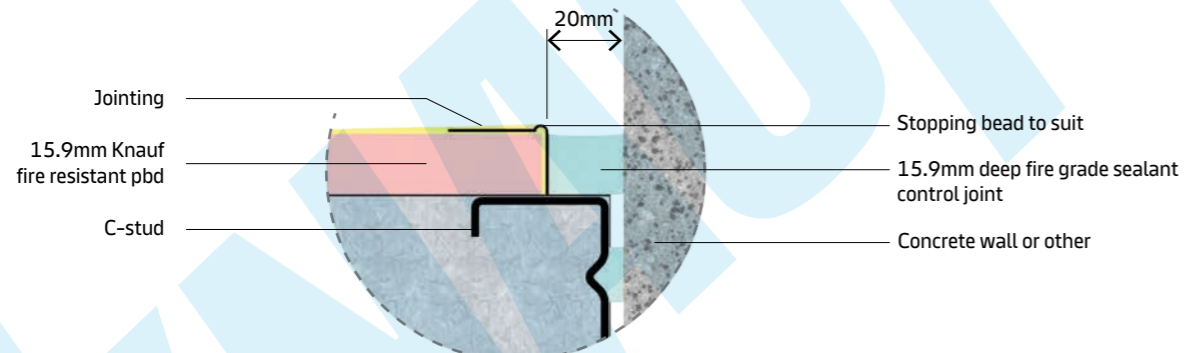


Figure H14: Detail A

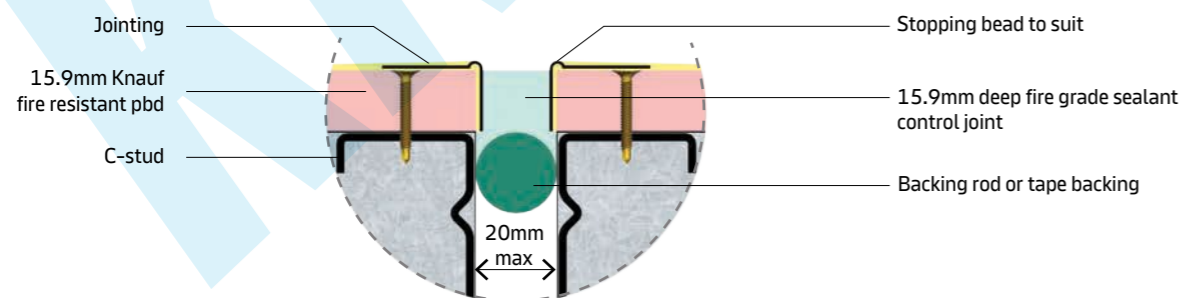


Figure H15: Detail B

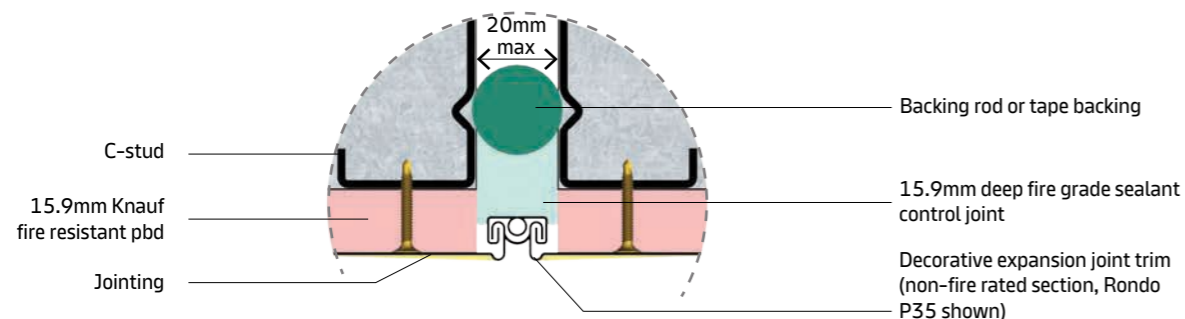


Figure H16: Detail C

# FIRE RATED STEEL STUD WALLS

## Control / Movement Joints

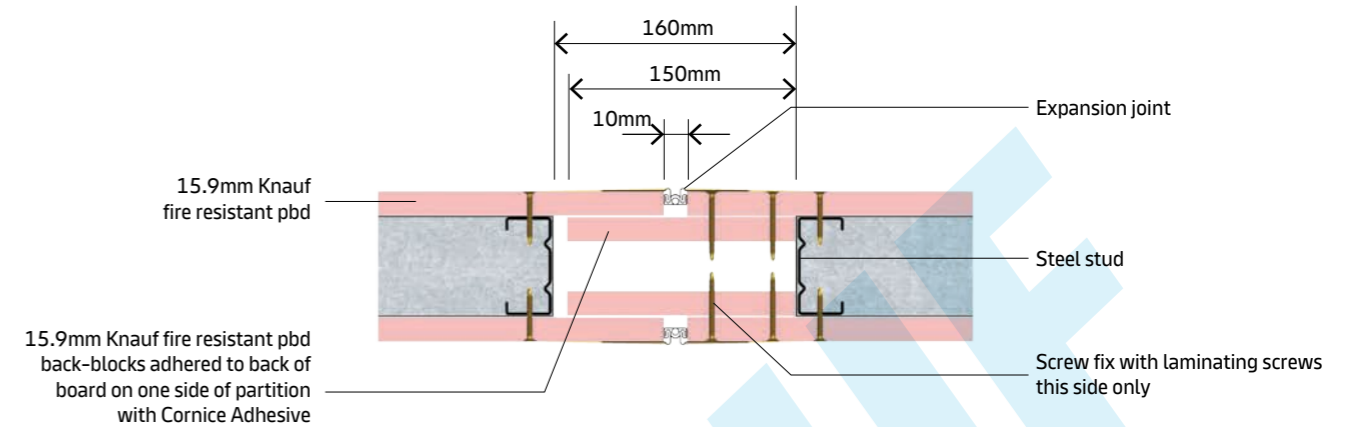


Figure H17: Movement Joint Detail FRL -/90/90

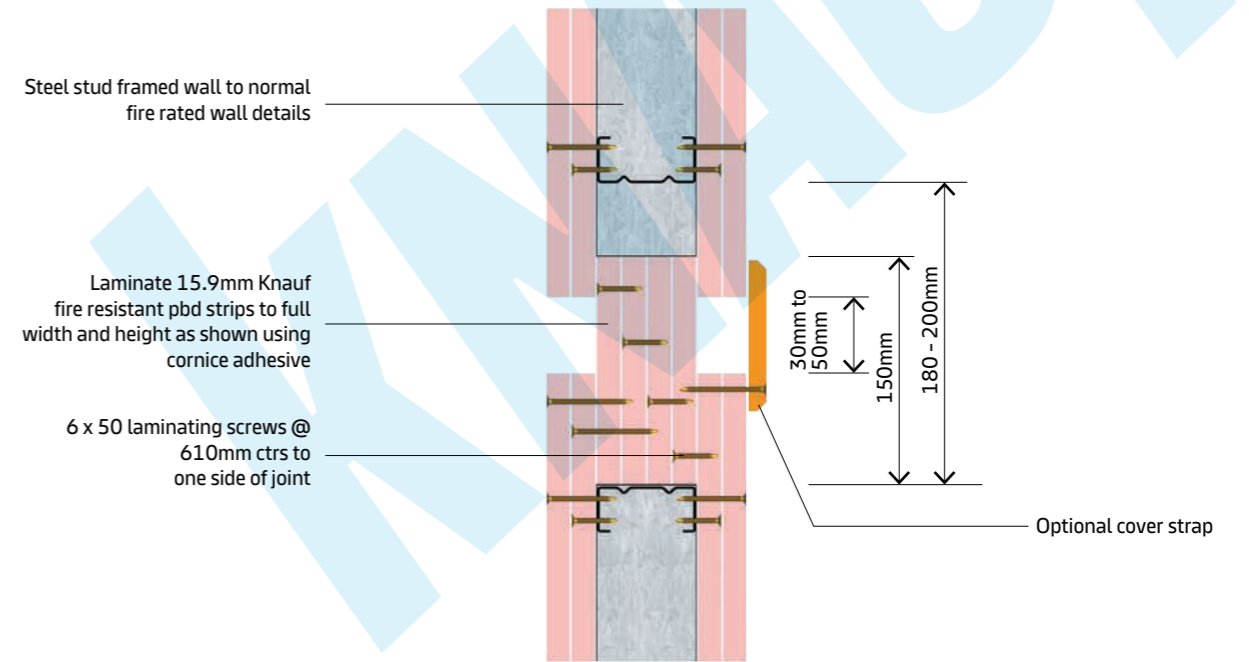


Figure H18: Movement Joint Detail up to FRL 120/120/120 (-/180/180)

**NOTES:**

- Maximum joint movement capacity +/-20mm horizontally in plane of wall.
- FRL of wall not to exceed 120/120/120 (-/180/180).
- Floor tracks to be cut over width of required control joint.

# FIRE RATED STEEL STUD WALLS

## Door Details

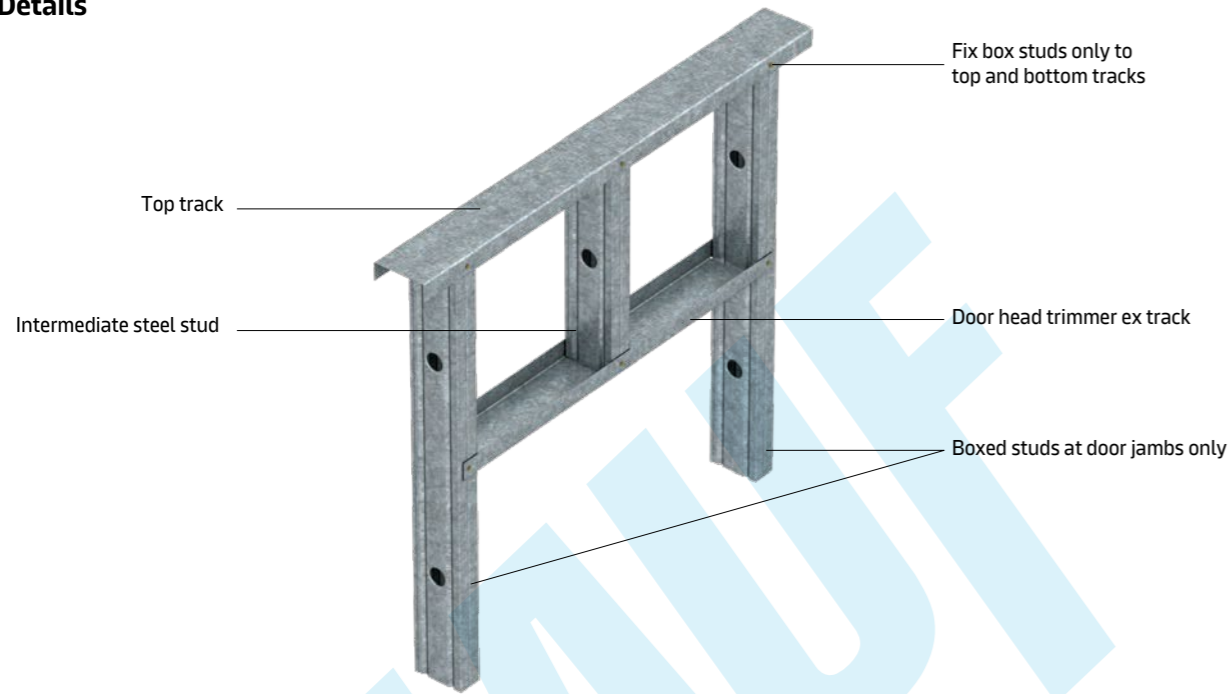


Figure H19: Door Head Trimmer Detail

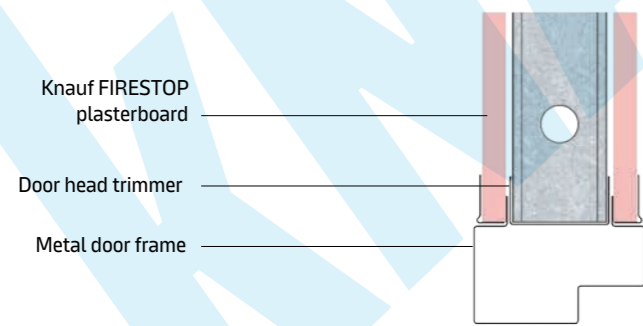


Figure H20: Door Head Detail

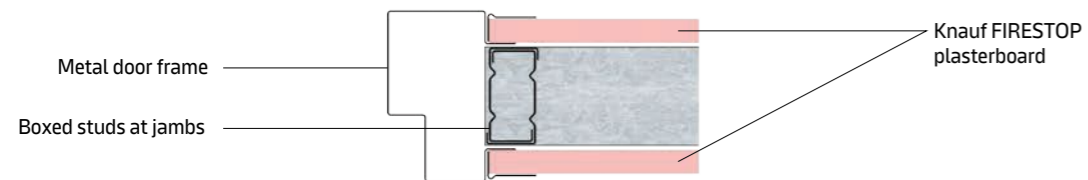


Figure H21: Door Jamb Detail

**NOTES:**

- Jamb studs may consist of double CS studs or boxed CS studs. This may be determined by structural requirements or the fixing details recommended by the door frame manufacturer.
- Above details are typical only. Refer to fire door manufacturer full details and installation specifications.

# FIRE RATED STEEL STUD WALLS

## Plumbing Penetrations

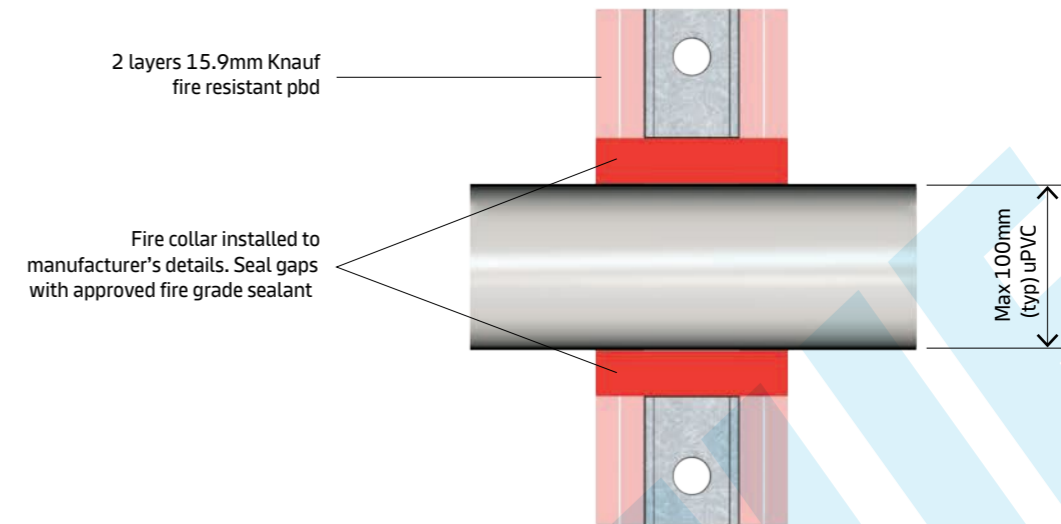


Figure H22: Penetration Detail - uPVC Pipe - Single Stud - Refer to Collar Manufacturer

# FIRE RATED STEEL STUD WALLS

## Plumbing Penetrations

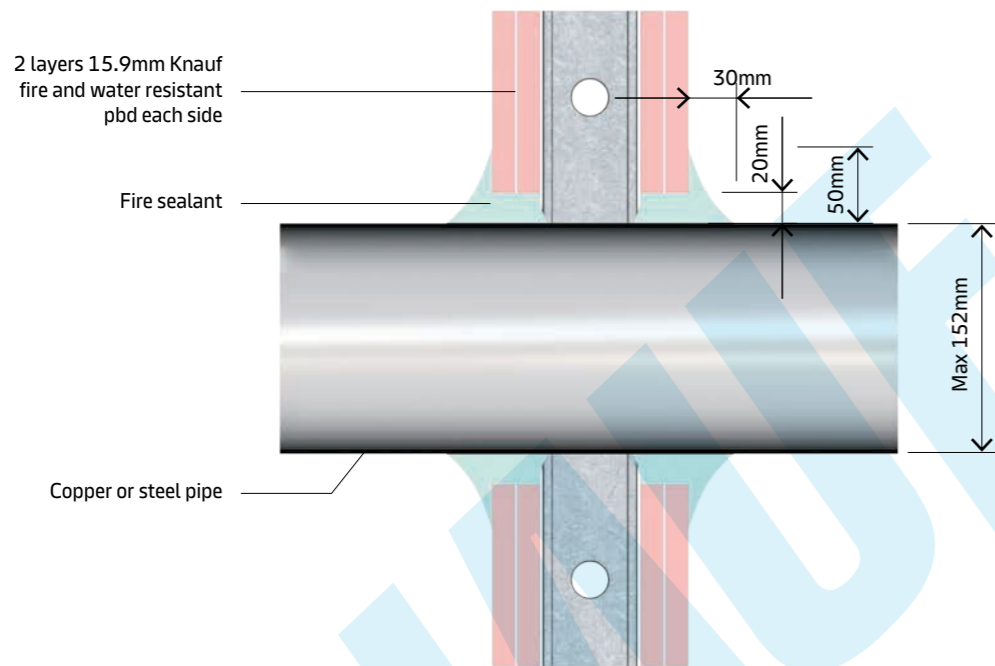


Figure H23: Penetration Detail - Copper/Steel Pipe - Single Stud -- /120/-

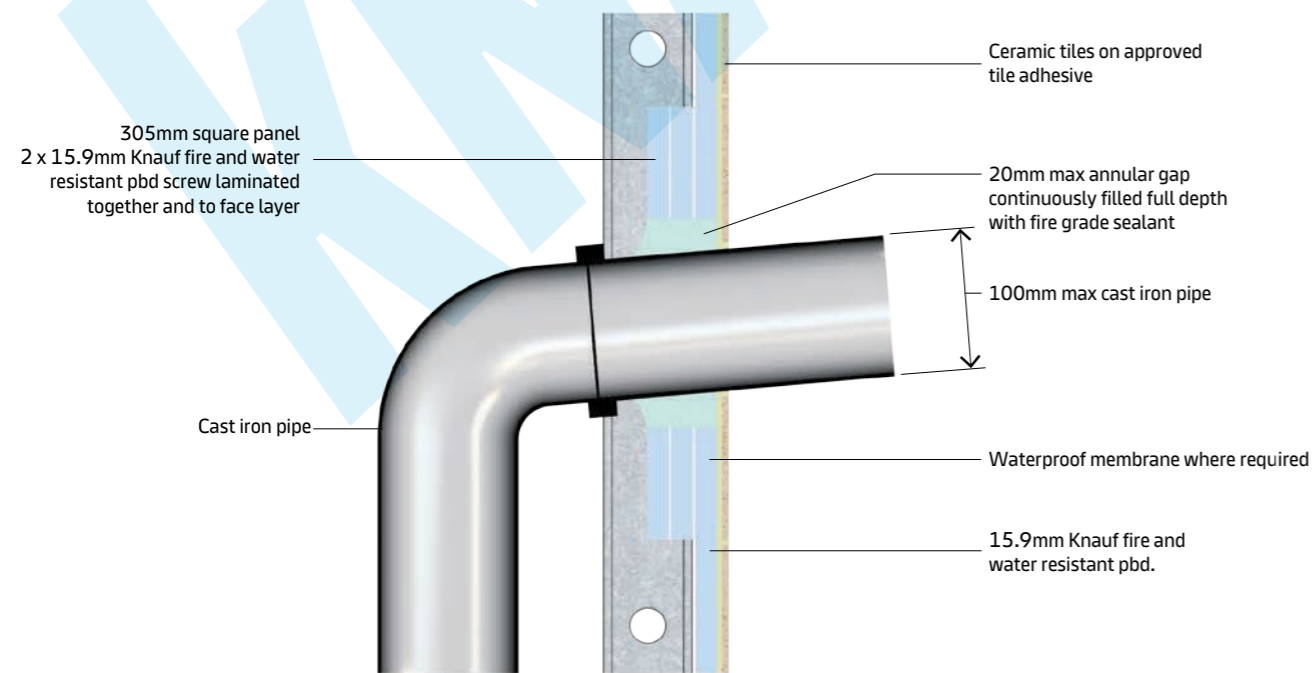


Figure H24: Penetration Detail - Cast Iron Pipe - Twin Stud - FRL -/60/-

# FIRE RATED STEEL STUD WALLS

## Plumbing Penetrations

305mm square piece of 15.9mm Knauf fire and water resistant pbd located centrally around penetration and screw fixed to face layer

Provide nogging to back of tap set and secure pipes

C-studs at no greater than 610mm ctrs

15.9mm Knauf fire resistant pbd

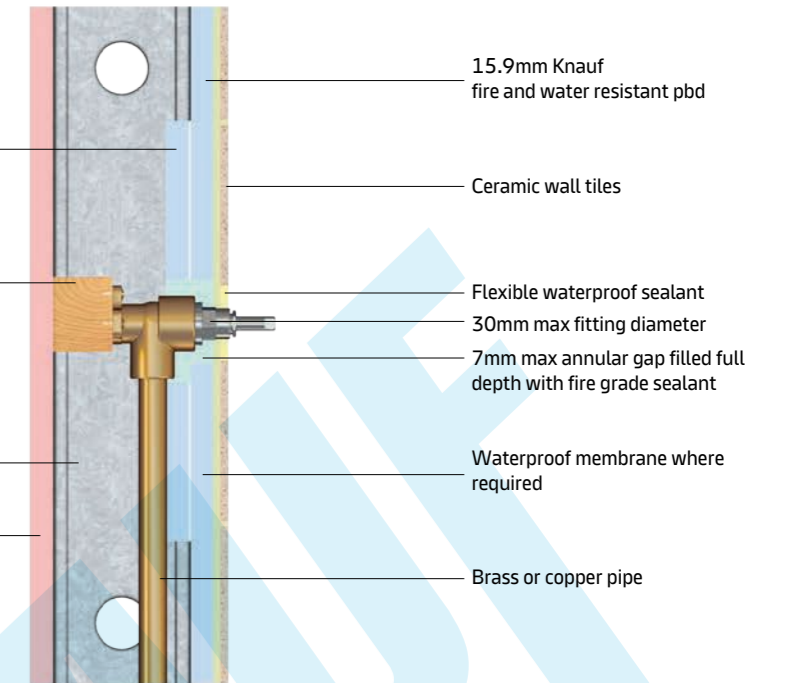


Figure H25: Typical Plumbing Penetration Detail - Section - FRL -/60/-

305mm square piece of 15.9mm Knauf fire and water resistant pbd located centrally around penetration and screw fixed to face layer

15.9mm Knauf fire resistant pbd

Waterproof membrane where required

Flexible waterproof sealant

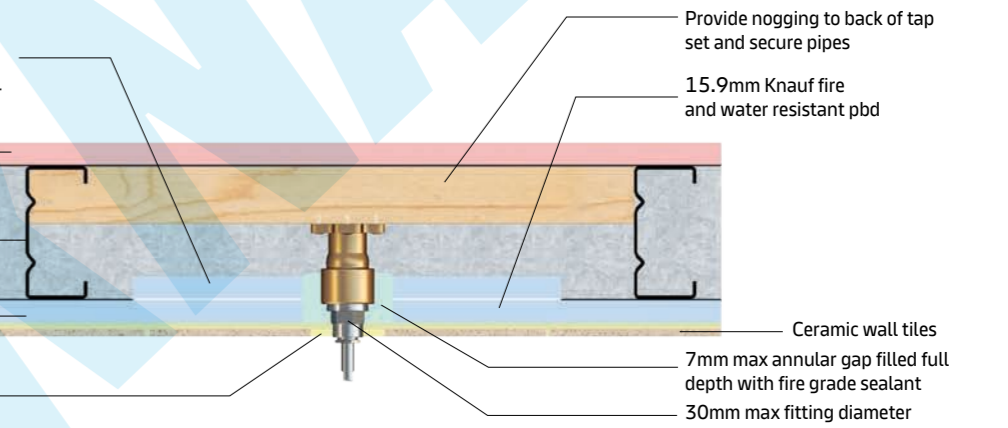


Figure H26: Typical Plumbing Penetration Detail - Plan - FRL -/60/-

**NOTES:**

The following instructions must be followed to achieve satisfactory results:

- Care should be taken to isolate copper pipes away from contact with steel framing to avoid problems with corrosion.
- Plasterboard linings are not to act as supports for piping.
- Piping is to be kept clear of face sheets and baffles.
- Ensure that baffles protect the areas immediately behind wall penetrations.
- Pipes are to penetrate one face only of the partition between any two wall studs.
- Total area of all openings between any two wall studs must be no greater than 5000mm<sup>2</sup>

# FIRE RATED STEEL STUD WALLS

## Electrical Penetrations

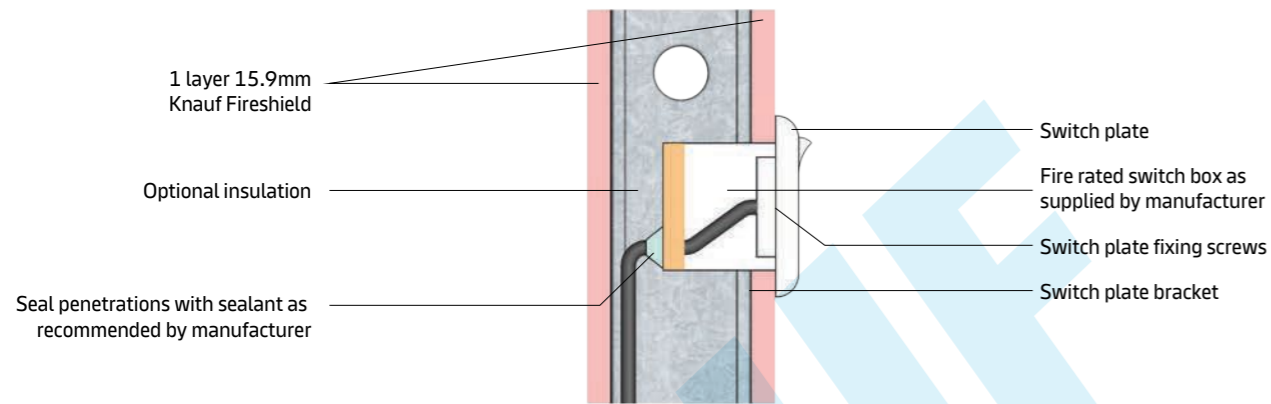


Figure H27: Fire Rated GPO Detail Only - Partition FRL -/90/90

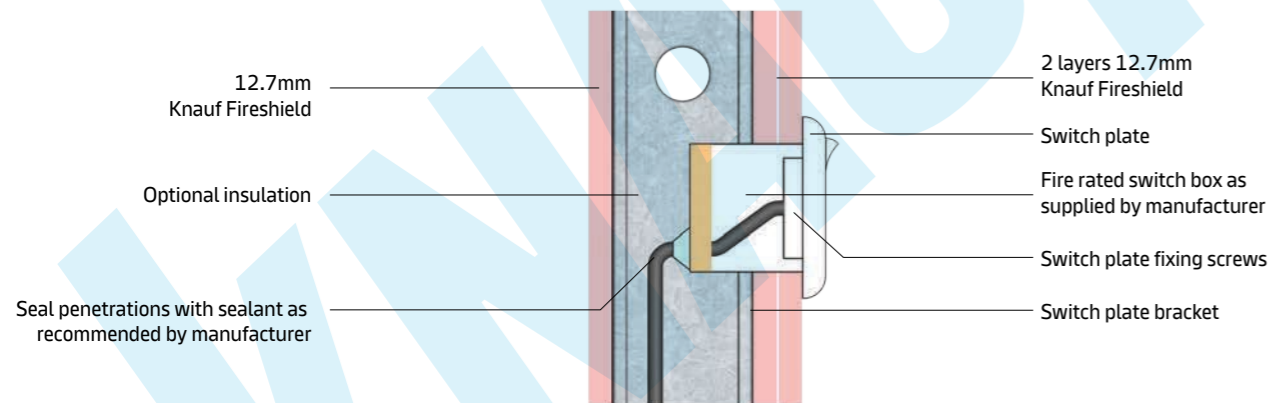


Figure H28: Fire Rated GPO Detail Only - Partition FRL -/90/90

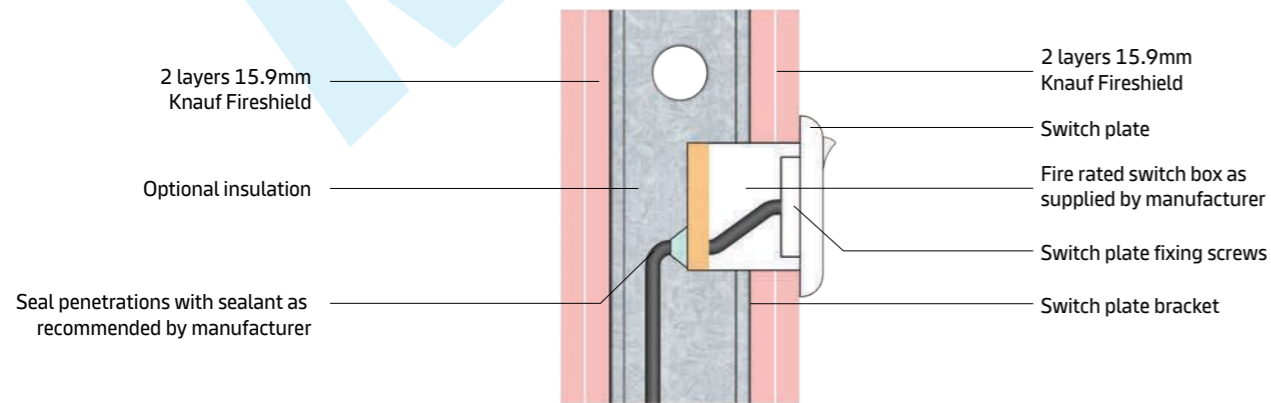


Figure H29: Fire Rated GPO Detail Only - Partition FRL -/180/180

# FIRE RATED STEEL STUD WALLS

## Electrical Penetrations

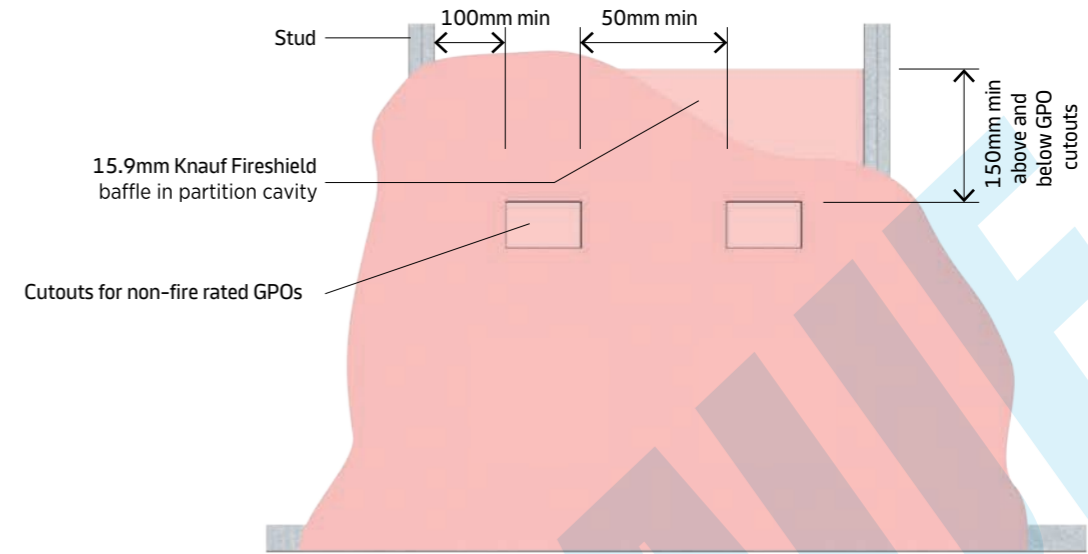


Figure H30: Typical Layout Elevation - Non Fire Rated GPOs in Fire Rated Partition

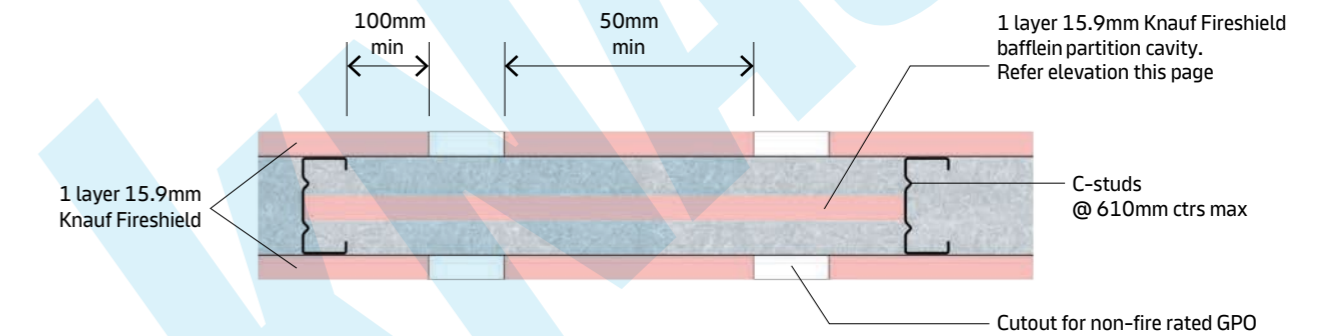


Figure H31: Typical Layout Plan - Non Fire Rated GPOs in FRL-/90/90 Partition

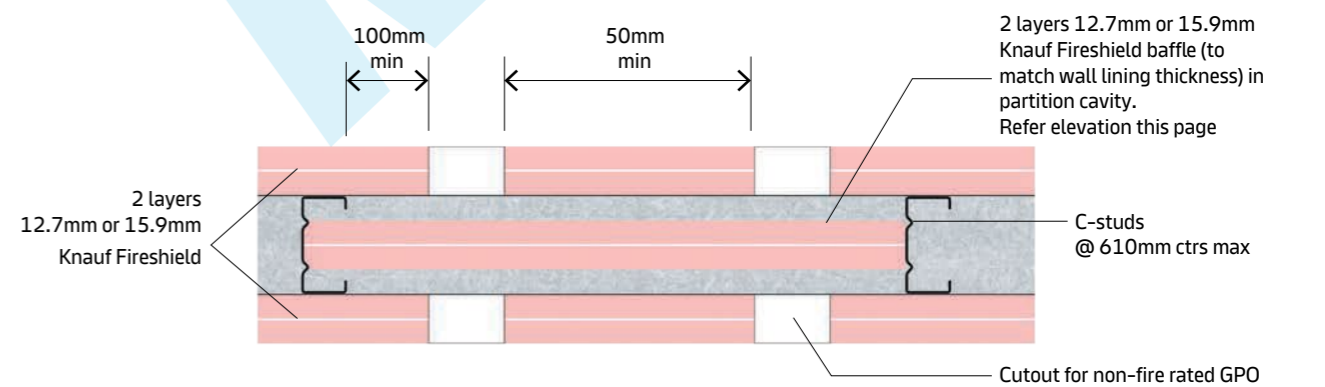


Figure H32: Typical Layout Plan - Non Fire Rated GPOs in -/120/120 and FRL -/180/180 Partition

**NOTES:**  
Only 2 non fire rated GPOs on any wall face per stud panel.

# FIRE RATED STEEL STUD WALLS

## Electrical Penetrations

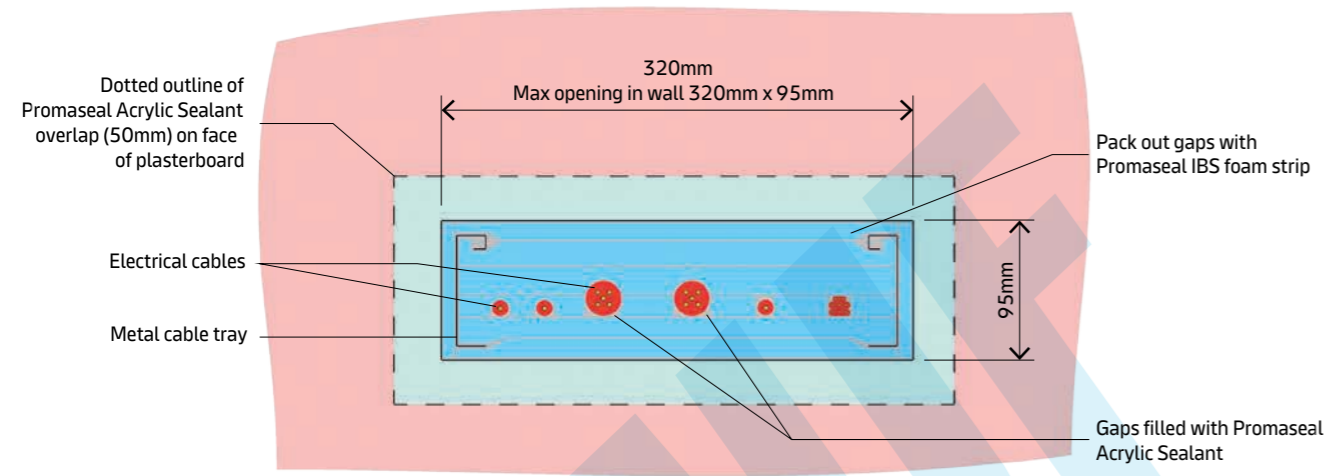


Figure H33: Penetration Detail - Cable Tray - Section Through Tray (Refer to Promat for full details and report)

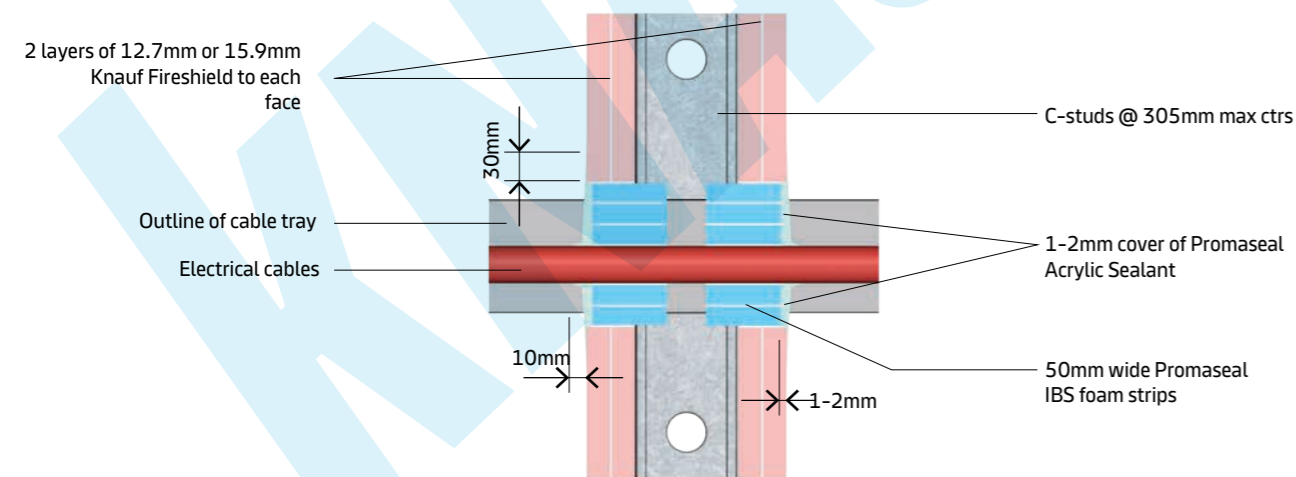


Figure H34: Penetration Detail - Cable Tray - Section Through Wall (Refer to Promat for full details and report)

**NOTES:**  
For larger openings refer to penetration manufacturer for details and certification.

# FIRE RATED STEEL STUD WALLS

## HVAC Penetrations

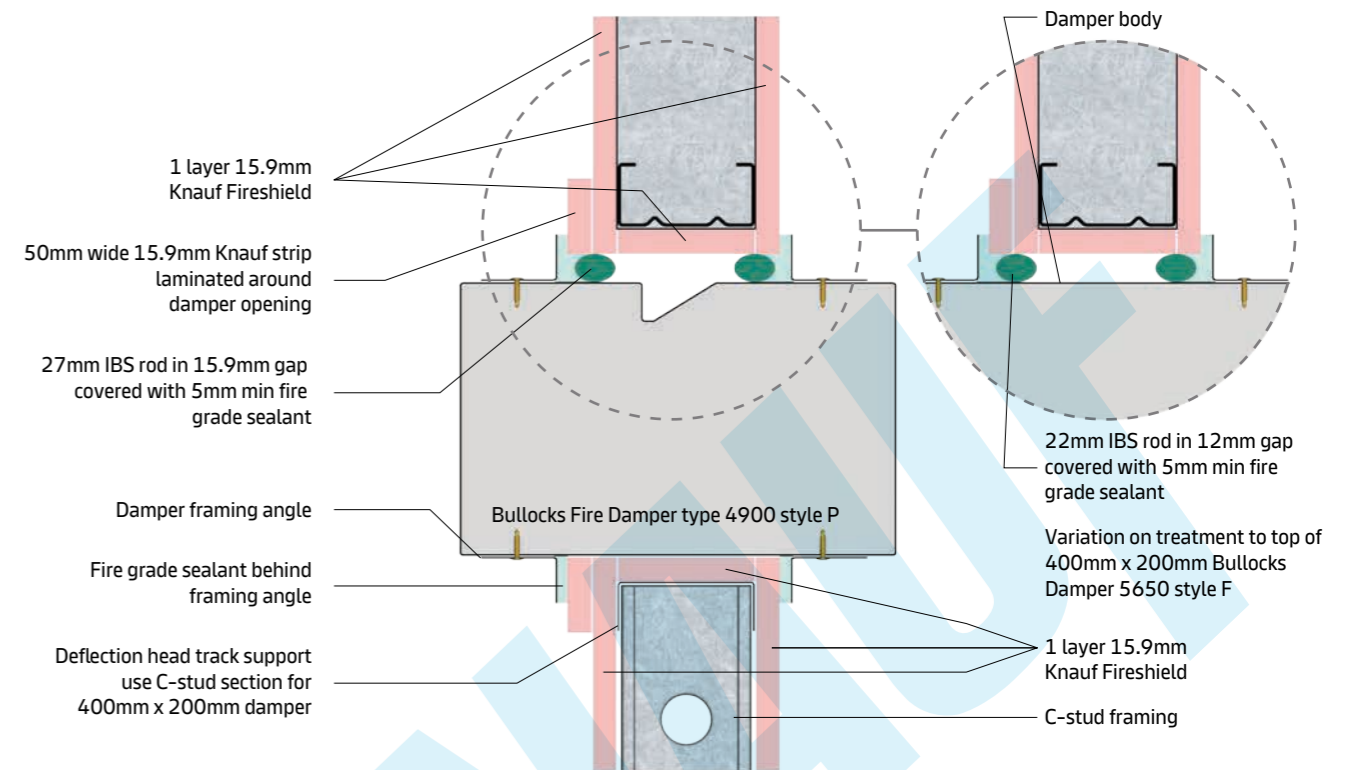


Figure H35: Typical Fire Damper Detail - FRL -/90/90 Steel Stud Wall

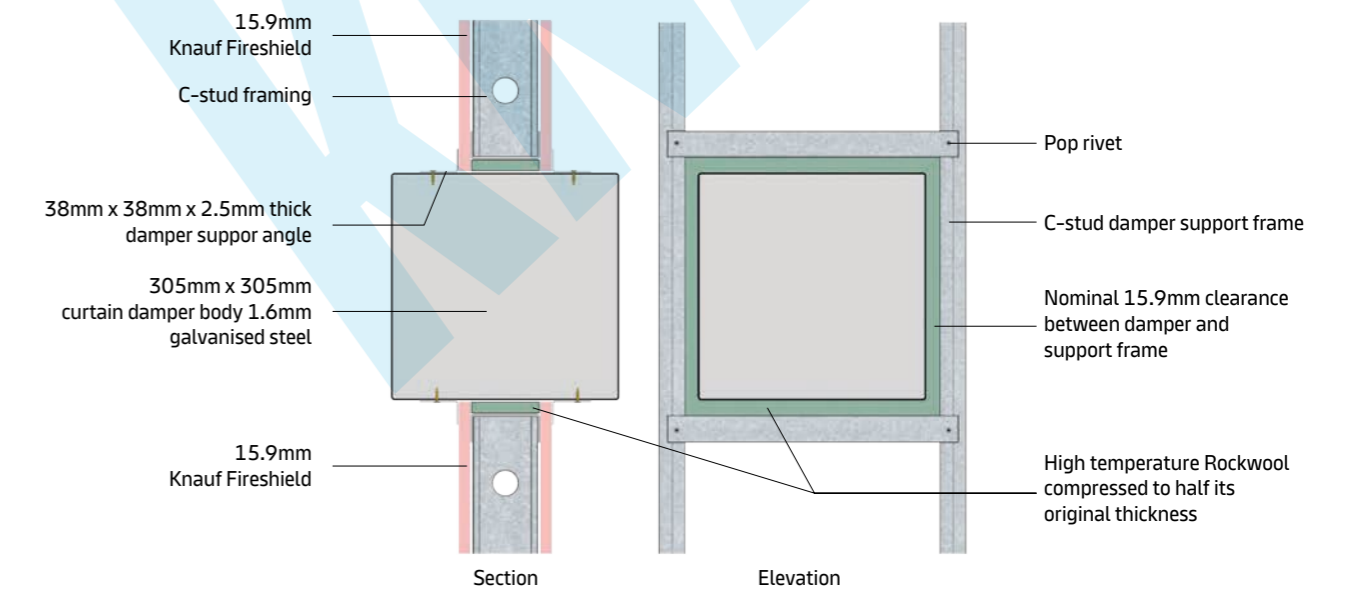


Figure H36: Typical Fire Damper Detail - FRL -/90/90 Steel Stud Wall

**NOTES:**  
 ■ Damper penetration details on pages J19 and J20 are specific to the type/model of dampers shown. For other damper types/models, refer to the damper manufacturer for penetration details to ensure the fire rating of the wall is maintained.  
 ■ Consult with Mechanical and Structural Engineers for details of methods of supporting damper at wall, especially if damper opening exceeds 600mm x 900mm.  
 ■ Refer to fire damper manufacturer for alternative or additional fixing details.

# FIRE RATED STEEL STUD WALLS

## HVAC Penetrations

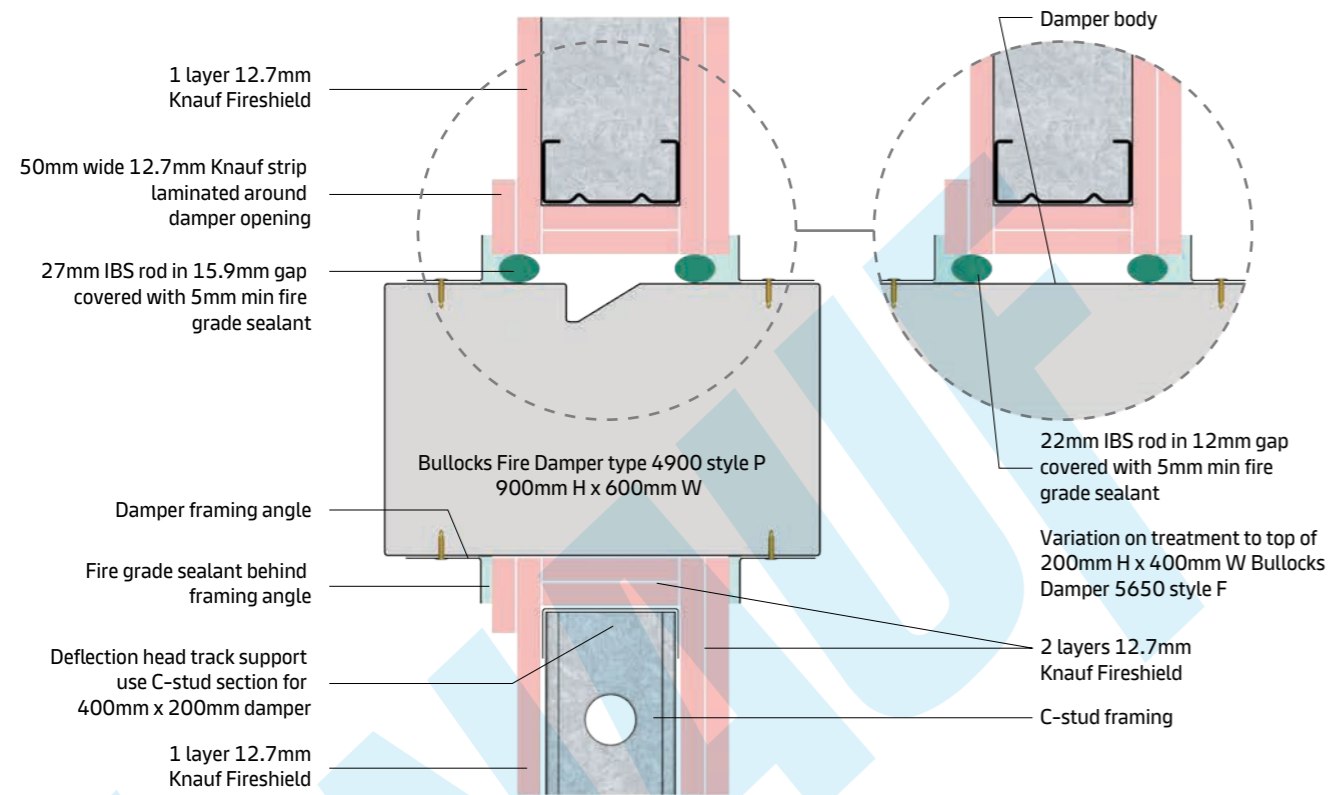


Figure H37: Typical Fire Damper Detail - FRL -/90/90 Steel Stud Wall

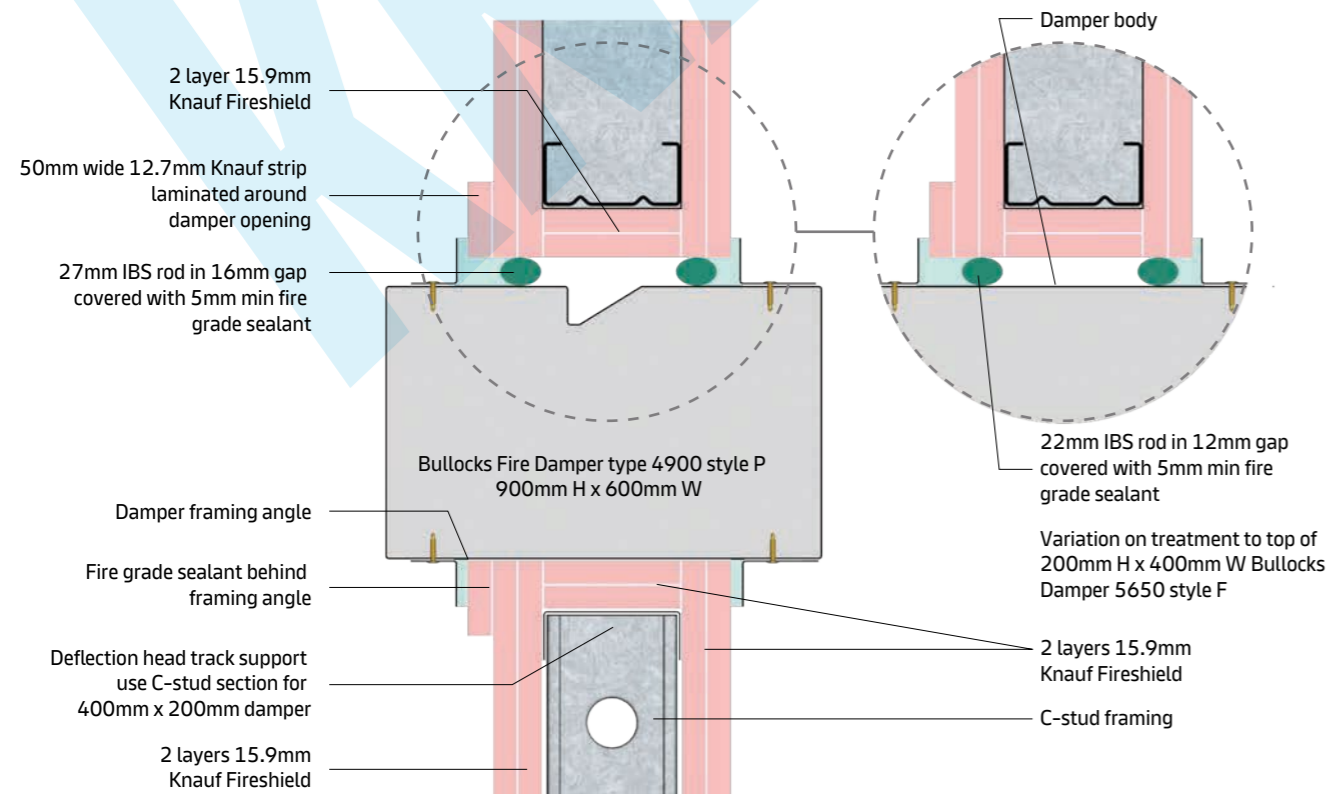


Figure H38: Typical Fire Damper Detail - FRL -/180/180 Steel Stud Wall

# FIRE RATED STEEL STUD WALLS

## HVAC Penetrations

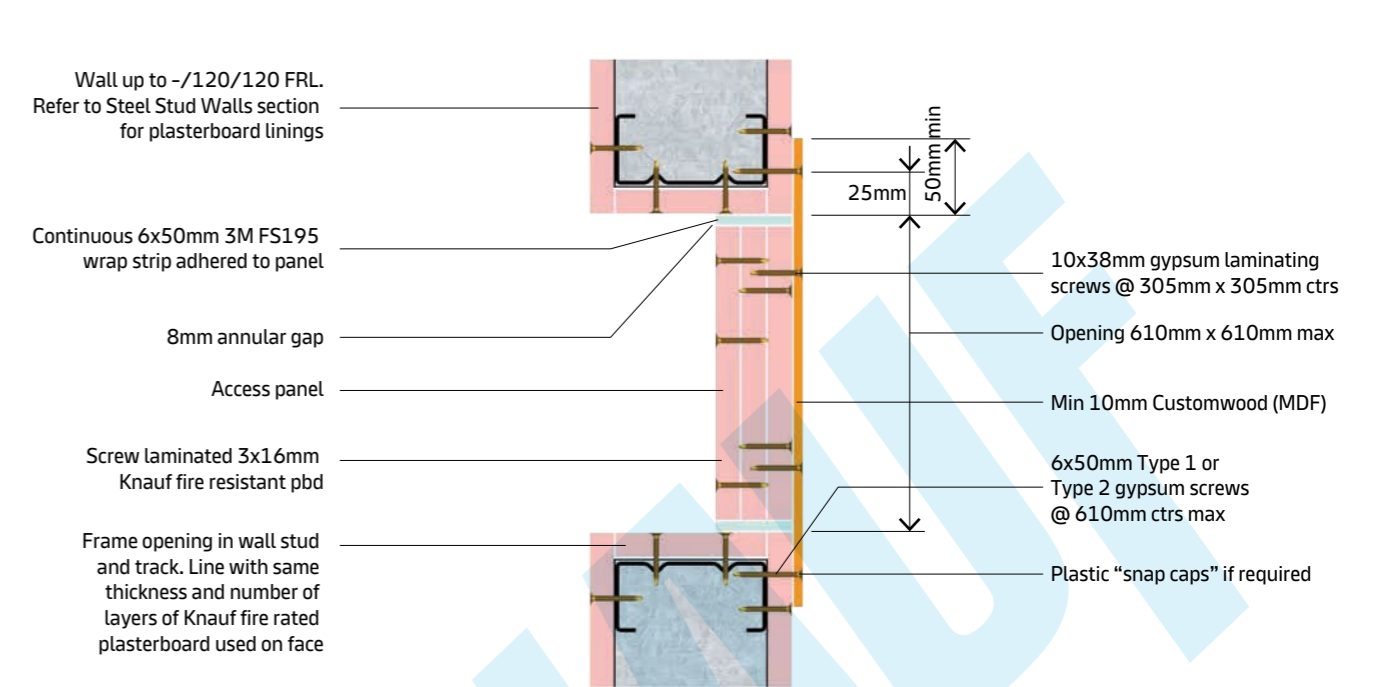


Figure H39: Access Panel Detail

# NON-FIRE RATED STEEL STUD WALLS

## Plumbing Penetrations

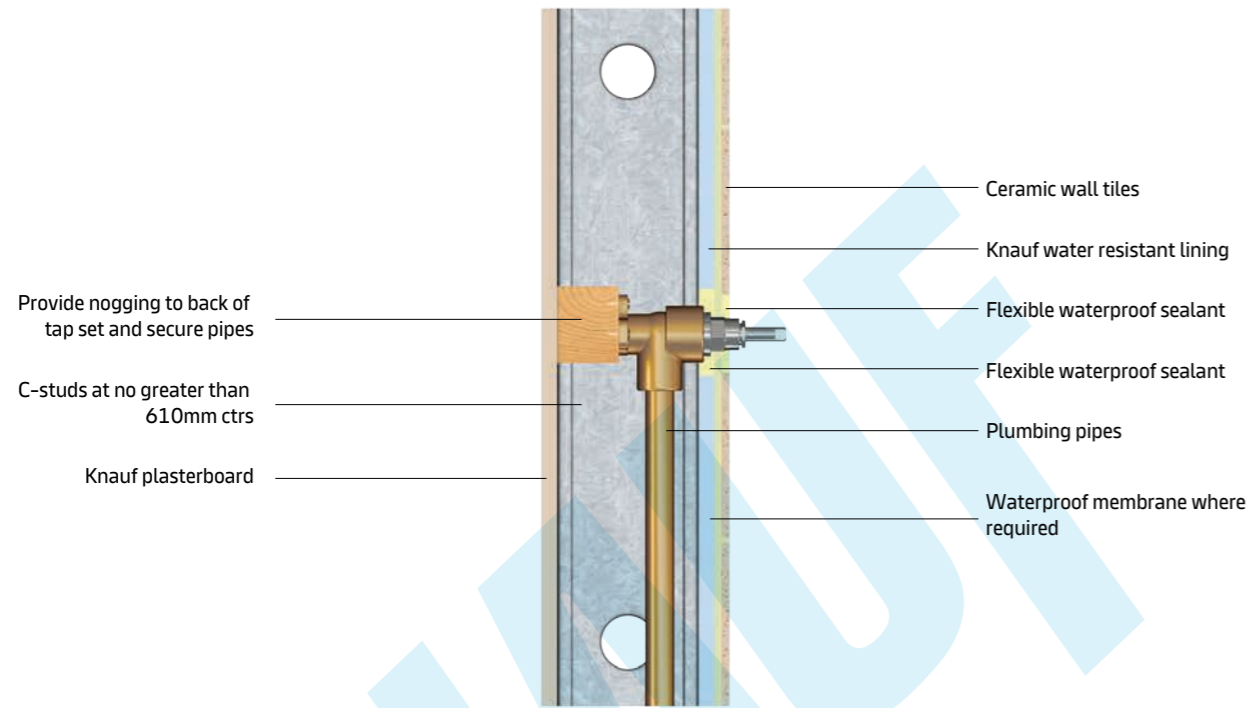


Figure H40: Typical Plumbing Penetration Detail - Section

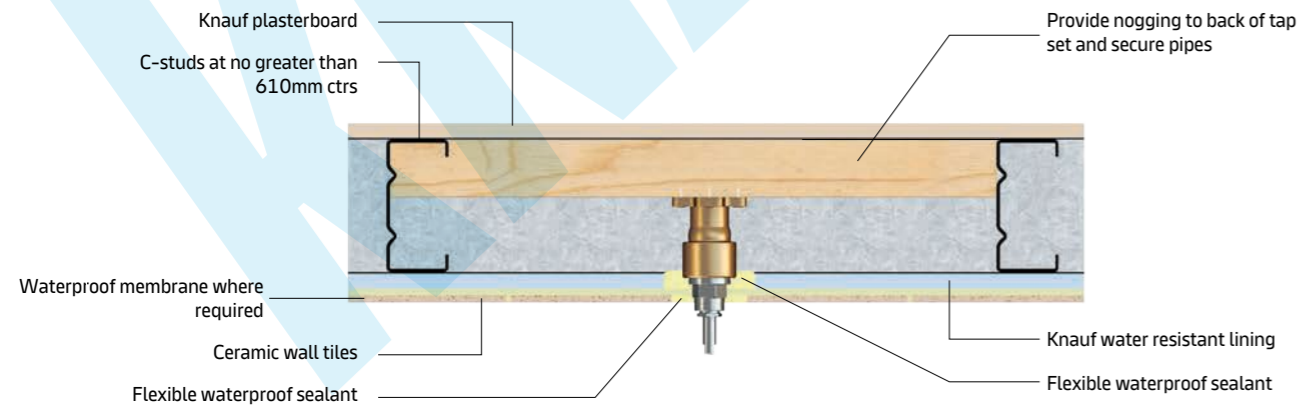


Figure H41: Typical Plumbing Penetration Detail - Plan

**NOTES:**

- The following instructions must be followed to achieve satisfactory results:
- Care should be taken to isolate copper pipes away from contact with steel framing to avoid problems with corrosion.
- Linings are not to act as supports for piping.
- Piping is to be kept clear of face sheets.

# NON-FIRE RATED STEEL STUD WALLS

## Back-Blocking

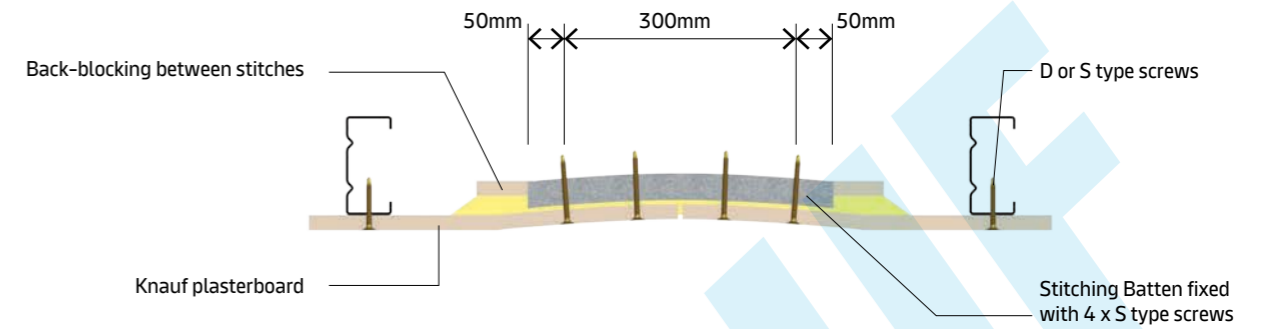


Figure H42: Back-Blocking Using Stitching Batten Detail

## Door Details

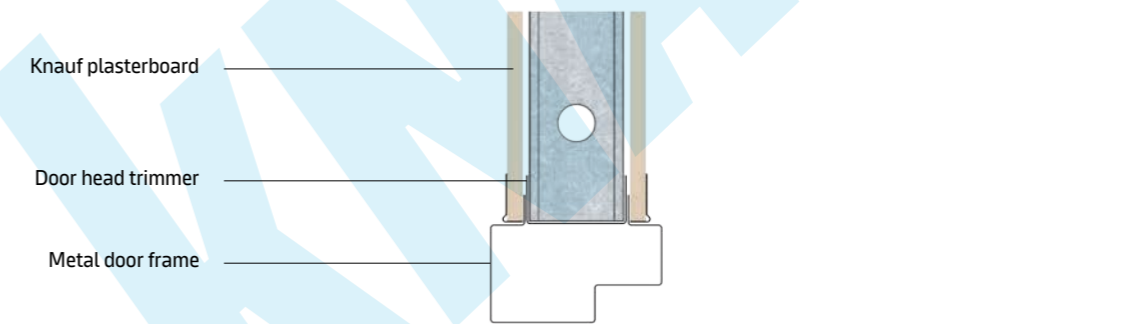


Figure H43: Door Head Detail - Non-Fire Rated

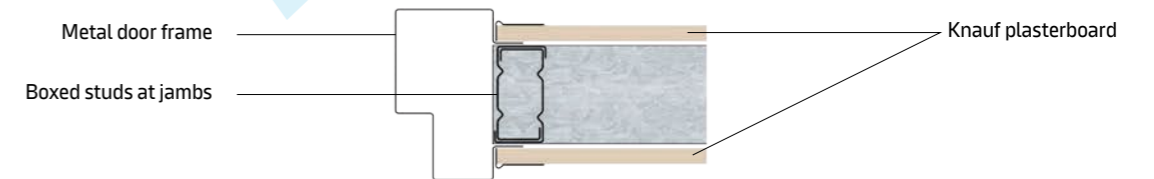


Figure H44: Door Jamb Detail - Non-Fire Rated

**NOTES:**

- Details shown are generic only.
- Check with specific door frame manufacturer for alternative detailing.

H Junctions & Penetrations

H Junctions & Penetrations

# NON-FIRE RATED STEEL STUD WALLS

## Control Joints

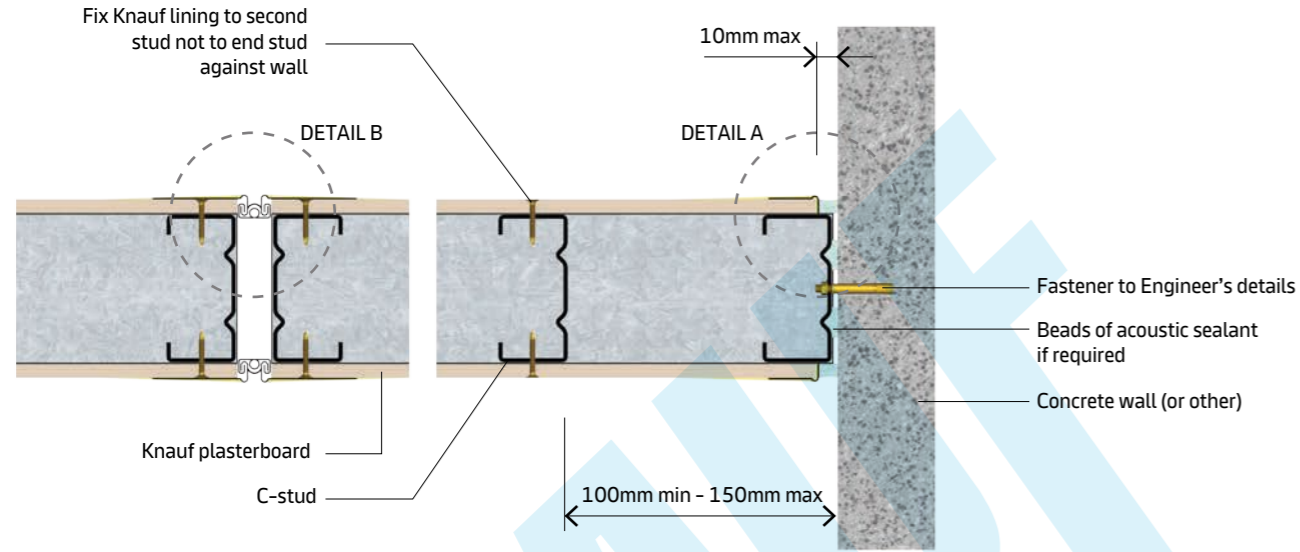


Figure H45: Control Joint Plan Detail

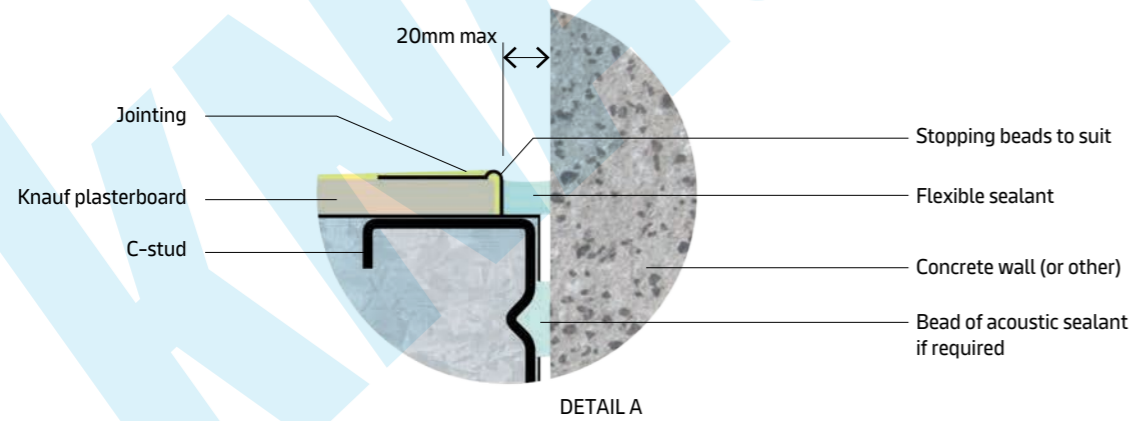


Figure H46: Control Joint - Detail A

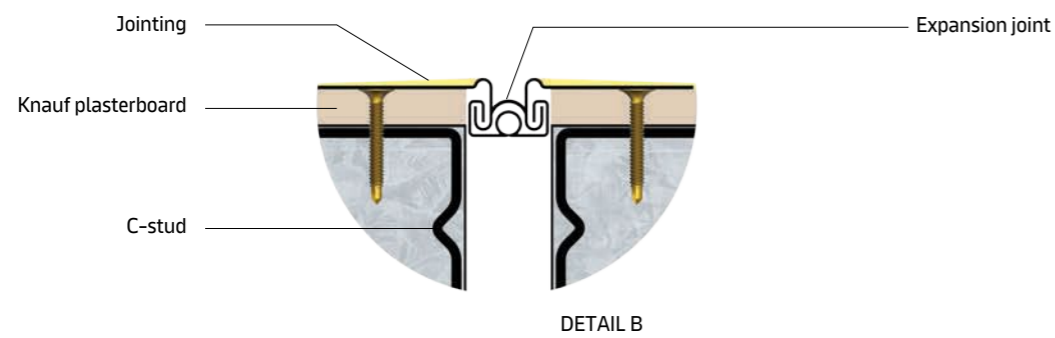


Figure H47: Control Joint - Detail B

# NON-FIRE RATED STEEL STUD WALLS

## Head Details

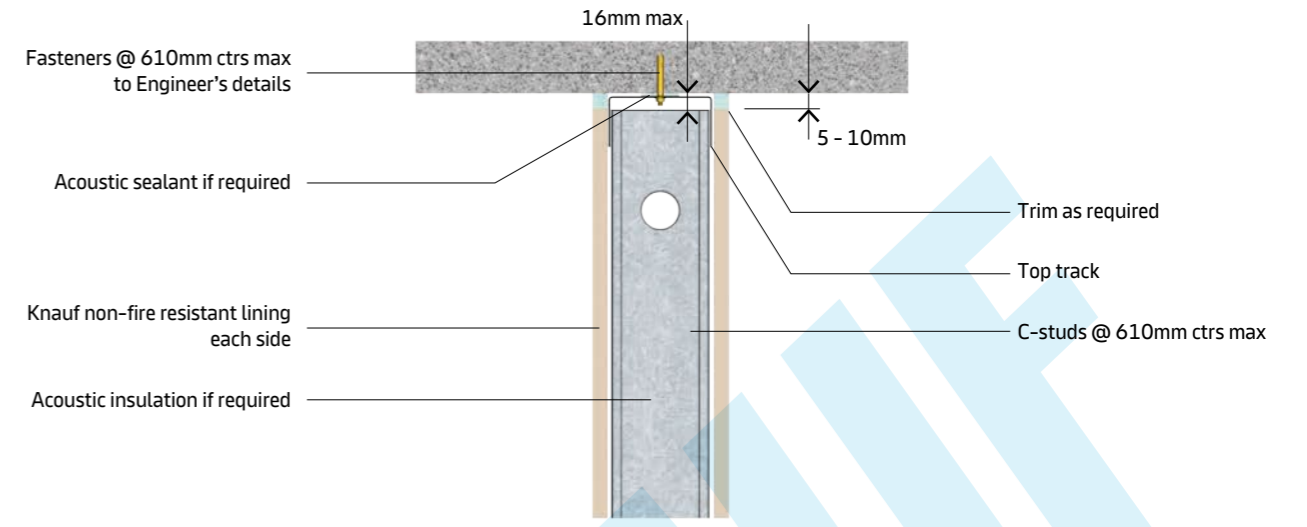


Figure H48: Standard Non-Fire Rated Wall Head Detail

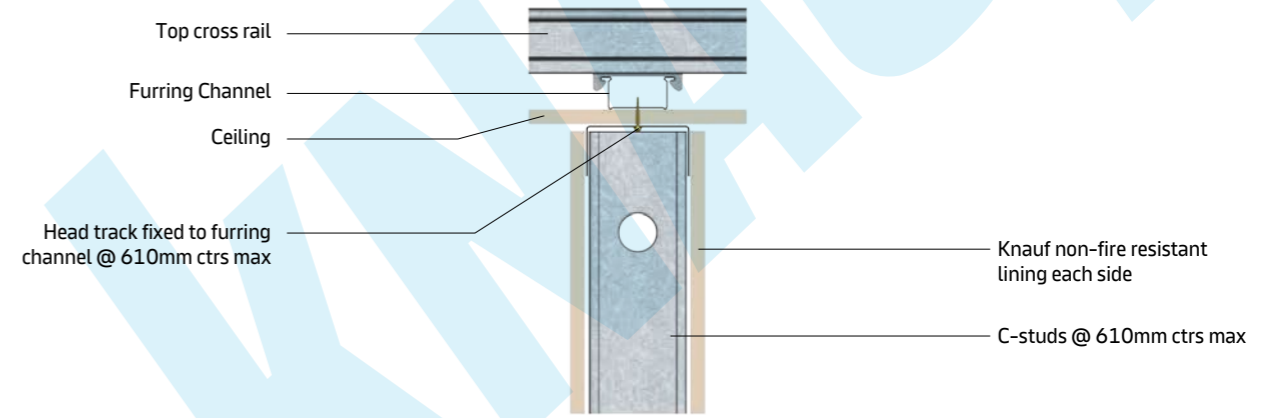


Figure H49: Wall Head Fixing to Suspended Ceiling Detail - Parallel to Furring

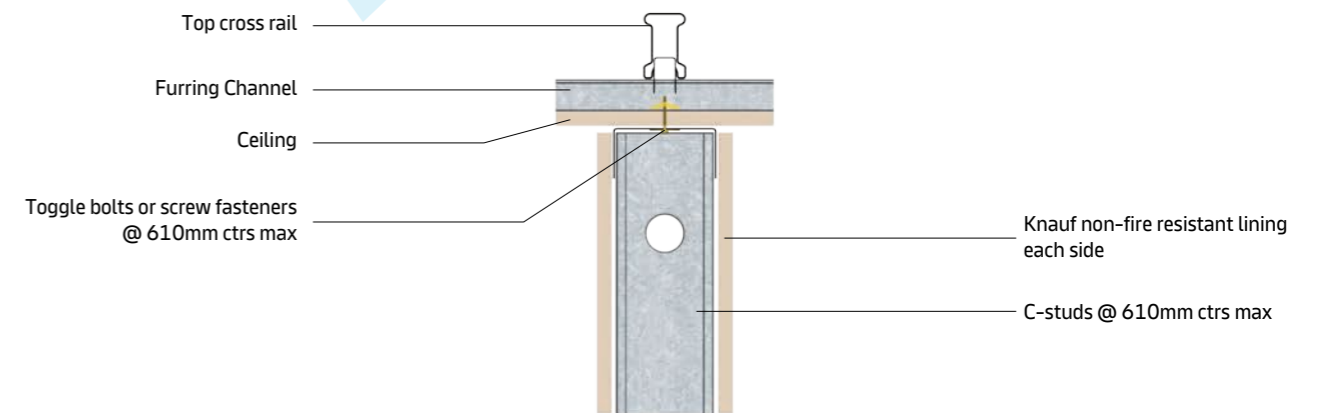


Figure H50: Wall Head Fixing to Suspended Ceiling Detail - Perpendicular to Furring

# NON-FIRE RATED STEEL STUD WALLS

## Base Details

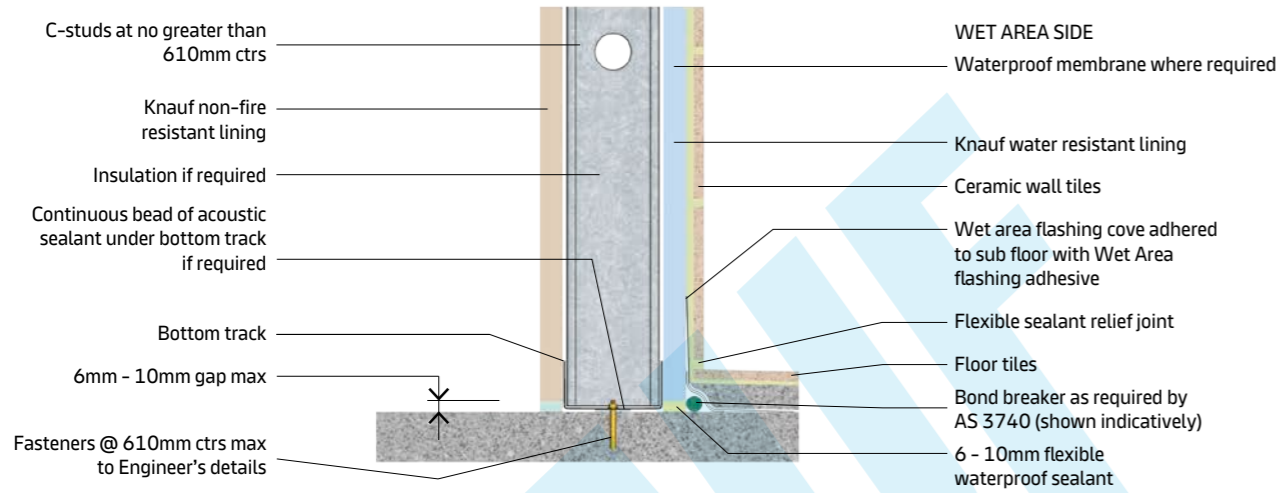


Figure H51: Standard Non-Fire Rated Wall Base Detail





## Section I

Finishing Plasterboard

01/2025

### **I/ FINISHING PLASTERBOARD**

- I 2 Knauf Levels of Finishing
- I 4 Knauf Taping & Jointing System

## KNAUF LEVELS OF FINISHING

### Knauf Taping & Jointing System

Knauf Taping and Jointing System is used to create continuous seamless plaster board wall linings, partitions and ceilings using purpose-designed compounds and tapes for finishing all plaster board joints.

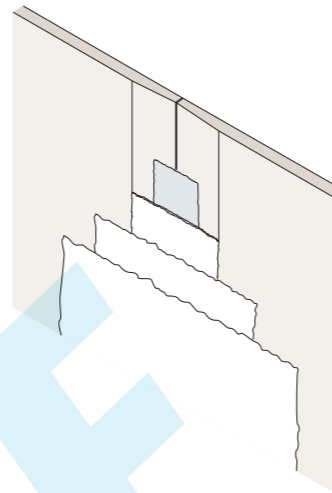
Using Knauf plasterboard systems together with Knauf taping & Jointing allows for quicker installation, high quality of finish to be achieved and markedly less drying time when compared with traditional masonry finishing methods.

#### NOTES:

In some parts of Vietnam it is common practice to use square edge plasterboards, mesh tapes and limestone/cement based compounds for jointing. This method for jointing is not recommended and is likely to result in severe joint cracking with in 12 months of the job being completed.

### Knauf Design Profiles

Knauf Design Profiles are a range of curved, rounded and shadow-line beads that allow for aesthetic looks to be easily incorporated in Knauf wall linings, partitions and ceilings. Other Knauf Design Profiles like the Knauf Movement Control bead, allow Knauf systems to move with the building design movement.



## KNAUF LEVELS OF FINISHING

### Knauf Levels Of Finishing

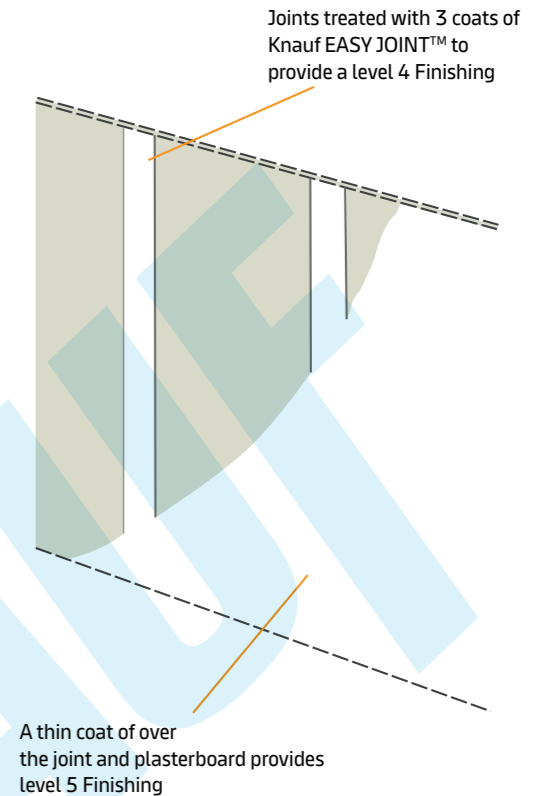
This standard applies a system called 'Levels Of Finish' to help determine the quality of finish required.

The level of finish is determined at the design stage. This is essential since each level of finishing requires a tighter tolerance control for frame alignment and plasterboard fixing and finishing. The desired level of finish is achievable only when these requirements are met throughout the stages of construction.

The level of finish required also affects the method of jointing, the number of coats of jointing compound applied, the fitting and finishing of corner tapes and beads and if a final skim compound is required over the entire plasterboard and jointed surface.

The level 4 Finish is the quality of finish generally applied in most construction, unless a higher or lower level of finish is specified.

### Levels Of Finishing



### The 5 Levels Of Finishing

#### Level 1

Used in concealed applications, example area is plenum areas above ceilings. Not open to public view.

#### Level 2

Suitable where surface appearance is not of primary concern like warehouse, storage or other similar areas.

#### Level 3

Suitable for surfaces intended to have heavy or medium textured coatings through sprayed or hand-held application. Also suitable where heavy wall coverings like wall paper is the desired final decoration.

#### Level 4

The accepted level of finish for most construction. Used where critical lighting shines on light textured coatings, medium or light wall coverings like wall paper. Also used where smooth textured finishes like satin/flat/low sheen paints are illuminated by non-critical lighting.

#### Level 5

Used where gloss or semi-gloss paints are specified. Also used where critical lighting affects smooth satin/flat or low-sheen paints. Joints and plasterboard will require a skim coating to remove differential surface textures and porosity.

# KNAUF TAPING & JOINTING SYSTEM

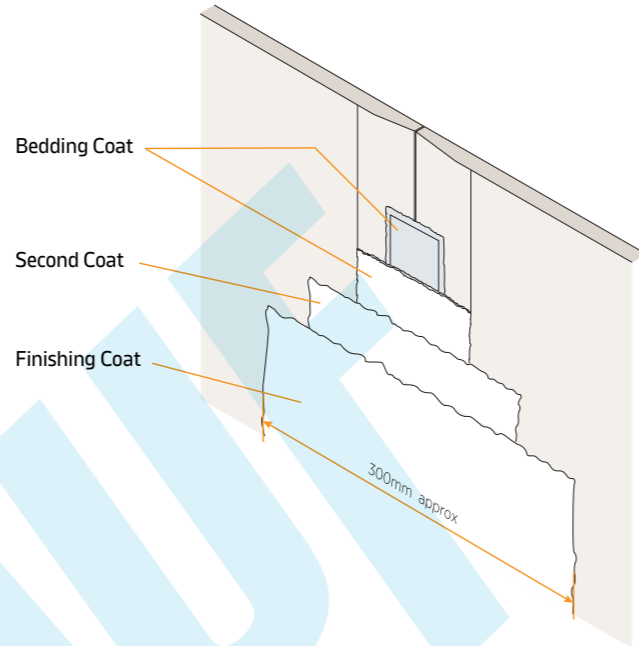
## Knauf Taping & Jointing System

Knauf Taping and Jointing System is used to create continuous seamless plasterboard wall linings, partitions and ceilings using purpose-designed compounds and tapes for finishing all plasterboard joints.

- Tapered Edge Joints
- Square Edge Joints
- Internal and External corner joints
- Screw heads
- Knauf Designer Profiles

Using Knauf plasterboard system together with Knauf Taping & Jointing allows for quicker installation, high quality finish to be achieved and markedly less drying time when compared with traditional masonry finishing methods.

## Knauf Taping & Jointing - 3 coat process



## Components

NAME	IMAGE	DESCRIPTION	JOINTING USAGE
Knauf EASY JOINT 90		Purpose-designed gypsum based setting compound for treating all plasterboard joints.  Set time: 90 minutes Working time: 90 minutes	Used for bedding coat, second coat and finishing coat  Note: Knauf EASY JOINT™ should not be applied over Knauf EASY FINISH™
Knauf Paper Tape		White perforated cross-fibre paper tape with centre crease line.	Use with Knauf EASY JOINT 90 to reinforce taped edge, square edge and internal corner joints.
Knauf Corner Tape		White perforated cross-fibre paper tape with centre crease line and reinforced with rust-resistant steel strips for protection of external corner joints.	Use with Knauf EASY JOINT 90 to reinforce external corner joints.

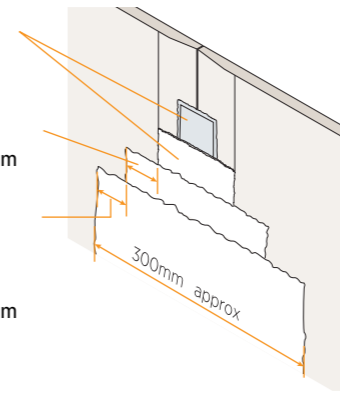
# KNAUF TAPING & JOINTING SYSTEM

## Tapered Edge Joints

Bedding Coat (150mm) Knauf Paper Tape bedded into Knauf EASY JOINT™

Second coat (200mm) of Knauf EASY JOINT™ feathered out 50 to 60mm beyond bedding coat

Finishing coat (300mm) of Knauf EASY JOINT™ or Knauf EASY FINISH™ feathered out 50 to 60mm beyond second coat

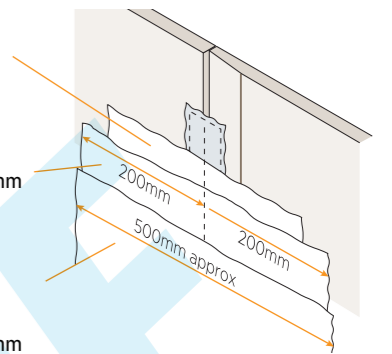


## Square Edge Joints

Bedding Coat (300mm) Knauf Paper Tape bedded into USG Boral EASY JOINT™

Second coat (400mm) of Knauf EASY JOINT™ feathered out 50 to 60mm beyond bedding coat

Finishing coat (500mm) of Knauf EASY JOINT™ or Knauf EASY FINISH™ feathered out 50 to 60mm beyond second coat

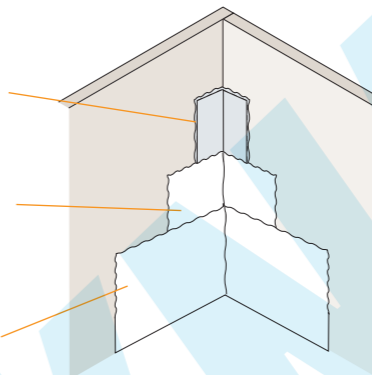


## Internal Corner Joints

Bedding Coat (100mm each side) Knauf Paper Tape bedded into Knauf EASY JOINT™

Second coat (125mm each side) of Knauf EASY JOINT™ feathered out beyond bedding coat

Finishing coat (150mm each side) of Knauf EASY JOINT™ or Knauf EASY FINISH™ feathered out beyond second coat

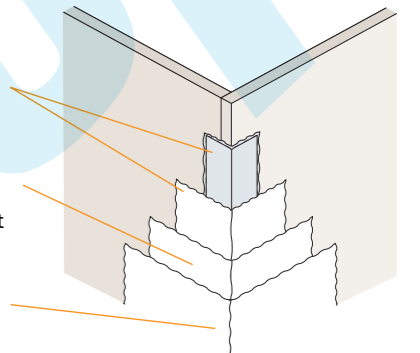


## External Corner Joints

Bedding Coat (150mm each side) Paper Tape bedded into Knauf EASY JOINT™

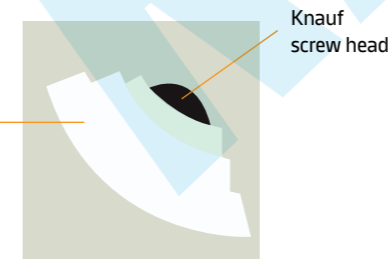
Second coat (200mm each side) of Knauf EASY JOINT™ feathered out beyond bedding coat

Finishing coat (300mm each side) of Knauf EASY JOINT™ feathered out beyond second coat



## Screw Head Depressions

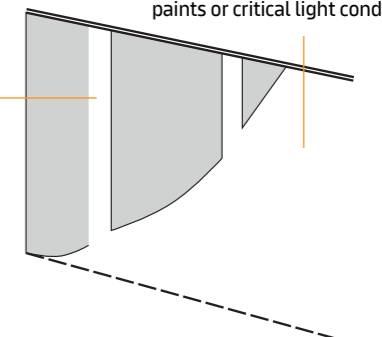
Treat screw depressions with three coats of Knauf EASY JOINT™



## Skim Coat-Level 5 Finishing

Apply a thin coat (<1mm) of Knauf EASYFINISH™ across plasterboard face and joints to achieve level 5 finishing for high gloss paints or critical light condition

Joint treated as shown above



***Build on us.***

KNAUF

KNAUF

Knauf – One of worldwide market leaders in providing customers with light-weight material Solution

“Knauf Group, a German-based global company operating across 90 countries worldwide, acquired Sheetrock as part of its acquisition of USG in 2018. The synergies from this acquisition increases Knauf’s capability to provide products and systems for light-weight building material that are environment-friendly, energy-efficient, and fairly-priced to help customers work and build better.”

Knauf – One of leading German brands for builders to Build a Better Living Space.



**KNAUF VIETNAM CO., LTD.**

**HO CHI MINH OFFICE:**

7th Floor, Harbour View Tower,  
35 Nguyen Hue Street, Ben Nghe Ward, District 1,  
Ho Chi Minh City, Vietnam

Tel: +84 28 3915 1400  
Fax: +84 28 3915 1405

**HO CHI MINH Plant:**

Lot B3a, Hiep Phuoc Industrial Zone,  
Hiep Phuoc Commune, Nha Be Ward,  
Ho Chi Minh City, Vietnam

Tel: +84 28 3781 8439  
Fax: +84 28 3781 8440

**HANOI OFFICE:**

8th floor, TNR Tower, 54A Nguyen Chi Thanh  
Street, Lang Thuong Ward, Dong Da District,  
Ha Noi, Vietnam

Tel: +84 24 3791 8412  
Fax: +84 24 3791 8413

**HAI PHONG Plant:**

Land Plot CN4.4A, Dinh Vu IP, Dinh Vu - Cat Hai Economic  
Zone, Dong Hai 2 Ward, Hai An District,  
Hai Phong City, Vietnam

Tel: +84 225 883 0660  
Fax: +84 225 883 0686

[knauf.com/vi-vn](http://knauf.com/vi-vn) | [info-vn@knauf.com](mailto:info-vn@knauf.com) | <https://www.facebook.com/knaufvietnam>

Remarks: Information provided is for reference purpose only. Products, specifications and requirements may vary according to geographical locations and applications. As each project is unique, please contact your nearest Knauf representative for further product, solution and technical supports.

This document is owned by Knauf Vietnam Co., Ltd. Last update: 10/2024