



CURTAIN WALL FACADES


/ October 2017

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A Family affair



We are global, based in 120 countries, and employs 25,000 people, bringing innovative solutions to construction professionals around the globe. Everyday our technologies support awe-inspiring feats of engineering around the world – from the famous bullet train in Japan to metro tunnels deep under the largest cities on earth.

Founded by Martin Hilti, as a small family business in the principality of Liechtenstein in 1941, the company has evolved into the worldwide Hilti Group of today. Still family owned, the company's corporate culture is based on the values of courage, commitment, teamwork, and integrity.

For more information, follow us.     

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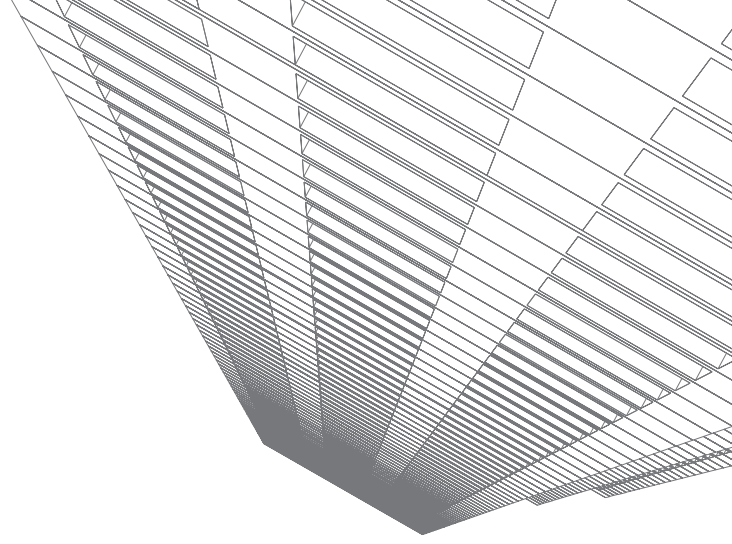
1 BASICS - A. CURTAIN WALL FACADES

Curtain wall systems play a more and more significant role in the construction industry because onsite installation is simpler, provides a safe working environment and saves time and money. Anchor Channel systems are the link between modern curtain wall panels and buildings. They represent an efficient and effective method to install curtain wall panels and to resist loads over a lifetime of a facade.

Complete facade elements can consist of concrete, glass, metal, and natural stone elements even intelligent solar power and air conditioning systems can be integrated.

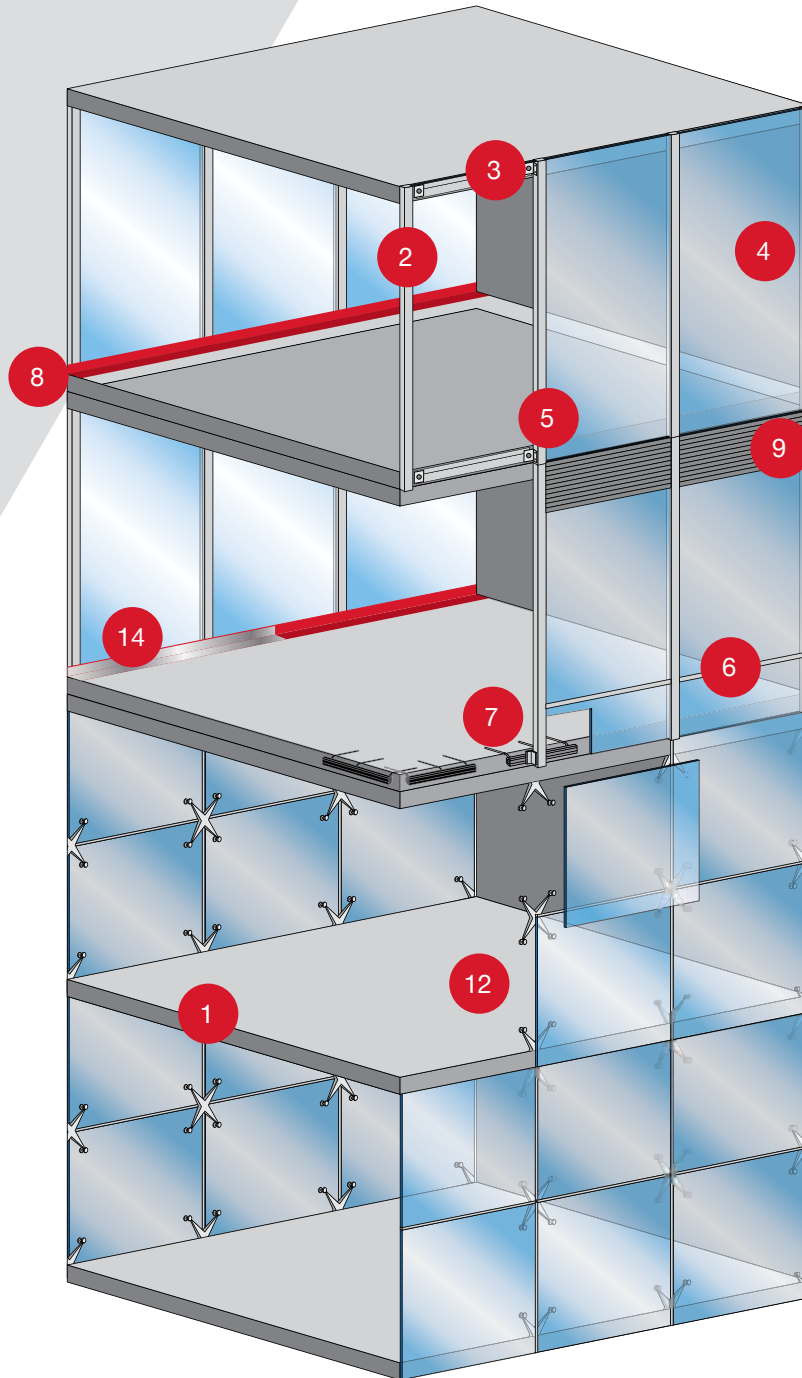
They will be pre-configured in a factory and lifted with a crane into position. The design of the Anchor including the T-Bolts guarantees that the outer loads are transferred to the Anchor Channel and T-Bolts and then into the concrete structure.





HILTI SOLUTIONS OVERVIEW FOR FAÇADE.

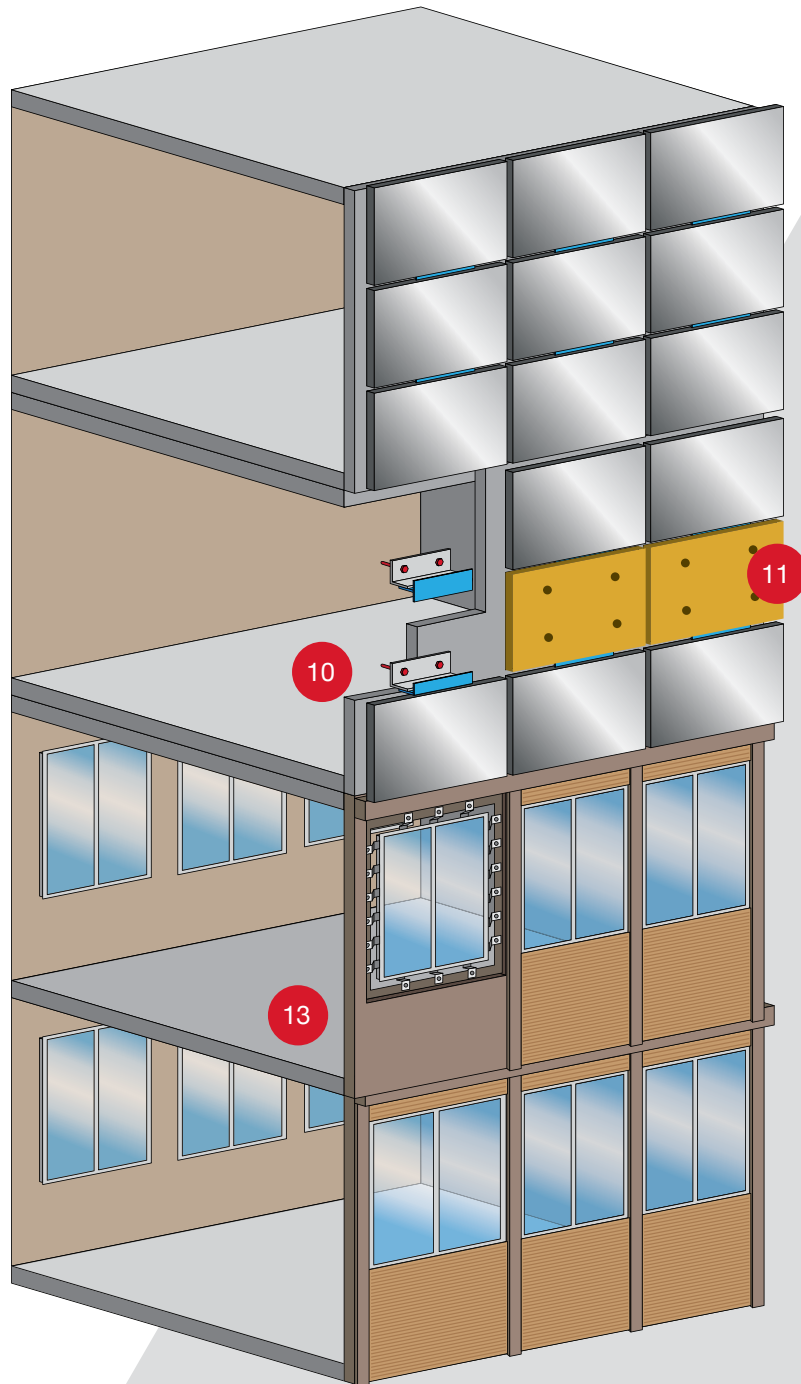
For optimum planning and implementation.



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| 1 Base Material | 6 Unitized Panel | 11 Insulation In Cladding Area Fixing |
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HILTI PROFIS ANCHOR CHANNEL & PROFIS ANCHOR

Design software.



1 BASICS

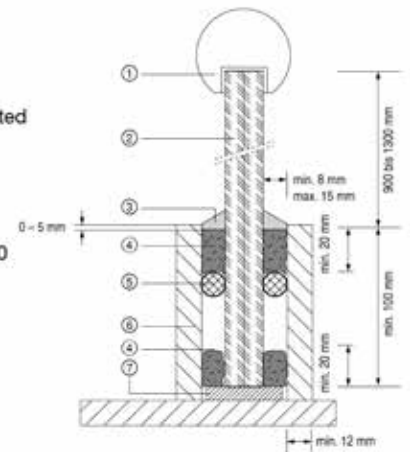
B. GLASS BALUSTRADE

Glass balustrades consist of a main frame of balusters (and top rail) with the glass used to form the infill panels. In such cases the glass is not designed to provide any support to the main frame. The glass in barriers should be designed and installed to resist the design infill loads that are appropriate to building type, and to provide containment.

This means that under impact at appropriate design loads the glass should not break or it should prevent penetration.



- ① Handrail
- ② Pane of laminated safety glass
- ③ Seal
- ④ Hilti HIT-HY 270
- ⑤ Round cord
- ⑥ Steel profile
- ⑦ Glass wedge



Characteristics	HIT-HY 270
Product description	Ultimate performance hybrid mortar for all glass
Necessary accessories	HDE 500-A22 Cordless electric dispenser

Ordering designation	Content per can/cartridge	Package contents	Sales pack quantity	Item number
HIT-HY 270 330/2	330 ml	1x Foil pack, 2x Mixer, 1x Mixer extension	1 pc	2092828
HIT-HY 270 330/1/P(20)	330 ml	1x Foil pack, 1x Mixer, 1x Mixer extension	20 pc	2092880
HIT-HY 270 500/2	500 ml	1x Foil pack, 2x Mixer, 1x Mixer extension	1 pc	2092829

Chemical and mechanical compatibility

- Compatibility with PVB film (polyvinyl butyral film) in laminated glass
- Compatibility with EPDM films (ethylene propylene diene monomer rubber) in the case of seals
- Compatibility with silicone caulking compounds
- Compatibility with stainless steel and aluminum surfaces

1 BASICS

C. SKY LIGHT

Sky light provides different usage of the natural day light. System usually consists of a steel structure with aluminum cladding or steel structure with spider glazing. Different solutions can be used at the same project.

Glazing transparent or translucent provides an additional UV protection & thermal insulation to the building.

Installation process is the most critical part for any of sky light systems and should be performed in accordance with the instructions and standards of the producer.



Characteristics

DX 460-F8/ DX 450



Product description Powder actuated fastening tool

Technology Powder actuated

Magazine holds DX 460-F8: single nail

Base material concrete, steel

Thickness of base material steel:

Nails:
 $t_{ll} \geq 6.00 \text{ mm}$
 Threaded studs:
 X-CRM: $h_{min} \geq 4.00 \text{ mm}$
 X-BT: $h_{min} \geq 8.00 \text{ mm}$



Thickness of fastened material (steel plate/ GI sheet)

Nails:
 $t_l \leq 3.00 \text{ mm}$
 Threaded studs:
 $t_l \approx \text{up to } 13 \text{ mm}$

Nails steel nails:
 X-CR 14 P8



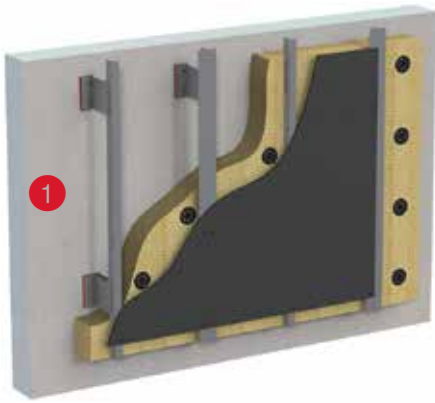
Threaded studs steel: X-CR M8 (no pre-drilling)



Threaded studs steel: X-BT M8 (pre-drilling required)



Necessary accessory Cartridge 6.8/11, TX-TB 4/7 (for predrilling)



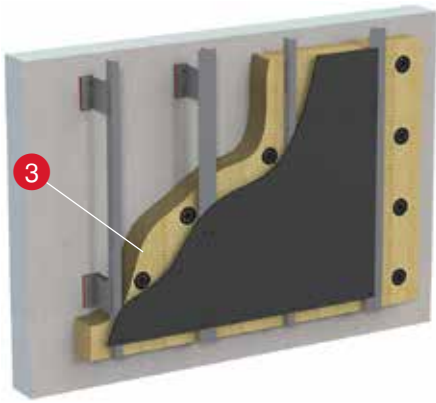
1 BASICS

D. BASE MATERIALS

Surfaces to which the facade can be anchored may consist of standardized materials (e.g. concrete, brick, steel, timber, etc.) or non-standardized materials. Surface layers such as rendering, coatings or facings do not count as load-bearing materials.

The following are suitable base materials:

- Concrete
- Bricks
- Sand-lime block
- Aerated concrete
- Timber
- Composite lumber
- Steel frame structures
- Existing/unclassified masonry (load-bearing capacity must be verified by pull-out tests)
- Sandwich components (e.g. metal, concrete or lightweight concrete) may be considered suitable only after verification



1 BASICS E. INSULATION

A layer of thermal insulation between the supporting surface and the ventilation cavity. Depending on the type of insulating material used, it may also fulfil fire protection and soundproofing requirements.

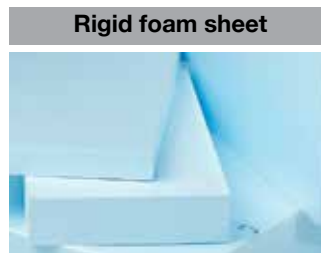
Thermal insulation for rain screen/ventilated facades must consist of an insulating material of a type suitable for the intended purpose (exterior wall insulation behind cladding).

The insulation must meet the following requirements:

- Able to retain its shape
- Able to retain its dimensions
- Completely hydrophobized and non-vapor retardant (as necessary)
- Non-flammable (as necessary)

The following types of facade insulation can be used, for example:

- Mineral wool
- Foam glass
- Rigid foam sheet
- Wood fiber board



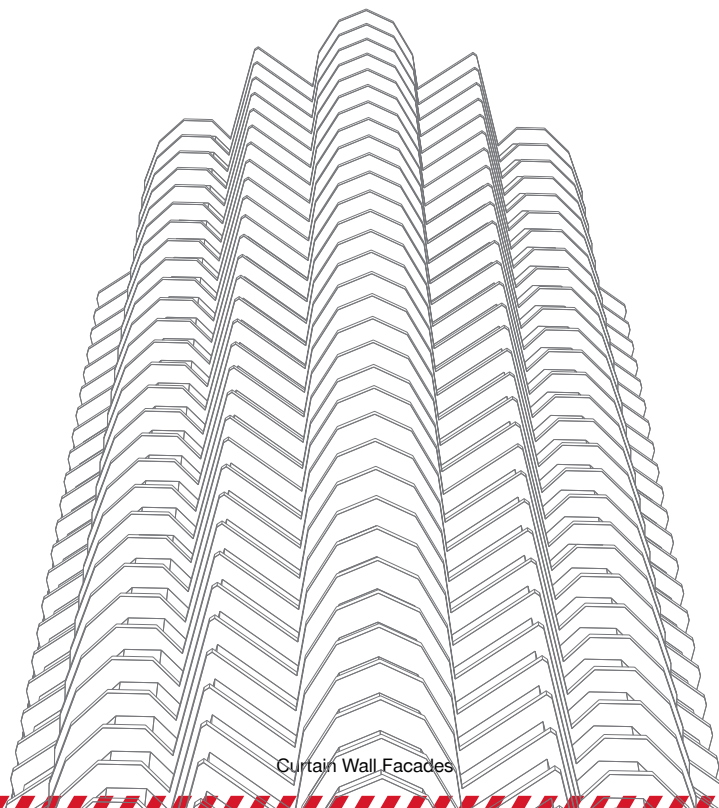
- Insulation sheets must be tightly butted together and fitted in a “brickwork” pattern. This is particularly important at the corners of the building.
- The thermal insulation must be snugly fitted around the points where the substructure penetrates the insulating material.
- Where water spray is to be expected, moisture-resistant insulating material must be used.
- As a basic rule, national regulations and installation instructions issued by the manufacturer must be observed.

CONTENT AND OVERVIEW OF THIS SECTION

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2 GENERAL REQUIREMENTS AND REGULATIONS

A. BUILDING REGULATIONS

Emirate of Abu Dhabi

Governing body

- Department of Municipal Affairs (DMA)
- Ministry of Interior Civil Defense G.H.Q.

Legislative framework

- Abu Dhabi International Building Code
- Abu Dhabi International Energy Conservation Code
- UAE Fire and Life Safety Code of Practice

Emirate of Dubai

Governing body

- Dubai Municipality DM
- Dubai Civil Defense DCD

Legislative framework

- Structural Codes & Guidelines (issued by Dubai Municipality)
- Green Building Regulations & Specifications (issued by Dubai Municipality)
- Dubai wind code (issued by Dubai Municipality)
- UAE Fire and Life Safety Code of Practice (issued by General Headquarters of Civil Defense-Ministry of Interior United Arab Emirates)

Emirate of Sharjah

Governing body

- Sharjah Municipality SM
- Sharjah Civil Defense SHJCD

Legislative framework

- Construction rules and regulations (issued by Sharjah Municipality)
- UAE Fire and Life Safety Code of Practice (issued by General Headquarters of Civil Defense -Ministry of Interior United Arab Emirates)

Northern Emirates

Governing body

- Municipality
- Civil Defense

Legislative framework

- Construction rules and regulations (issued by the Municipality)
- UAE Fire and Life Safety Code of Practice (issued by General Headquarters of Civil Defense-Ministry of Interior United Arab Emirates)

2 GENERAL REQUIREMENTS AND REGULATIONS

B. GENERAL REQUIREMENTS

Structural stability

Curtain wall facades are mechanically connected to the load-bearing structure of the building and must remain structurally stable at all times. When considering this point, the following loads must be taken into account:

- Dead weight
- Wind loads (wind uplift and wind pressure)
- Snow and ice
- Dynamic (shock) loads
- Special cases (seismic loads, signage)

Proof of the structural stability of the curtain wall facade system, including all individual certificates, must be provided in a verifiable form in accordance with the state of the art and the applicable International and/or national regulations. The proof of structural stability must, in particular, include the structural stability calculations for the substructure, the cladding and the anchoring and connecting or fastening components.

The dead weight (own weight) is the sum of the weight of the cladding plus the substructure. The corresponding values can be taken from, for example, national regulations or the manufacturer's specifications.

A difference must be drawn between the two types of wind loads, i.e. wind uplift and wind pressure. The values to be applied in calculations depend, above all, on the shape and dimensions of the building, the type of facade cladding and how it is installed, and the location of the building.

Where necessary, the applicable special loads (impacts, balls being thrown, etc.) must be taken into account (more closely spaced substructure members) in areas where special stresses of this kind are to be expected.

Fire protection

Curtain wall facades must comply with the applicable national requirements regarding fire protection. The planning of fire protection measures is the responsibility of the planning specialist.

Thermal insulation and protection from dampness

The facade, in terms of its cladding and substructure, must be planned and constructed in such a way that any rainwater that finds its way behind the cladding and any condensation is drained away to the exterior in a controlled manner. This shall ensure that the thermal insulation or any timber components in the substructure, and the material to which it is anchored, do not remain damp.

Facades with thermal insulation on the exterior of the wall present a very favorable solution in terms of building physics. In addition, the ventilation cavity allows any dampness that has found its way through the joints in the cladding to run off.

Airtightness

Requirements regarding the airtightness of the external envelope of the building are to be fulfilled by its design and construction. The curtain wall facade does not contribute to the airtightness of the building. Airtightness is ensured, for example, by the interior plasterwork and correctly installed doors and windows.

Soundproofing

Requirements in terms of soundproofing must be taken into account during planning of the complete structure and must comply with national regulations. A high sound reduction index can be achieved due to the high sound absorption properties of mineral insulation material in conjunction with thick cladding.

Lightning protection

Lightning protection requirements must be taken into account by the applicable specialists at the planning stage and must comply with national regulations.

Attention must be paid to the compatibility of the materials used for lightning conductors and any parts of the facade cladding that they come into contact with.

Deformation

Deformation may occur, in particular, due to temperature fluctuations and changes in humidity. Attention must be paid to the local temperature differences (ΔT) (usually within the -20° to $+80^{\circ}\text{C}$ range).

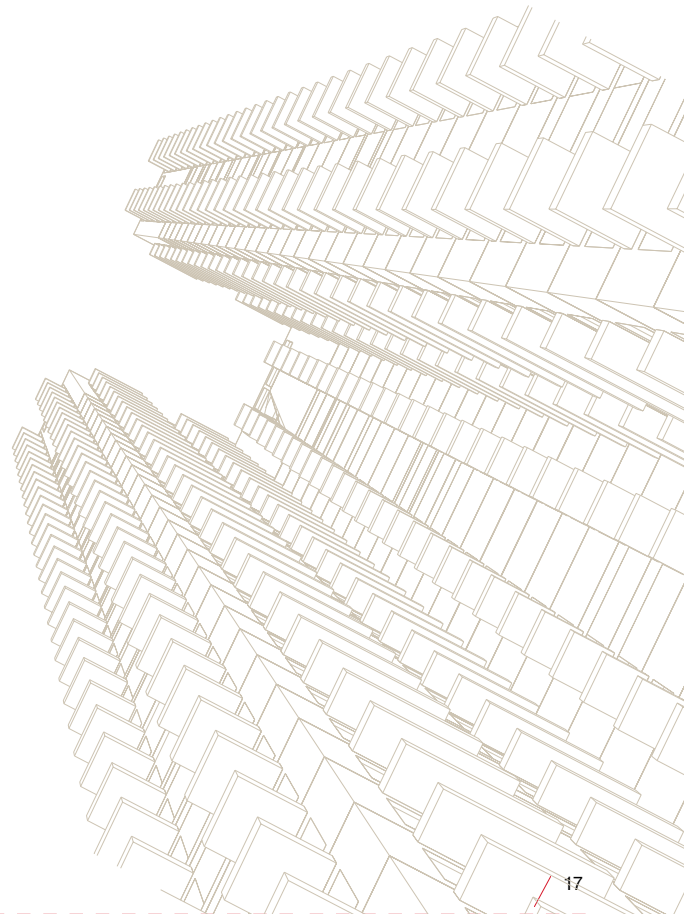
Deformation must not cause individual parts of the facade to work loose and must have no detrimental effect on the structural stability of the facade. Such effects can be avoided, for example, by the following:

- Division of the substructure and cladding into separate areas (e.g. height of each floor)
- The positioning of joints
- Avoidance of forces of constraint during installation of the facade cladding and substructure through use of fixed and sliding points or other suitable measures

Building expansion joints must be taken into account by the substructure and cladding and allowance made accordingly.

Tolerances

The surface of the facade cladding must be flat and even. Any unevenness of the load-bearing surface must be taken into account right at the planning stage and evened out by the supporting substructure. The permissible degree of unevenness of the load-bearing surface or facade must be defined or the applicable values taken from national regulations.



Corrosion

Corrosion is a process that affects metals due to their exposure to atmospheric influence. A greater concern is the safety risks, where corrosion can lead to significant impairment to the functionality of the fastening systems of the structural elements.

Selection of corrosion protection for anchors

Environmental Conditions	Fastened part	Anchors					
		HSA HUS HST HT-V	HUS-HP	HSA-F HT-V-F	HSA-P2	HUS-HR HSA-R HST-R HT-S-R	HST-HCR
	Coating/Material	Electro galvanize	Duplex coated carbon steel	HDG/sherardized 45-60 µm	A2 AISI 304	A4 AISI 316	HCR, e.g. 1.4529
Dry indoor	Steel (zinc-coated, painted), aluminum, stainless steel	■	■	■	■	■	■
Indoor with temporary condensation	Steel (zinc-coated, painted), aluminum	-	■	■	■	■	■
	Stainless steel	-	-	-	■	■	■
Outdoor with low pollution	Steel (zinc-coated, painted), aluminum	-	□*	□*	■*	■	■
	Stainless steel	-	-	-	■*	■	■
Outdoor with moderate concentration of pollutants	Steel (zinc-coated, painted), aluminum	-	□*	□*	■*	■	■
	Stainless steel	-	-	-	■*	■	■
Coastal areas	Steel (zinc-coated, painted), aluminum, stainless steel	-	-	-	-	■	■
Outdoor areas with heavy industrial pollution	Steel (zinc-coated, painted), aluminum, stainless steel	-	-	-	-	■	■
Close proximity to roads treated with de-icing salts	Steel (zinc-coated, painted), aluminum, stainless steel	-	-	-	-	■	■
Special applications	-	Consult experts					■

- = expected lifetime of anchors made from this material is typically satisfactory in the specified environment based on the typically expected lifetime of a building. The assumed service life in ETA approvals for powder-actuated and screw fasteners is 25 years, and for concrete anchors it is 50 years.
 - = a decrease in the expected lifetime of non-stainless fasteners in these atmospheres must be taken into account (≤ 25 years). Higher expected lifetime needs a specific assessment.
 - = fasteners made from this material are not suitable in the specified environment. Exceptions need a specific assessment.
- From a technical point of view, HDG/duplex coatings and A2/304 material are suitable for outdoor environments with certain lifetime and application restrictions. This is based on long-term experience with these materials as reflected e.g. in the corrosion rates for Zn given in the ISO 9224:2012 (corrosivity categories, C-classes), the selection table for stainless steel grades given in the national technical approval issued by the DIBt 2.30.3-8 (April 2009) or the ICC-ES evaluation reports for our NB-T2 anchors for North America (e.g. ESR-1917, May 2013). The use of those materials in outdoor environments however is currently not covered by the European Technical Approval (ETA) of anchors, where it is stated that anchors made of galvanized carbon steel or stainless steel grade A2 may only be used in structures subject to dry indoor conditions, based on an assumed working life of the anchor of 50 years.

Environment categories

Applications can be classified into various environmental categories, by taking the following factors into account:

Indoor applications	
	Dry indoor environments (Heated or air-conditioning areas) without condensation, e.g. office buildings, schools.
	Indoor environments with temporary condensation (Unheated areas without pollutants) e.g. storage sheds
Outdoor applications	
	Outdoor, rural or urban environment with low pollution Large distance (> 10 km) from the sea
	Outdoor, rural or urban environment with moderate concentration of pollutants and/or salt from sea water Distance from the sea 1-10 km
	Coastal areas Distance from sea < 1 km
	Outdoor areas with heavy industrial pollution Close to plants < 1 km (e.g. petrochemical, coal industry)
	Close proximity to roadways threatened with de-icing salts Distance to roadways = 10 m
Outdoor applications	
	Special applications Areas with special corrosive conditions, e.g. road tunnels with de-icing salt, indoor swimming pools, special applications in the chemical industry (exceptions possible).

Important notes

The ultimate decision on the required corrosion protection must be made by the customer. Hilti accepts no responsibility regarding the suitability of a product for a specific application, even if informed of the application conditions. The tables are based on an average service life for typical applications. For metallic coatings, e.g. zinc layer systems, the end of lifetime is the point at which red rust is visible over a large fraction of the product and widespread structural deterioration can occur – the initial onset of rust may occur sooner. National or international codes, standards or regulations, customer and/or industry specific guidelines must be independently considered and evaluated. These guidelines apply to atmospheric corrosion only. Special types of corrosion, such as crevice corrosion or hydrogen assisted cracking must be independently evaluated. The tables published in this brochure describe only a general guideline for commonly accepted applications in typical atmospheric environments. Suitability for a specific application can be significantly affected by localised conditions, including but not limited to: Elevated temperatures and humidity; High levels of airborne pollutants; Direct contact with corrosive products, such as found in some types of chemically-treated wood, waste water, concrete additives, cleaning agents, etc.; Direct contact to soil, stagnant water; Electrical current; Contact with dissimilar metals; Confined areas, e.g. crevices; Physical damage or wear; Extreme corrosion due to combined effects of different influencing factors; Enrichment of pollutants on the product.

Typical examples of application

Facades / roofing				
Profiled metal sheets, curtain wall cladding, insulation fastenings, facade support framing		Outdoor, rural or urban atmosphere with low pollution	Indoor	Electrogalvanised
			Outside application	Hot-dipped galvanised / sherardized min. 45 microns, A2 (304) and A4 (316) steel
		Outdoor, rural or urban environment with moderate concentration of pollutants	Indoor	Electrogalvanised
			Outside application	Hot-dipped galvanised / sherardized min. 45 microns, A2 (304) and A4 (316) steel
		Outdoor areas with heavy industrial pollution and (e.g. petrochemical and coal industry) or coastal areas	Indoor	Electrogalvanised
			Outside application	A4 (316) steel, Hilti HCR if chlorides and industrial pollution are combined,

The following table shows the suitability of the respective metal couple. It also shows which two metals in contact are permissible in field practice and which should rather be avoided.

Fastened part (Large area)	Fastener (small area)			
	Electrogalvanised	Duplex coated carbon steel	Hot-dipped galvanized	Stainless steel
Electrogalvanised	☐	■	■	☐
Hot-dipped galvanized	☐	■	■	☐
Aluminium	■	■	■	☐
Structural or cast steel	■	■	■	☐
Stainless steel (CrNi or CrNiMo)	■	■	■	☐
Tin	■	■	■	☐
Copper	■	■	■	☐
Brass	■	■	■	☐

- ☐ Slightly or no corrosion of fastener
- Moderate corrosion of fastener, technically acceptable in many cases
- Heavy corrosion of fastener

Seismic

Seismic anchorage applications can include strengthening or retrofitting an existing structure, as well as standard anchorage applications that exist both in seismic and non-seismic geographies. In addition to an engineers focus on the anchoring of structural elements, it is crucial for an adequate seismic design to attend to non-load bearing and non-structural elements. These elements failure can severely compromise the building/structure functionality or repair costs after a seismic event.

As a structure responds to earthquake ground motion it experiences displacement and consequently deformation of its individual members. This deformation leads to the formation and opening of cracks in members. Consequently all anchorages intended to transfer earthquake loads should be suitable for use in cracked concrete and their design should be predicted on the assumption that cracks in the concrete will cycle open and closed for the duration of the ground motion.

In the United States the anchor seismic resistance shall be evaluated in accordance with ACI 318 Appendix D. Created in accordance with the ACI 355.2 regulated testing procedures and acceptance criteria ICC-ES AC193 and AC308, pre-qualification reports provide sound data in a proper design format.

With the release of the ETAG 001 Annex E in the first half of 2013, the seismic pre-qualification of anchors became regulated in Europe. Anchors submitted to these new test procedures will now also incorporate in the ETA (European Technical Approval) all the required technical data for seismic design. Until the release of the EN 1992-4, planned for 2015, EOTA TR045 (Technical Report) will set the standard for the seismic design of steel to concrete connections.

Therefore, the design framework for the seismic design of anchors is already available through both the U.S. and European regulations.

After a strong or design earthquake occasion, the ultimate loading capacity of an anchor is considerably reduced (30 to 80% of the original resistance). Proper inspection shall then be carried to ensure the level of performance not only for a future earthquake but also for the static load combinations.

Fatigue

If an anchor is subjected to a sustained load that changes with respect to time, it can fail after a certain number of load cycles even though the upper limit of the load withstood up to this time is clearly lower than the ultimate tensile strength under static loading. This loss of strength is referred to as material fatigue. When evaluating actions causing fatigue also the planned or anticipated fastening life expectancy is of major importance.

The grade and quality of steel has a considerable influence on the alternating strength. In the case of structural and heat-treatable steels, the final strength (i.e. after 2 million load cycles or more) is approx. 25-35% of the static strength.

In the non-loaded state, concrete already has micro-cracks in the zone of contact of the aggregates and the cement paste, which are attributable to the aggregates hindering shrinkage of the cement paste. The fatigue strength of concrete is directly dependent on the grade of concrete. Concrete strength is reduced to about 55 – 65% of the initial strength after 2'000'000 load cycles.

Two main groups of fatigue type loading can be identified:

- Vibration type loading of fasteners with very high recurrence and usually low amplitude (e.g. ventilators, production machinery, etc.).
- Repeated loading and unloading of structures with high loads and frequent recurrence (cranes, elevators, robots, etc.).

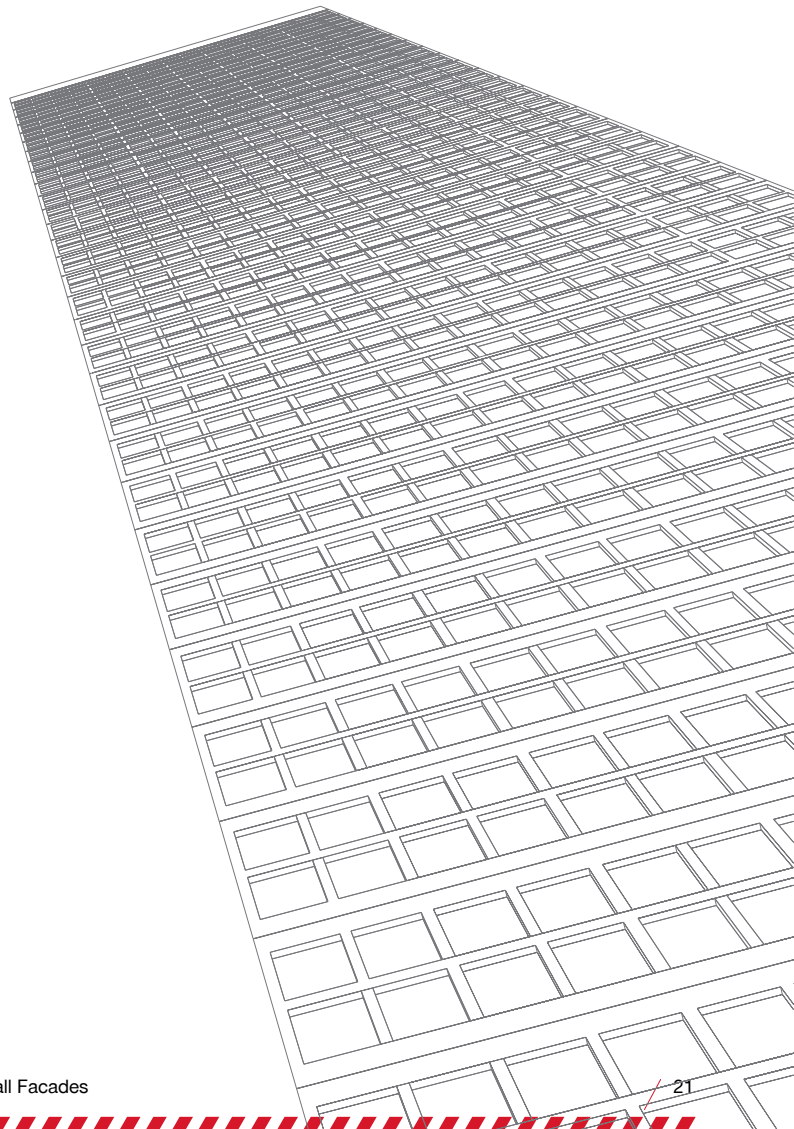
3 Application overview

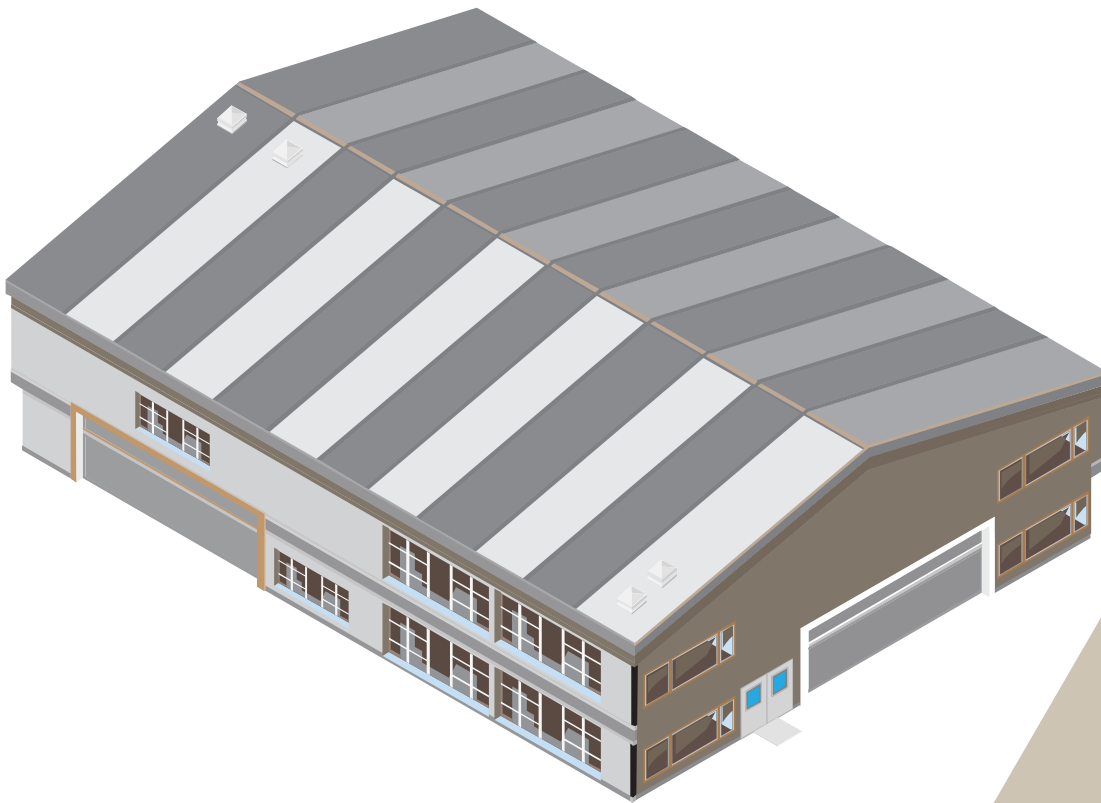
Fabrication

- a. Drilling in metal
- b. Cutting/ Grinding metal frame panels
- c. Screwing and fixing frame panels

On site

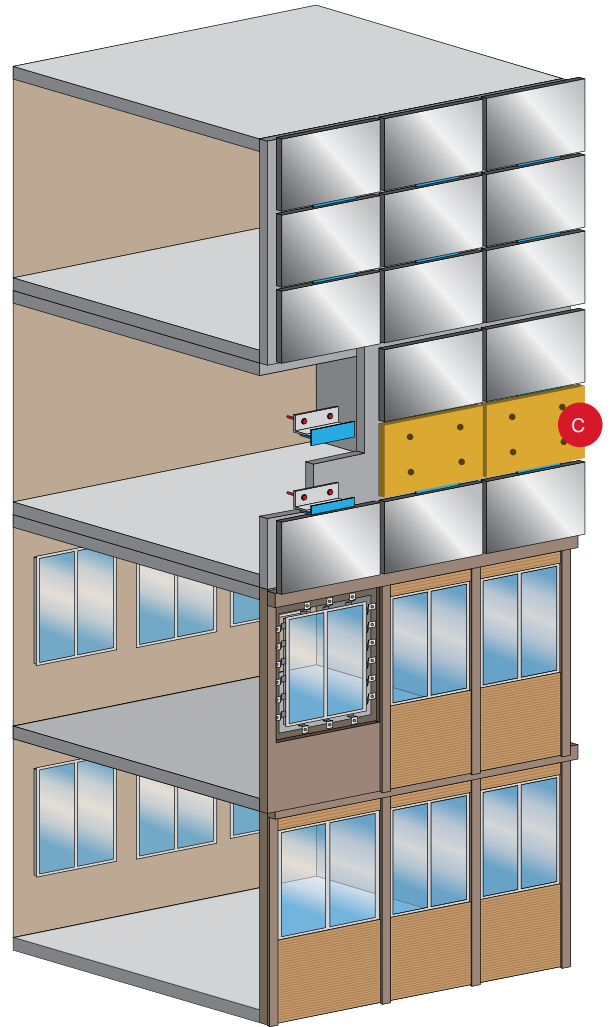
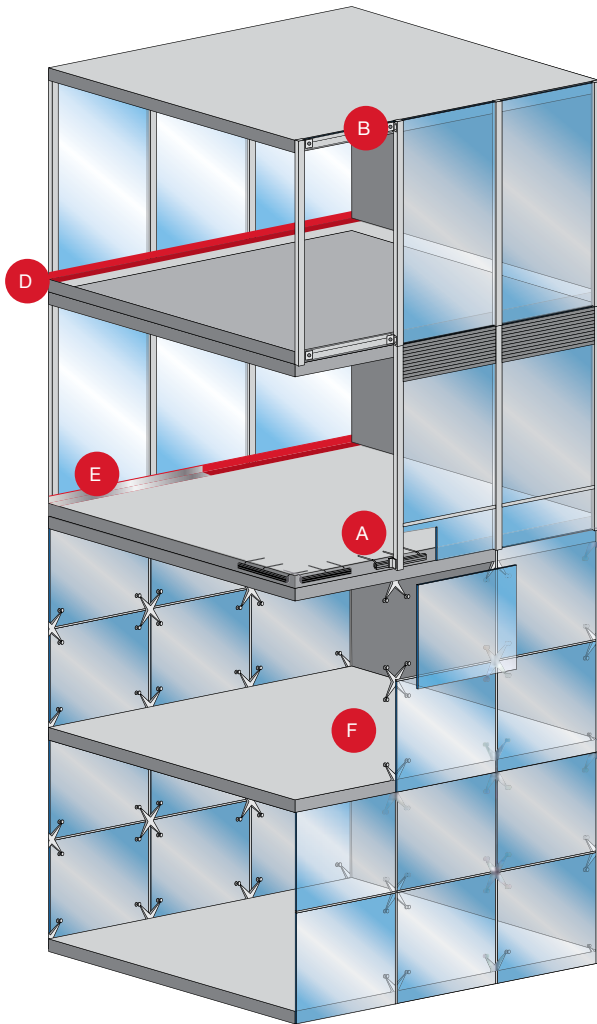
- a. Fixing brackets for unitized systems
- b. Fixing mullions brackets
- c. Fixing insulation in cladding area
- d. Sealing the perimeter gap
- e. Fixing GI sheet
- f. Point fixing Glass Wall



**Fabrication**

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- A** Drilling in metal
- B** Cutting/ Grinding metal frame panels
- C** Screwing and fixing frame panels



On site

- A** Fixing brackets for unitized systems
- B** Fixing mullions brackets
- C** Fixing insulation in cladding area
- D** Sealing the perimeter gap
- E** Fixing GI sheet
- F** Point fixing Glass Wall

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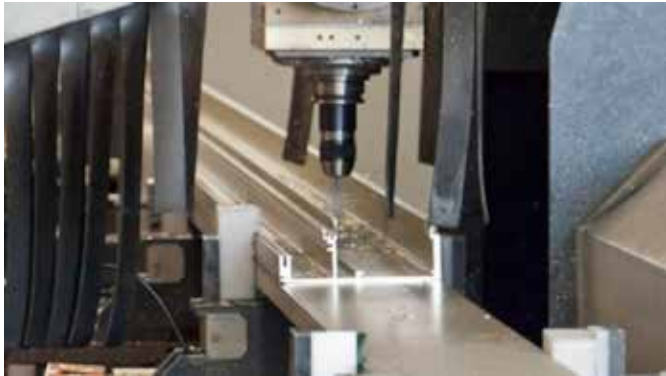




3 FABRICATION

A. DRILLING IN METAL

Curtain Wall elements such as mullions, transoms or unitized panels are prepared for installation in a controlled manufacturing environment. It requires high precision and tolerance to achieve fast assembly process on site. All components built in a factory will require engineered drawing and layouts for building code approval. Curtain Wall manufacturers will provide engineered designs, along with components and jobsite delivery.

Hilti offers ideal solution for drilling, cutting and panels assembly solutions.



Characteristics	HSS
Base material	<p>HSS:</p>  <p>medium alloyed steel, carbon steel, aluminum, plastics, wood</p> <p>HSS co:</p>  <p>stainless steel, high-tensile steel, high-temperature alloys, heat-treated materials</p>
Material coating	<p>HSS: M2 steel</p> <p>HSS co: M35 steel</p>
Diameters	<p>HSS: 1 – 18.0 mm</p> <p>HSS co: 1.0 – 18.0 mm</p>
Necessary accessory	UD 30

Product details/ ordering:

add qr code

3 FABRICATION

B. CUTTING/ GRINDING METAL FRAME PANELS

Framing components of the Curtain Wall such as transoms or mullions require precise cutting edges and often have to be modified or finished in the workshop conditions or even on site.

Hilti offers a range of solutions for cutting and grinding



Characteristics

AG 125-A22/ A36



Product description	Cordless angle grinder
Technology	Battery Li-Ion 22V
Discs Diameter	125 mm
Cutting discs	AC-D SP
Grinding discs	AG-D, AF-D (flap disc)
Necessary accessory	Battery charger C 4/36 Li-Ion 230V Battery pack B 22/2.6 Li-Ion Battery pack B 22/5.2 Li-Ion

Product details/ ordering:

add qr code

3 FABRICATION

C. SCREWING AND FIXING FRAME PANELS

Framing components of the Curtain Wall unitized system must be assembled into unit frame. Commonly used tools are pneumatic or cordless drill drives.



Characteristics

SFC-22A



Product description	Compact cordless drill driver
Technology	Battery Li-Ion 22V
Number of gears	2
Necessary accessory	S-BS (S) standard bit set Battery charger C 4/36 Li-Ion 230V Battery pack B 22/2.6 Li-Ion

Product details/ ordering:



ON SITE A. FIXING BRACKETS FOR UNITIZED SYSTEMS

The shapes, styles and materials used in the construction of facades are becoming increasingly unconventional. Accordingly, the fastenings used to secure each section are frequently located in the heavily-reinforced edge zone of the supporting concrete structure. The demands placed on these fastenings in terms of their usability, loadbearing capacity and life expectancy are thus rising all the time.

Hilti offer a first-class product portfolio for the installation of curtain wall facades:


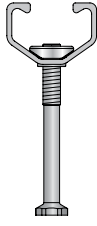
- a. Cast-in anchor channels – the preferred solution for securing curtain wall facades
- b. Mechanical stud anchors – optimized portfolio provides versatile, well-proven solutions for fastening all types of facades
- c. Chemical fast curing anchors – safe and no hole cleaning solution with new revolutionary HIT-Z anchor rod

Cast-in anchor channels

Since 2017 Hilti exclusively offers all three relevant production standards for Anchor Channel Profiles - TCRS (Temperature Controlled Roll Shaping), hot-rolled and cold-formed. Now you have the choice between three different Anchor Systems - depending on your applications.

All channels are ETA certified. Hilti also provides dedicated and tested solutions for e.g. corner, thin slab cases. Additionally, V-shape channels are approved for seismic, static and dynamic loads, as well as loads occurring in the event of fire.



Characteristics	HAC	HAC-C
Product description		
Technology	Anchor channel V-shape Temperature Controlled Roll Shaping (TCRS)	Anchor channel C-shape Cold-formed Hot-rolled
Material	Hot-dip galvanized	Hot-dip galvanized Stainless steel A4
Necessary accessory	Torque controlled wrench for correct T-bolt fixation	

3 ONSITE A. FIXING BRACKETS FOR UNITIZED SYSTEMS



3 MECHANICAL ANCHORS

Complex curtain wall designs often present planners with a major challenge – especially when time is at a premium. Planning and execution of the work thus sometimes run almost parallel. Changes to plans at short notice can make it impossible to use anchor channels on all areas of the structure. For these situations, Hilti offers a range of stud anchors that provides versatile, well-proven solutions for fastening facades – which also includes revolutionary new Hilti HUS3 undercut anchor.

Characteristics	HUS3	HST3/2	HSA	HSV
Product description	Ultimate performance screw anchor	Ultimate performance stud anchor	Standard stud anchor ETA approved	Standard stud anchor Material
Material	Carbon steel Carbon steel with multilayer coating	Carbon steel Stainless steel A4	Carbon steel Carbon steel hot deep galvanized Stainless steel A2 Stainless steel A4	Carbon steel
Base material	Cracked (concrete) Non-cracked (concrete)	Cracked (concrete) Non-cracked (concrete)	Non-cracked (concrete)	Non-cracked (concrete)
Load conditions	Tensile zone Seismic ETA- C1 Fire resistance	Static/ quasi static Seismic ETA- C1/C2 Fire resistance	Fire resistance	
Installation conditions	Hammer drilled holes	Hammer drilled holes Diamond drilled holes Hollow drill bit holes	Hammer drilled holes Diamond drilled holes Hollow drill bit holes	Hammer drilled holes
Other information	ETA CE conformity PROFIS Anchor design DIBt approval Reusability / Adjustability	Hammer ETA CE conformity PROFIS Anchor design FM approved	ETA CE conformity PROFIS Anchor design	

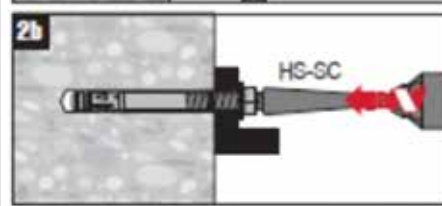
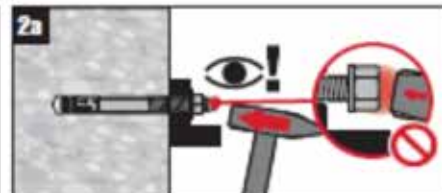
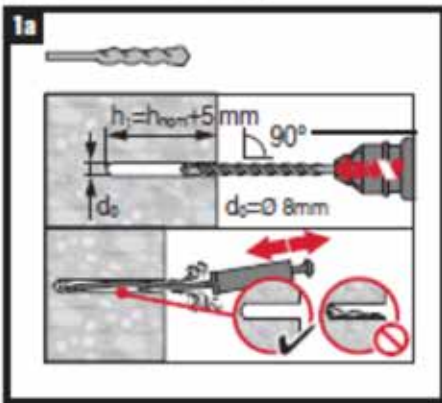
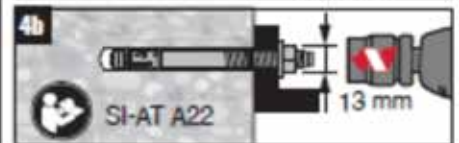
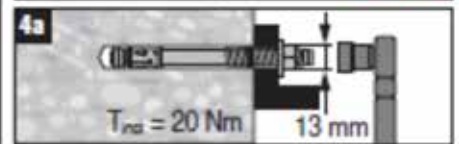
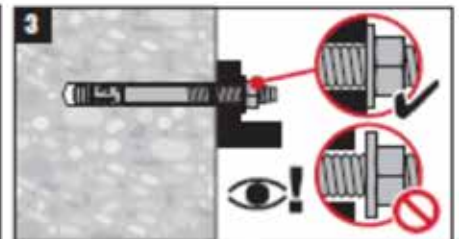
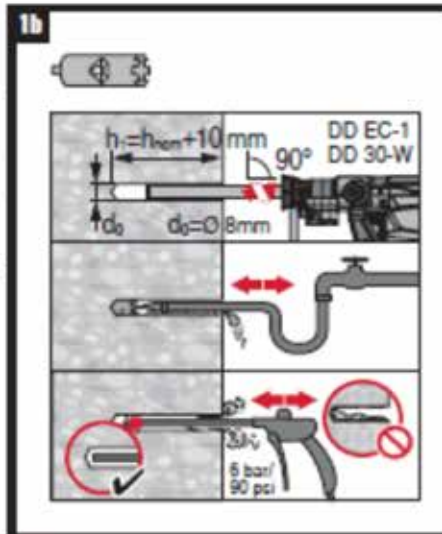
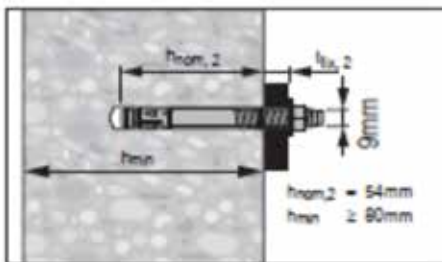
HST3 STUD ANCHOR - SETTING INSTRUCTIONS

Installation equipment

Anchor size	M8	M10	M12	M16	M20	M24
Rotary hammer	TE2(-A) – TE30(-A)			TE40 – TE70		
Diamond coring tool	DD-30W, DD-EC1					
Setting tool	Setting tool HS-SC				-	
Hollow drill bit	-		TE-CD, TE-YD			
Other tools	hammer, torque wrench, blow out pump					

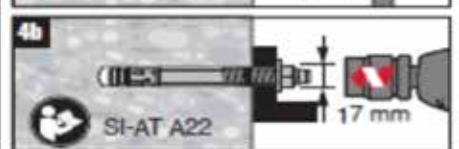
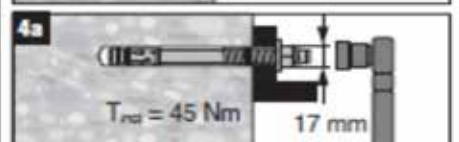
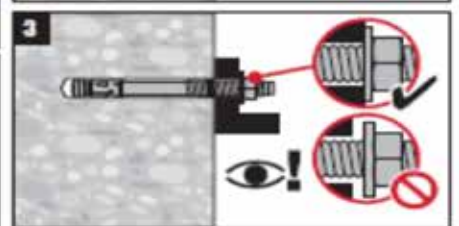
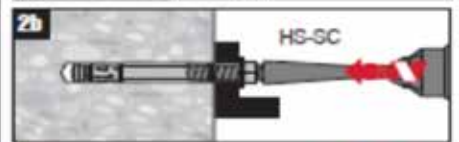
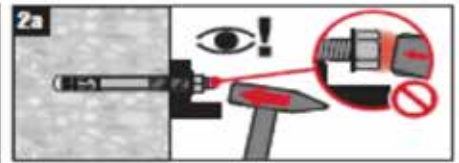
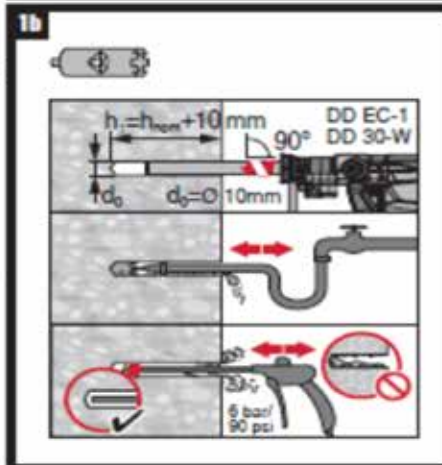
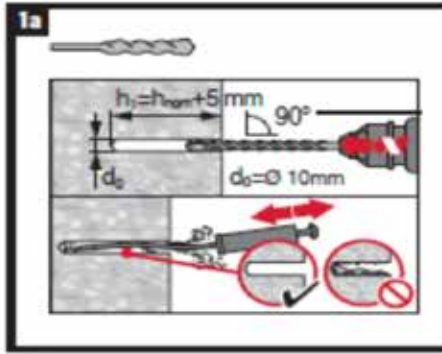
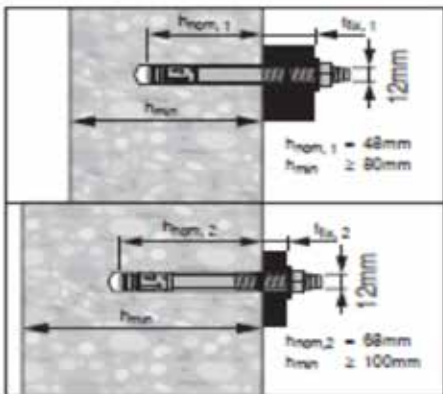
Setting instruction for M8

	HST3	HST3-R	HST3/-R EW	tsu, 1	tsu, 2
M8x75 -/10	✓	✓	✓	-	10
M8x95 -/30	✓	✓	-	-	30
M8x115 -/50	✓	✓	-	-	50



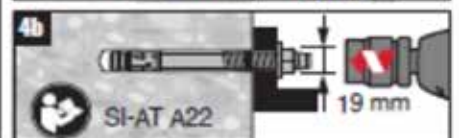
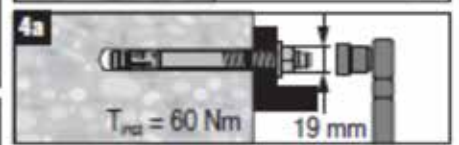
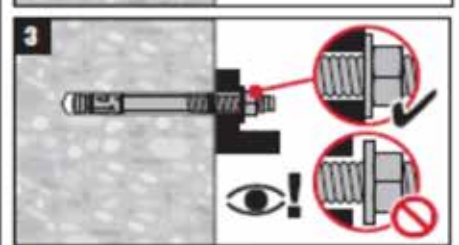
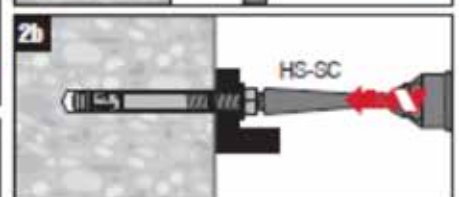
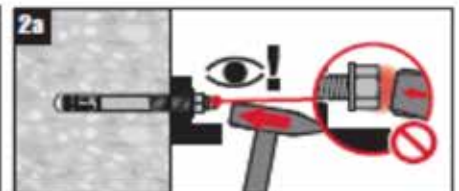
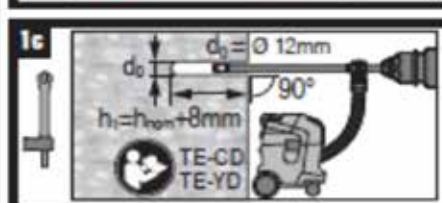
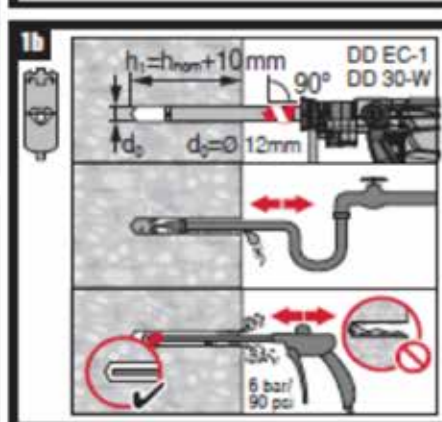
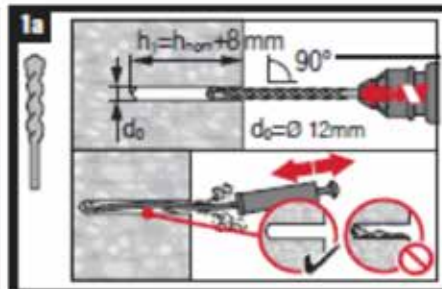
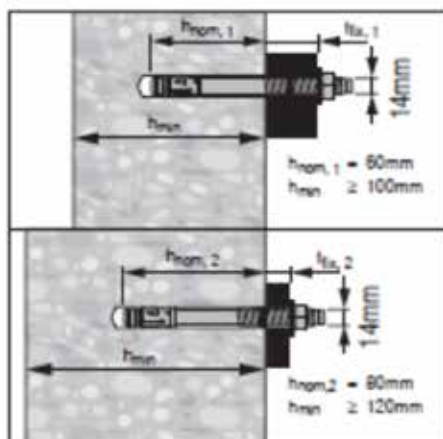
Setting instruction for M10

	HST3	HST3-R	HST3/ -R SW	h ₁ , 1	h ₂ , 2
M10x70 10/-	✓	✓	-	10	-
M10x80 20/-	✓	✓	-	20	-
M10x90 30/10	✓	✓	-	30	10
M10x100 40/20	✓	✓	✓	40	20
M10x110 50/30	✓	✓	-	50	30
M10x130 70/50	✓	✓	-	70	50
M10x160 100/80	✓	✓	-	100	80
M10x200 140/120	✓	-	-	140	120



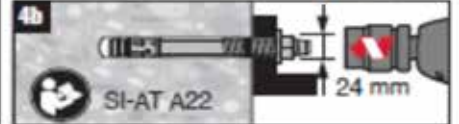
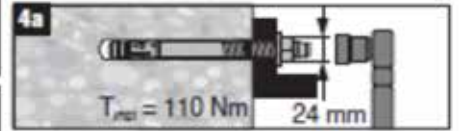
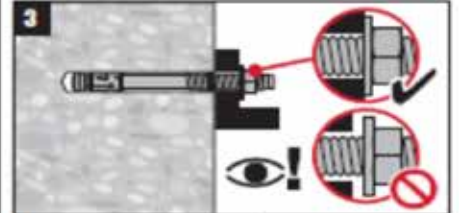
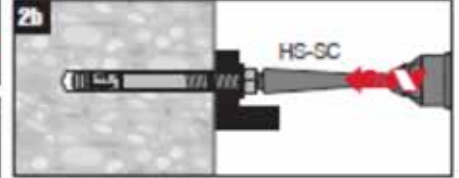
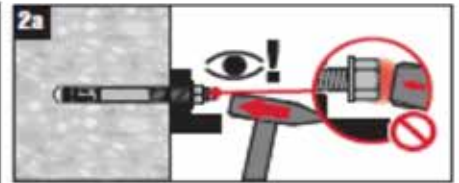
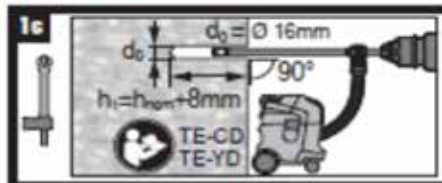
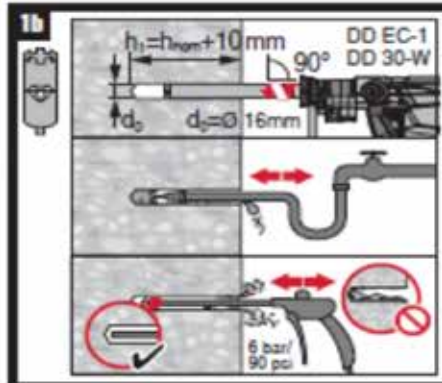
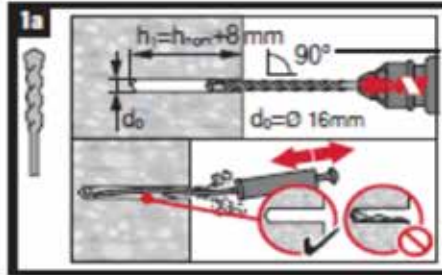
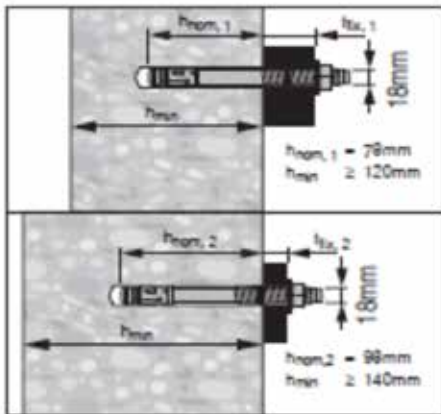
Setting instruction for M12

	HST3	HST3-R	HST3/ -R SW	h ₁ , 1	h ₂ , 2
M12x85 10/-	✓	✓	-	10	-
M12x95 20/-	✓	✓	-	20	-
M12x105 30/10	✓	✓	-	30	10
M12x115 40/20	✓	✓	✓	40	20
M12x125 50/30	✓	✓	-	50	30
M12x145 70/50	✓	✓	-	70	50
M12x165 90/70	✓	✓	-	90	70
M12x185 110/90	✓	✓	-	110	90
M12x215 140/120	✓	✓	-	140	120
M12x235 160/140	✓	-	-	160	140
M12x255 180/160	✓	-	-	180	160
M12x295 220/200	✓	-	-	220	200
M12x345 270/250	✓	-	-	270	250



Setting instruction for M16

Model	HST3	HST3-R	HST3-R BW	h ₁	h ₂
M16x115 15/-	✓	✓	-	15	-
M16x135 35/15	✓	✓	-	35	15
M16x145 45/25	✓	✓	✓	45	25
M16x170 70/50	✓	✓	-	70	50
M16x220 120/100	✓	✓	-	120	100
M16x260 160/140	✓	✓	-	160	140
M16x300 200/180	✓	✓	-	200	180
M16x360 260/240	✓	-	-	260	240
M16x420 320/300	✓	-	-	320	300
M16x470 370/350	✓	-	-	370	350



HSA STUD ANCHOR - SETTING INSTRUCTIONS

Machine tightening of the anchor for standard installation torque

Type	HSA, HSA-BW, HSA-R2, HSA-R																	
	M6			M8			M10			M12			M16			M20		
Setting position	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③	①	②	③
Nominal anchorage depth h _{nom} [mm]	37	47	67	39	49	79	50	60	90	64	79	114	77	92	132	90	115	130
Standard installation torque T _{inst} [Nm]	-			15			25			50			80			-		
Setting tool	-			S-TB HSA M8			S-TB HSA M10			S-TB HSA M12			S-TB HSA M16			-		
Impact screw driver	-			-			Hilti SIW 14-A Hilti SIW 22-A			-			Hilti SIW 22T-A			-		
Speed	-			1			1			3			- ¹⁾			-		
Setting time t _{set} [sec.]	-			-			-			-			-			4		

¹⁾ The impact screw driver operates with a fixed speed.

HUS3 STUD ANCHOR - SETTING INSTRUCTIONS

Installation equipment

Anchor size		8	10	14
Type	HUS3	H, C	H, C, HF	H, HF
Rotary hammer		TE 2 – TE 30	TE 2 – TE 30	TE 2 – TE 30
Drill bit for concrete, solid clay brick and solid sand-lime brick		CX 8	CX 10	CX 14
Drill bit for aerated concrete		CX 6	CX 8	-
Socket wrench insert		S-NSD 13 1/2	S-NSD 15 1/2	S-NSD 21 1/2
Torx		S-SY TX45	S-SY TX50	-
Tube for temporary application (only for H type)		HRG 8	HRG 10	HRG 14
Setting tool for concrete C12/15 to C50/60		SIW 22T-A		
Setting tool for solid brick and aerated concrete		SFH 22A		
Setting tool for hollow core slab		SIW 22 A		








ONSITE A. FIXING BRACKETS FOR UNITIZED SYSTEMS

3 CHEMICAL FAST CURING ANCHORS

Hilti provides an unique solution for façade brackets installation: HY 200 fast-curing adhesive with no cleaning required HIT-Z rod. This solution works in both cracked and non-cracked concrete.

The Hilt HIT-Z rod works as a torque-controlled bonded anchor. Because of their shape, rods are not affected by uncleaned holes.

Characteristics	HY 200	HIT-Z
Product description	 <p>Ultimate-performance hybrid mortar for heavy-duty anchoring</p>	 <p>Ultimate performance anchor rod for injection</p>
Material	Hybrid urethane methacrylate adhesive	Carbon steel Stainless steel A4 Multilayer coating
Base material	Cracked (concrete) Non-cracked (concrete)	
Load conditions	Tensile zone Fire resistance	
Installation conditions	Hammer drilled holes Diamond drilled holes	
Necessary accessories	HDE 500-A22 Cordless electric dispenser TE 7 Rotary hammer or TE 6-A36 cordless rotary hammer or TE 30-A36 cordless combi hammer TE-CX drill bits	

Product details/ ordering:

add qr code



ONSITE B. FIXING MULLIONS BRACKETS

1 ANCHOR FASTENING (MECHANICAL OR CHEMICAL) ON BRICK, HOLLOW BLOCK OR CONCRETE

Bracket fasteners are used to anchor substructures to load-bearing base material. The bracket fasteners must comply with national regulations or approval requirements and must meet the manufacturer's installation specifications. Where applicable, corrosion protection measures must be also implemented and the compatibility of materials considered.

The load-bearing capacity of the bracket fastener must also be verified by carrying out on-the-spot pull-out tests in accordance with equivalent test method.

Depending on the base material, the most common bracket fastening methods are:

1. Anchor fastening (mechanical or chemical) on brick, hollow block or concrete
2. Screw fastening on steel
3. Direct fastening on concrete or steel

ANCHOR SPECIFICATION (CHEMICAL & MECHANICAL)

	HIT-HY 200 HIT Z Rod HIT V Rod HIS N Sleeve Rebar	No borehole cleaning required (when used with HIT Z), suitable for dry and water saturated concrete, suitable for use in diamond drilled holes, fast cure	M8-M20 HIT Z, HIS N M8-M30 HIT V D8-D32 Rebar
	HIT-HY 170 HIT V Rod HAS Rod HAS E Rod HIT IC Sleeve HIT SC Sleeve	Everyday standard hybrid mortar for anchoring in concrete and masonry	M8-M24 HIT V, HAS, HAS E
	HIT-HY 270 HIT V/C HAS Rod	Chemical adhesive anchor for applications on masonry and hollow block, available in Profis Design Software	M6-M16 HIT V/C, , HAS, HAS E
	HVU HAS Rod HAS E Rod	Very high loading capacity, large diameter applications, suitable for dry and water saturated concrete	M8-M39 HAS, HAS E M8-M20 HIS
	HST 3	Safety wedge for follow up expansion	M8-M24
	HSA	different embedment depths, approved for diamond drilled holes 3	M6-M20
	HSV	.High quality stud anchor for non-specified applications	M8-M16
	HUS3	Reusable anchor available with hexagon and countersink heads. Up to 30% .more load in compaction to stud anchors	mm 14-8
	HRD	Excellent setting behaviour, versatile with regards: base material, finishes and head types; hex, countersunk, pan	8, 10, 14 mm
add hud-1, hud-l, ht after HPS			4-8 mm

Product details/ ordering

add qr code



Base material								Installation method		Special features		Corrosion protection			Approvals					
Uncracked concrete	Cracked concrete	Natural stone	Lightweight concrete	Solid brick	Airbrick	Hollowcore	Piesterboard	Through set installation	Pre-set installation	Small edge distance	Data available in PROFIS Anchor 2	Electroplated	Additional protection against corrosion	Stainless steel	Fire	European technical approval	Shock load	Dynamic load	Sprekner	CE Marking

Anchor applications / approvals



ONSITE B. FIXING MULLIONS BRACKETS

2 SCREW FASTENING ON STEEL

Before the right screw for fastening brackets can be selected, the properties of the material, e.g. thickness of steel must be known.



Characteristics	HY 200	HIT-Z
		change table
Product description	Ultimate-performance hybrid mortar for heavy-duty anchoring	Ultimate performance anchor rod for injection
Material	Hybrid urethane methacrylate adhesive	Carbon steel Stainless steel A4 Multilayer coating
Base material	Cracked (concrete) Non-cracked (concrete)	

Product details/ ordering

add qr code





ONSITE B. FIXING MULLIONS BRACKETS

3 DIRECT FASTENING ON CONCRETE OR STEEL

With the direct fastening technology, a powder-actuated fastening tool is used to drive a nail or threaded studs into concrete or steel.

Provides high fastening rate and easy to use solution for curtain wall fastening. Due to constant exposure to external environment stainless steel nails or threaded studs to be used.

When pre-drilling in concrete for threaded studs fastening, it helps to guide the nail and ensures extremely high loads. Additionally, the hole is drilled to a depth of only 23 mm and no reinforcing bars are hit during the drilling.

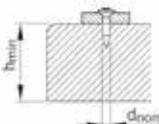






Product details/ ordering:

add qr code

Characteristics

DX 5-F8



Product description	Powder actuated fastening tool	
Technology	Hybrid urethane methacrylate adhesive	
Magazine holds	DX 5-F8: single nail	
Base material	concrete, steel	
Thickness of base material concrete:		Nails: $h_{min} \geq 80.00 \text{ mm}$ Threaded studs: $h_{min} \geq 100.00 \text{ mm}$
Steel:		Nails: $t_l \geq 6.00 \text{ mm}$ Threaded studs: $h_{min} \geq 4.00 \text{ mm}$
Thickness of fastened material (steel plate/ GI sheet)	Nails: $t_l \leq 3.00 \text{ mm}$ Threaded studs: $t_l \approx \text{up to } 13 \text{ mm}$	
Nails		concrete & steel nails: X-CR 14, 16, 21, 29 P8 
Threaded studs		concrete: X-CR M8 (requires pre-drilling)  
Necessary accessory	Cartridge 6.8/11, drill bit TE-C-5/23B or TE-C-5/23, TE 4-A22	

ONSITE C. FIXING INSULATION IN CLADDING AREA

Insulation Fasteners

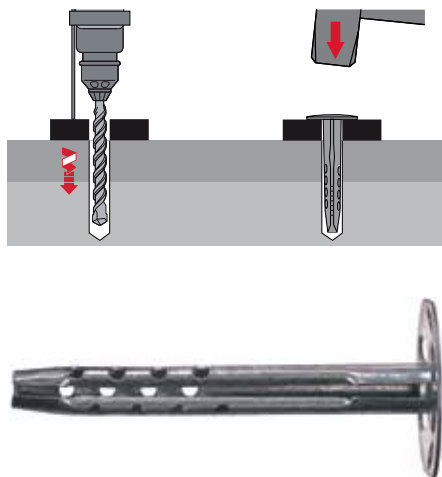
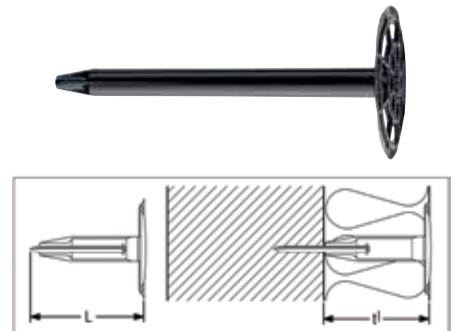
The insulation sheets must be fitted without gaps and reliably, permanently secured (depending on the type of substructure, anchors, adhesive, clamps or mechanical pressure may be used). The wind loads to be expected, also during construction, must be taken into account. Excessive compression of the insulating material at the fastening points should be avoided.

Hilti offers a range of insulation fasteners:

- Insulation fastener with direct fastening (X-IE)
- Insulation fastener (HIF)
- Insulation fastener with expansion pin (IZ)
- Fire-resistant metal insulation fastener (IDMR/IDMS)



Characteristics X-IE	
Base material	Concrete
Insulation thickness	60 – 200 mm
Load capacity	High
Washer diameter	90 mm
Insulation material	Mineral wool, EPS
Necessary accessories	DX 460 and cartridge 6.8/11



Characteristics IDMR/IDMS	
Base material	Concrete
Insulation thickness	60 – 240 mm
Load capacity	Medium
Washer diameter	90 mm
Insulation material	Mineral wool, EPS
Necessary accessories	Hammer

ONSITE

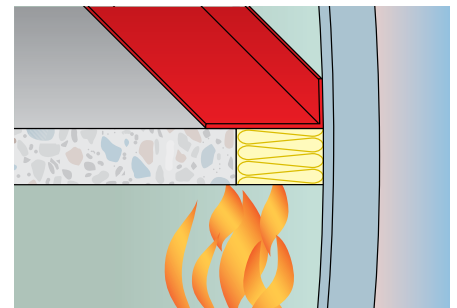
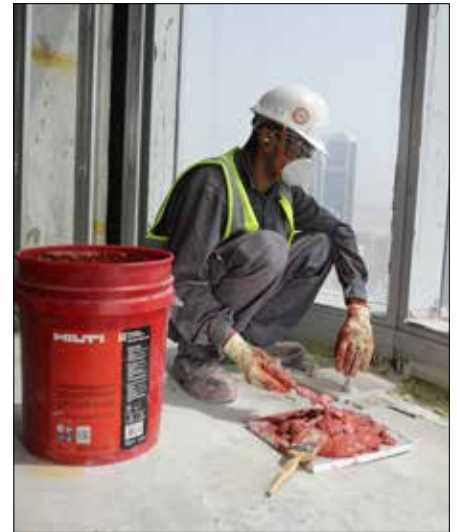
D. SEALING PERIMETER GAP

The structure of a building changes dramatically during a fire. Components become deformed and facades bulge outwards. Curtain walls flex under wind loads, and in seismically active areas will need to be designed to accommodate this movement. Conventional or static firestop solutions can compensate for these deformations only to a limited extent. Gaps and cracks open up between floor decks and walls or curtain wall facade sections, allowing flames, smoke and dangerous fumes to spread.

The perimeter barrier shall be intended to restrict the interior vertical passage of flame and hot gases from one floor to another at the location where the floor intersects the inside of an exterior curtain wall.

Only tested and listed firestop systems, which provide dynamic movement capabilities shall be used for slot gaps between edge of floor slabs and perimeter curtain walls.

The sealing membrane created by Hilti CFS-SP WB firestop joint spray is extremely elastic and capable of adapting to a gap, provides a reliable, fire-resistant membrane.



Characteristics	
Product flexibility	Meets 500 cycles requirements (as per ASTM E 1966 & UL 2079)
Movement capabilities	Up to 50%
Curing time	Approx. 24 hours @ 73°F (24°C), 50% humidity for 1/8" (3mm) depth
Insulation material	Rock wool
Necessary accessory	Brush or spray machine
Tested in accordance with	ASTM E2307 BS EN 1364-4 UL CW-D-1001, CW-D-1015, CW-D-1018, CW-D-2025, CW-D-2027, CW-D-2046, CW-S-1007, CW-S-2028, CW-S-2030, CW-S-2032, CW-S-2053 INTERTEK CEJ 127P, CEJ 216P, CEJ 244P, CEJ 245P, CEJ 246P, CEJ 259P, CEJ 260P, CEJ 261P, CEJ 262P, CEJ 263P, CEJ 264P, CEJ 265P, CEJ 307P, CEJ 308P, CEJ 309P, CEJ 310P, CEJ 314P, CEJ 315P, CEJ 316P, CEJ 400P, CEJ 421P, CEJ 425P, CEJ 526P, CEJ 529P, HI_BP 120-05, HI_BP 150-01
Tested and listed firestop systems	

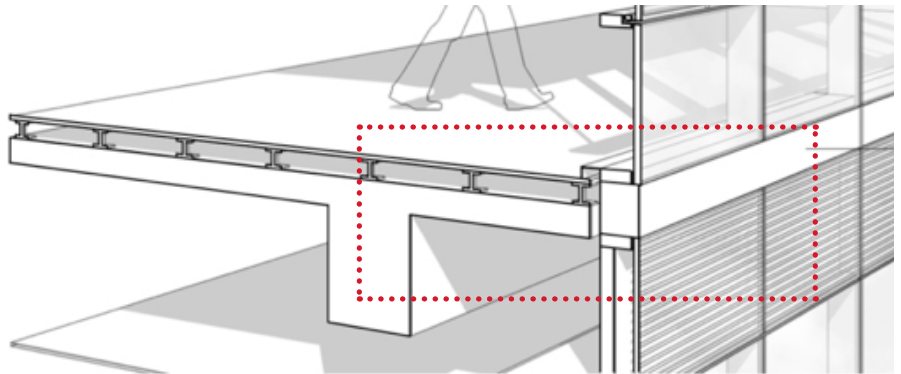





ONSITE E. FIXING GI SHEET



A metal sheet layer covering perimeter gap (over the sealed perimeter gap). Depending on thickness and type of metal sheet, it may provide an additional aesthetical finishing and soundproofing requirements, besides providing a cover for the rockwool with firestop.

Hilti offers a range of solutions for fixing GI sheet



Characteristics	BX 3	GX 120	DX 5-F8/ MX 72
Product description	 Battery actuated fastening tool	 Gas actuated fastening tool	 Powder actuated fastening tool Technology
Technology	Battery actuated	Gas actuated	Powder actuated
Magazine holds	20 nails	40 nails	DX 5-F8: single nail DX 5 MX 72: 10 nails
Base material	filled block, concrete, steel	concrete, concrete block, steel	concrete, steel
Thickness of base material concrete:	concrete: hmin = 60.00 mm dnom = 3.00 mm	concrete: hmin = 60.00 mm dnom = 3.00 mm	concrete: hmin ≥ 80.00 mm
steel:	steel: tll ≥ 4.00 mm	steel: tll ≥ 4.00 mm	steel: tll ≥ 6.00 mm
Thickness of fastened material (steel plate/ GI sheet)	tl ≤ 2.00 mm	tl ≤ 2.00 mm	tl ≤ 3.00 mm
Nails	concrete nails: X-C 20/24 B3 MX steel nails: X-S 14 B3 MX	concrete nails X-GN 20/27 steel nails: X-EGN 14MX, 18MX, 20MX, 24MX	Concrete nails: X-C 20, X-C 27 High strength concrete: X-P 22, X-P 27 Steel nails: X-U 16, X-U 19 X-MX nails with DX 5 MX, X-P8 nails with DX 5-F8
Necessary accessory	Battery charger C 4/36 Li-Ion 230V Battery pack B 22/2.6 Li-Ion	Gas can GC 21	concrete: X-CR M8 (requires pre-drilling) steel: X-CR M8 (no pre-drilling)
Necessary accessory			Cartridge 6.8/11, drill bit TE-C-5/23B or TE-C-5/23, TE 4-A22

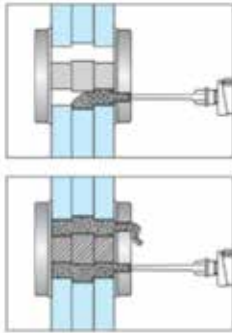
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ONSITE - F. POINT FIXING GLASS WALL

The incorporation of structural glass in a building presents many challenges due to the transfer of alternating compressive and shear forces between the glass and the steel structure. Allowance must also be made for stresses generated by temperature fluctuations and the heat of the sun. A versatile, reliable high-strength fastening solution capable of meeting these demanding requirements is thus called for.

Hilti HIT-HY 270 injectable adhesive mortar is particularly suitable. In contrast to mechanical fastening solutions, this injectable mortar offers maximum flexibility in use and its high compressive strength combined with excellent ductility allows loads to be taken up reliably without transferring stress peaks to the glass.



Product details/ ordering:

add qr code



Characteristics	HIT-HY 270
Product description	Ultimate performance hybrid mortar for all glass
Necessary accessories	HDE 500-A22 Cordless electric dispenser

Ordering designation	Content per can/cartridge	Package contents	Sales pack quantity	Item number
HIT-HY 270 330/2	330 ml	1x Foil pack, 2x Mixer, 1x Mixer extension	1 pc	2092828
HIT-HY 270 330/1/P(20)	330 ml	1x Foil pack, 1x Mixer, 1x Mixer extension	20 pc	2092880
HIT-HY 270 500/2	500 ml	1x Foil pack, 2x Mixer, 1x Mixer extension	1 pc	2092829

Chemical and mechanical compatibility

- Compatibility with PVB film (polyvinyl butyral film) in laminated glass
- Compatibility with EPDM films (ethylene propylene diene monomer rubber) in the case of seals
- Compatibility with silicone caulking compounds
- Compatibility with stainless steel and aluminum surfaces


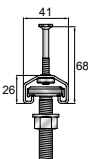
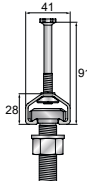
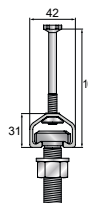
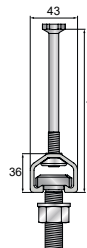
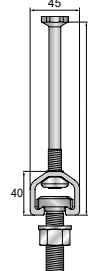
CONTENTS AND OVERVIEW OF THIS SECTION

Section

Page

4 Load tables

HAC Anchor Channels with European Technical Assessment (ETA) & ICC-ES Report

Profile		HAC-30 Advanced TCRS	HAC-40 Advanced TCRS	HAC-50 Advanced TCRS	HAC-60 Advanced TCRS	HAC-70 Advanced TCRS
Anchor		Round anchor				
		serrated profile 				
						
Material	Hot-dip galvanized	•	•	•	•	•
	Stainless steel A4	not available	not available	not available	not available	not available
T-Bolts ¹⁾		HBC-B	HBC-C			
Thread		M10 - M12	M10 - M16			
Tension design resistance of channel lips ²⁾						
	$N_{Rd,s,l}$ [kN]	11,1	13,9	19,4	27,8	39,4
Shear design resistance of channel lips Y-direction ²⁾						
	$V_{Rd,s,l}$ [kN]	13,2	19,4	26,4	40,1	53,2
Geometry						
Effective anchorage depth min.						
	$h_{ef,min}$ [mm]	68	91	106	148	175
Width of channel						
	b_{ch} [mm]	41	41	42	43	45
Height of channel						
	h_{ch} [mm]	26	28	31	36	40
Min. edge distance						
	c_{min} [mm]	50	50	50	75	75
Min. anchor spacing						
	s_{min} [mm]	50	100	100	100	100
Max. anchor spacing						
	s_{max} [mm]	250	250	250	250	250
End spacing						
	x [mm]	25	25	25	25	25
Further product information available on Hilti.com or your local Hilti website.						
¹⁾ Design resistance of the T-Bolt has to be proven additionally.						
²⁾ The given resistance values are only steel capacities of channel lips per bolt. For the influence of other boundary conditions like concrete please use our software or contact your Hilti technical team.						

June, 1st 2017

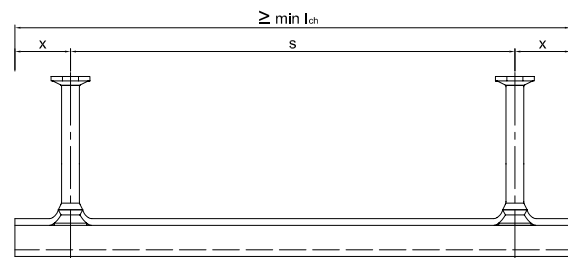
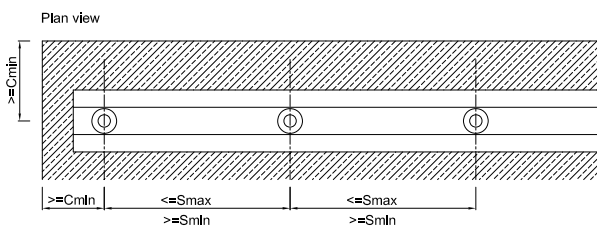
HAC-C Anchor Channels with European Technical Assessment (ETA)

Profile		HAC-C 28/15 Cold rolled	HAC-C 38/17 Cold rolled	HAC-C 40/25 Cold rolled	HAC-C 49/30 Cold rolled	HAC-C 54/33 Cold rolled
Anchor		Round anchor				
Material	Hot-dip galvanized	•	•	•	•	•
	Stainless steel A4	•	•	•	•	•
T-Bolts ¹⁾		28/15	38/17	40/22	50/30	50/30
Thread		M 10 - M 12	M 10 - M 16	M 12 - M 16	M 12 - M 20	M 12 - M 20
Tension design resistance of channel lips ²⁾						
	$N_{Rd,s,l}$ [kN]	5,0	10,0	11,1	17,2	30,6
Shear design resistance of channel lips Y-direction ²⁾						
	$V_{Rd,s,l}$ [kN]	5,0	10,0	11,1	17,2	30,6
Geometry						
Effective anchorage depth min.						
	$h_{ef,min}$ [mm]	45	76	79	94	155
Width of channel						
	b_{ch} [mm]	28	38	40	50	53,5
Height of channel						
	h_{ch} [mm]	15	17	25	30	33
Min. edge distance						
	c_{min} [mm]	40	50	50	75	100
Min. anchor spacing						
	s_{min} [mm]	50	100	100	100	100
Max. anchor spacing						
	s_{max} [mm]	200	200	250	250	250
End spacing						
	x [mm]	25	25	25	25	35


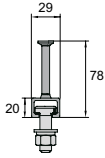
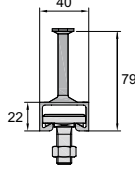
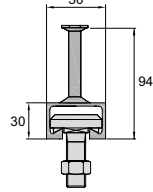
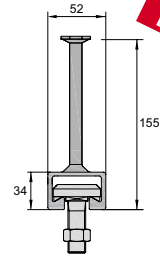
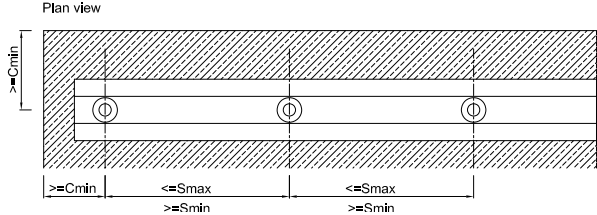
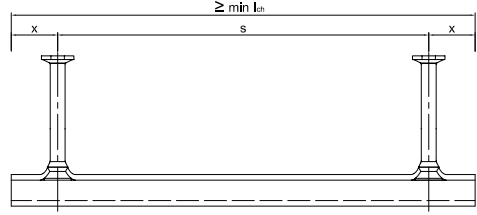
Further product information available on Hilti.com or your local Hilti website.

¹⁾ Design resistance of the T-Bolt has to be proven additionally.

²⁾ The given resistance values are only steel capacities of channel lips per bolt. For the influence of other boundary conditions like concrete please use our software or contact your Hilti technical team.



















HAC-C Cast-in Channels with European Technical Assessment (ETA)

Profile		HAC-C 29/20 ¹⁾ Hot rolled	HAC-C 40/22 Hot rolled	HAC-C 50/30 Hot rolled	HAC-C 52/34 Hot rolled	
Anchor		Round anchor				
		serrated profile  				
Material		Hot-dip galvanized				
		Stainless steel A4	not available			
T-Bolts ²⁾		29/20	40/22	50/30	50/30	
Thread		M 12	M 12 - M 16	M 12 - M 20	M 12 - M 20	
Tension design resistance of channel lips ³⁾						
		$N_{Rd,s,l}$ [kN]	11,2	19,4	20,0	36,1
Shear design resistance of channel lips Y-direction ³⁾						
		$V_{Rd,s,l}$ [kN]	11,2	14,4	22,4	39,7
Geometry						
Effective anchorage depth min.						
		$h_{ef,min}$ [mm]	78	79	94	155
Width of channel						
		b_{ch} [mm]	29	40	50	52
Height of channel						
		h_{ch} [mm]	20	22	30	34
Min. edge distance						
		c_{min} [mm]	100	50	75	100
Min. anchor spacing						
		s_{min} [mm]	100	100	100	100
Max. anchor spacing						
		s_{max} [mm]	200	250	250	250
End spacing						
		x [mm]	25	25	25	35
¹⁾ No ETA Assessment, covered by China TB code ²⁾ Design resistance of the T-Bolt has to be proven additionally. ³⁾ The given resistance values are only steel capacities of channel lips per bolt. For the influence of other boundary conditions like concrete please use our software or contact your Hilti technical team. ⁴⁾ Value for steel to steel contact.						
Plan view 						

June, 1th 2017

HST3 METAL EXPANSION ANCHOR

Anchor version	Benefits
 <p>HST3 Carbon steel</p>  <p>HST3-R Stainless steel</p>	<ul style="list-style-type: none"> - highest resistance for reduced member thickness, short spacing and edge distances - increased undercut percentage in combination with optimized coating - suitable for non-cracked and cracked concrete C 12/15 to C 80/95 - highly reliable and safe anchor for structural seismic design with ETA C1/C2 approval - flexibility with two embedment depths included in the ETA
 <p>HST3-BW Carbon steel</p>  <p>HST3-R-BW Stainless steel</p>	<ul style="list-style-type: none"> - minimum edge and spacing distances reduced by up to 25% compared to HST - design tension resistance increased by up to 66% compared to HST - product and length identification mark facilitates quality control and inspection



Base material  Concrete (uncracked)  Concrete (cracked)	Load conditions  Static/quasi-static  Seismic ETA-C1/C2  Fire ETA
Installation conditions  Hammer drilled holes  Diamond drilled holes  Hollow drill-bit drilling	Other informations  European Technical Approval  CE conformity  HILTI PROFIS Anchor design Software  FM approved












Recommended loads

Anchor size		M8	M10	M12	M16	M20	M24			
Eff. Anchorage depth h_{ef} [mm]		47	40	60	50	70	65	85	101	125
Non-cracked concrete										
Tensile N_{rec}^a										
HST3/HST3-BW	[kN]	5,7	6,1	9,5	8,5	11,9	12,6	18,8	24,4	28,6
HST3-R/HST3-R-BW	[kN]	5,7	6,1	9,5	8,5	11,9	12,6	18,8	24,4	28,6
Shear V_{rec}^a										
HST3/HST3-BW	[kN]	7,9	12,5	13,5	19,4	20,2	31,1	31,6	47,9	44,8
HST3-R/HST3-R-BW	[kN]	9,0	14,6	14,5	17,8	21,0	27,8	36,3	55,5	63,2
Cracked concrete										
Tensile N_{rec}^a										
HST3/HST3-BW	[kN]	3,6	4,3	5,7	6,1	9,5	9,0	13,4	17,4	19,0
HST3-R/HST3-R-BW	[kN]	3,6	4,3	5,7	6,1	9,5	9,0	13,4	17,4	19,0
Shear V_{rec}^a										
HST3/HST3-BW	[kN]	7,9	11,6	13,5	16,8	20,2	30,6	31,6	47,9	44,8
HST3-R/HST3-R-BW	[kN]	9,0	11,6	14,5	16,8	21,0	27,8	36,3	55,5	59,9

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HST2 METAL EXPANSION ANCHOR

Anchor version		Benefits
	HST2 Carbon steel	<ul style="list-style-type: none"> - optimized expansion cone and wedge design combined with special steel and coatings - suitable for non-cracked and cracked concrete - Product and length identification mark facilitates quality control and inspection
	HST2-R Stainless steel	
	HST2-BW Carbon steel	
	HST2-R-BW Stainless steel	

Base material  Concrete (uncracked)  Concrete (cracked)			Load conditions  Static/quasi-static  Fire ETA	
Installation conditions  Hammer drilled holes  Hollow drill-bit drilling  Diamond drilled holes			Other informations  European Technical Approval  CE conformity  PROFIS Anchor design Software  FM approved	

Recommended loads

Anchor size		M8	M10	M12	M16
Eff. Anchorage depth h_{ef}	[mm]	47	60	70	82
Non-cracked concrete					
Tensile N_{rec}^a					
HST2/HST2-BW	[kN]	4,3	7,6	9,5	16,7
HST2-R/HST2-R-BW	[kN]	4,3	7,6	9,5	16,7
Shear V_{rec}^a					
HST2/HST2-BW	[kN]	6,5	12,3	17,9	31,6
HST2-R/HST2-R-BW	[kN]	9,0	14,5	21,0	35,7
Cracked concrete					
Tensile N_{rec}^a					
HST2/HST2-BW	[kN]	2,4	4,3	5,7	9,5
HST2-R/HST2-R-BW	[kN]	2,4	4,3	5,7	11,9
Shear V_{rec}^a					
HST2/HST2-BW	[kN]	6,5	12,3	17,9	31,6
HST2-R/HST2-R-BW	[kN]	9,0	14,5	21,0	31,8

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HSA STUD ANCHOR

Anchor version	Benefits
 <p>HSA Carbon steel with DIN 125 washer</p>	<ul style="list-style-type: none"> - Fast & convenient setting behaviour - Reliable ETA approved torquing using impact wrench with torque bar for torque control - Small edge and spacing distances - High loads - Three embedment depths for maximal design flexibility - M12, M16 and M20 ETA approved for diamond cored holes using DD 30-W and matching diamond core bit - Suitable for pre- and through fastening - long lengths available suitable for wood structures fastening applications
 <p>HSA-R Stainless steel A4 with DIN 125 washer</p>	
 <p>HSA-R2 Stainless steel A2 with DIN 125 washer</p>	
 <p>HSA-BW Carbon steel with DIN 9021 washer</p>	
 <p>HSA-F Carbon steel hot dipped galvanized with DIN 125 washer</p>	



Concrete (uncracked)



Small edge distance and spacing



Fire resistance



Corrosion resistance



Diamond drilled holes



European Technical Assessment



CE conformity



PROFIS Anchor design software

Recommended loads



Anchor size		M6			M8			M10		
Effective anchorage depth	h_{ef} [mm]	30	40	60	30	40	70	40	50	80
Tensile $N_{rec}^{a)}$	HSA, HSA-BW	2,9	3,6	4,3	4,0	6,1	7,6	6,1	8,5	11,9
	HSA-R2, HSA-R	2,9	3,6	4,3	4,0	6,1	7,6	6,1	8,5	11,9
	HSA-F	2,9	3,6	4,3	4,0	6,1	7,6	6,1	8,5	11,9
Shear $V_{rec}^{a)}$	HSA, HSA-BW	3,7	3,7	3,7	4,0	6,1	6,1	10,8	10,8	10,8
	HSA-R2, HSA-R	4,0	4,1	4,1	4,0	7,0	7,0	12,9	12,9	12,9
	HSA-F	3,7	3,7	3,7	4,0	6,1	6,1	10,8	10,8	10,8

Anchor size		M12			M16			M20		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Tensile $N_{rec}^{a)}$	HSA, HSA-BW	8,5	12,6	16,7	12,6	17,2	23,8	15,6	24,0	29,7
	HSA-R2, HSA-R	8,5	12,6	16,7	12,6	17,2	23,8	15,6	24,0	29,7
	HSA-F	8,5	12,6	16,7	12,6	17,2	23,8	15,6 ^{b)}	24,0 ^{b)}	29,7 ^{b)}
Shear $V_{rec}^{a)}$	HSA, HSA-BW	16,9	16,9	16,9	29,1	29,1	29,1	31,2	49,0	49,0
	HSA-R2, HSA-R	16,7	16,7	16,7	32,3	32,3	32,3	31,2	52,5	52,5
	HSA-F	16,9	16,9	16,9	29,1	29,1	29,1	31,2 ^{b)}	49,0 ^{b)}	49,0 ^{b)}

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

b) Data covered by Hilti Technical Data.

HSV STUD ANCHOR

	Anchor versions	Benefits
	HSV Carbon steel with DIN 125 washer	<ul style="list-style-type: none"> - torque-controlled mechanical expansion allows immediate load application - setting mark - cold-formed to prevent breaking during installation - raised impact section prevents thread damage during installation - drill bit size is same as anchor size for easy installation.
	HSV-BW Carbon steel with DIN 9021 washer and DIN 127b spring washer	



Concrete

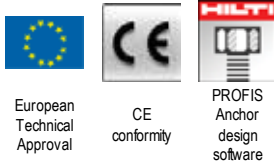
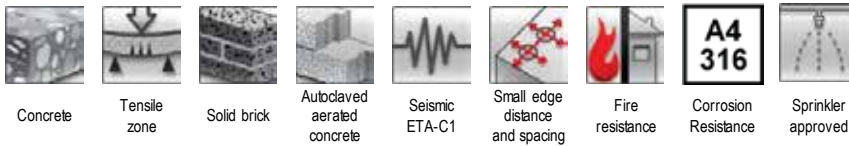
Recommended loads

Anchor size		M8		M10		M12		M16	
Effective anchorage depth $h_{ef} \geq$	[mm]	30	40	40	50	50	65	65	80
Tensile $N_{rec}^{a)}$	[kN]	3,3	4,8	5,7	6,7	6,9	9,5	10,5	14,3
Shear $V_{rec}^{a)}$	[kN]	4,0	4,9	6,1	8,2	8,5	12,9	24,2	24,2

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HUS-CR/HR SCREW ANCHOR

	Anchor version	Benefits
	HUS-HR 6 / 8 / 10 / 14 Stainless steel concrete Screw with hexagonal head	<ul style="list-style-type: none"> - High productivity – less drilling and fewer operations than with conventional anchors - ETA approval for cracked and non-cracked concrete - Seismic approval ETA C1 - Small edge and spacing distances
	HUS-CR 10 Stainless steel concrete screw with countersunk head	








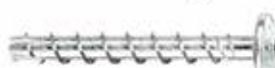

Recommended loads

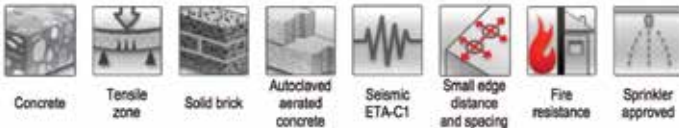
Anchor size	HUS	Non-cracked concrete				Cracked concrete			
		6	8	10	14	6	8	10	14
Type	HUS	HR	HR	HR,CR	HR	HR	HR	HR,CR	HR
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	30	50	60	-	30	50	60	-
Tensile $N_{rec}^{a)}$	[kN]	- ^{b)}	3,6	4,8	-	- ^{b)}	2,0	3,0	-
Shear $V_{rec}^{a)}$	[kN]	- ^{b)}	11,2	15,0	-	- ^{b)}	8,0	10,7	-
Reduced embedment (ETA-08/0307)									
h_{nom}	[mm]	-	60	70	70	-	60	70	70
Tensile $N_{rec}^{a)}$	[kN]	-	4,8	6,3	7,5	-	2,4	3,6	4,8
Shear $V_{rec}^{a)}$	[kN]	-	12,4	15,7	18,0	-	11,0	13,6	12,9
Standard embedment (ETA-08/0307)									
h_{nom}	[mm]	55	80	90	110	55	80	90	110
Tensile $N_{rec}^{a)}$	[kN]	3,1	6,3	9,9	16,0	1,7	4,8	6,3	9,9
Shear $V_{rec}^{a)}$	[kN]	8,1	12,4	15,7	36,7	7,8	12,4	15,7	27,3

a) With overall partial safety factor for action $\gamma = 1,4$, The partial safety factors for action depend on the type of loading and shall be taken from national regulations,

b) Please refer to resistance table in all load directions for multiple use fastenings in section HUS 6 screw anchor for redundant fastening,

HUS3 SCREW ANCHOR

	Anchor version	Benefits
	HUS3-H 6 / 8 / 10 / 14 Carbon steel concrete screw with hexagonal head	- High productivity – less drilling and fewer operations than with conventional anchors - ETA approval for cracked and non-cracked concrete
	HUS3-C 6 / 8 / 10 Carbon steel concrete screw with countersunk head	- ETA approval for adjustability (unscrew-rescrew) - Seismic approval ETA C1
	HUS3-HF 6 / 10 / 14 Carbon steel concrete screw with multilayer coating (≥14 µm) and hexagonal head	- High loads - Small edge and spacing distances - abZ (DIBt) approval for reusability in fresh concrete ($f_{cr,0.05} = 10/15/20 \text{ Nmm}^2$) for temporary applications
	HUS3-A 6 Carbon steel concrete screw with hexagonal head	- Three embedment depths for maximum design flexibility - HUS3-HF with multilayer coatings for additional corrosion protection
	HUS3-I 6 Carbon steel concrete screw with hexagonal head	- Forged-on washer and hexagon head with no protruding thread - Through fastening
	HUS3-P 6 Carbon steel concrete screw with pan head	
	HUS3-PS 6 Carbon steel concrete screw with pan head (small)	




Recommended load

		Data according ETA-13/1038, issue 2015-08-27.										
Anchor size		6		8			10			14		
Type	HUS3	H, C, A, I	P, PS	H, C, HF			H, C, HF			H, HF	H	
Nominal embedment depth	h_{nom} [mm]	55	55	50	60	70	55	75	85	65	85	115
Non-cracked concrete												
Tensile $N_{Ru,m}$	[kN]	3,6	3,0	4,3	5,7	7,6	5,7	9,5	13,2	8,3	13,0	21,2
Shear $V_{Ru,m}$	[kN]	6,0	6,0	6,1	8,1	8,1	6,5	13,3	13,3	16,6	21,4	21,4
Cracked concrete												
Tensile $N_{Ru,m}$	[kN]	2,4	2,4	2,9	4,3	5,7	4,6	7,7	9,4	5,9	9,3	15,1
Shear $V_{Ru,m}$	[kN]	6,0	6,0	4,3	8,1	8,1	4,6	13,3	13,3	11,9	18,5	21,4

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HUD-1 UNIVERSAL ANCHOR

Anchor version	Benefits
 <p>HUD-1</p>	<ul style="list-style-type: none"> - fast setting - flexibility of screw length - an anchor for every base material



Concrete Solid brick Hollow brick Autoclaved aerated Drywall

Recommended loads ^{e)}

Anchor size	Screw type ^{d)}	5x25		6x30		8x40		10x50		12x60	14x70
		W	C	W	C	W	C	W	C	W	W
Concrete ≥ C16/20	N _{rec} [kN]	0,3	0,1	0,55	0,35	0,85	0,5	1,4		2	3
	V _{rec} [kN]	0,4		0,9		1,25		2,2		3	5,6
Solid clay brick Mz 20	N _{rec} [kN]	0,17	0,06	0,35	0,15	0,6	0,35	0,8		1	1
	V _{rec} [kN]	0,24		0,3		0,44					
Solid sand-lime brick KS 12	N _{rec} [kN]	0,25	0,15	0,5	0,3	0,85	0,4	1		1,5	1,5
	V _{rec} [kN]	0,25		0,56		0,74		1,32			
Hollow clay brick HlzB 12	N _{rec} [kN]	0,08	0,05	0,1	0,08	0,2	0,12	0,25		0,28	0,32
	V _{rec} [kN]	0,23		0,35							
Hollow clay brick HlzB 12 – 15mm plastered	N _{rec} [kN]	0,08	0,05	0,15	0,1	0,25	0,15	0,3		0,35	0,4
	V _{rec} [kN]	0,23		0,35							
Autoclaved aerated concrete AAC 2	N _{rec} [kN]	0,06	0,04	0,1	0,06	0,15	0,1	0,2		0,25	0,3
	V _{rec} [kN]	0,04		0,05		0,08					
Autoclaved aerated concrete AAC 4	N _{rec} [kN]	0,1	0,06	0,15	0,1	0,3	0,2	0,4		0,5	0,6
	V _{rec} [kN]	0,13		0,18		0,3					
Gypsum board Thickness 12,5mm	N _{rec} [kN]	0,04	0,06	0,05	0,08	0,06	0,1		0,15		
	V _{rec} [kN]	0,09		0,14							
Gypsum board Thickness 2x12,5mm	N _{rec} [kN]	0,06	0,06	0,08	0,08	0,1	0,1	0,15	0,2	0,3	
	V _{rec} [kN]	0,09		0,14							
Fibre reinforced gypsum board Thickness 12,5mm	N _{rec} [kN]	0,09		0,12		0,18					
	V _{rec} [kN]	0,14		0,19		0,29					
Fibre reinforced gypsum board Thickness 2x12,5mm	N _{rec} [kN]	0,09		0,24		0,36		0,42			
	V _{rec} [kN]	0,14		0,38		0,58		0,67			

a) only with screw diameter 6mm

b) only with screw diameter 8mm



c) only with screw diameter 10mm

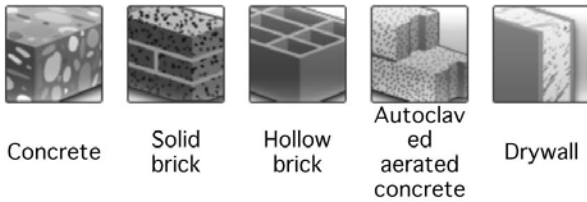
d) Screw type: W: Wood-screw C: Chipboard screw

Load data are valid for the mentioned woodscrew type, if other types or different screws are used the load capacity may decrease.

e) With overall global safety factor $\gamma = 5$ to the characteristic loads and a partial safety factor of $\gamma = 1,4$ to the design values.

HUD-L UNIVERSAL ANCHOR

	Anchor version	Benefits
	HUD-L 6 HUD-L 8	<ul style="list-style-type: none"> - universal plastic anchor for weak base materials and renovation - for many base materials - daily application - excellent setting behaviour
	HUD-L 10	



Recommended loads ^{d)}

Anchor size		HUD-L 6x50	HUD-L 8x60	HUD-L 10x70
	Screw type ^{c)}	Woodscrew 4,5x80 DIN 96	Woodscrew 5x90 DIN 96	Woodscrew 8mm DIN 571
Concrete ≥ C16/20	F _{rec} [kN]	0,23	0,28	1,8
Solid clay brick Mz 12	F _{rec} [kN]	0,17	0,2	-
Solid clay brick Mz 20	F _{rec} [kN]	-	-	1,4
Solid sand-lime brick KS 12	F _{rec} [kN]	0,17	0,2	0,4
Hollow clay brick Hlz 12 ^{a)}	F _{rec} [kN]	0,1	0,15	0,3
Hollow sand-lime brick KSL 12	F _{rec} [kN]	0,14	0,16	-
Autoclaved aerated concrete AAC 2 ^{a)}	F _{rec} [kN]	0,05	0,11	0,4
Gypsum board Thickness 2x12,5mm ^{a)}	F _{rec} [kN]	0,06	0,14	0,12 ^{b)}

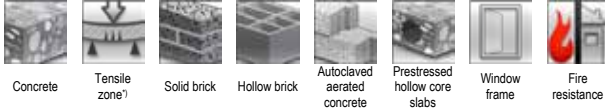
a) Drilling without hammering

b) Suitable for fitting hexagonal screws by hand

c) Load data are valid for the mentioned woodscrew type, if other types or different screws are used the load capacity may decrease.

d) With overall global safety factor $\gamma = 5$ to the characteristic loads and a partial safety factor of $\gamma = 1,4$ to the design values.

HRD FRAME ANCHOR



	Anchor version	Benefits
	HRD-C 8x HRD-CR 8x	Innovative screw design for better hold Suitable on practically all base materials
	HRD-C 10x... HRD-CR 10x... HRD-CR2 10x...	Flexible embedment depth (approved at 50mm and 70mm)
	HRD-H 10x... HRD-HR 10x... HRD-HR2 10x... HRD-HF 10x...	Suitable for fastening thicknesses up to 260mm
	HRD-K 10x... HRD-KR 10x... HRD-KR2 10x...	Available in 4 different materials for optimum suitability in all corrosive environments Pre-assembled for optimum handling and fastening quality
	HRD-P 10x... HRD-PR 10x... HRD-PR2 10x...	

Recommended loads ^{a)}

Anchor size				HRD 8		HRD 10	
				h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Concrete C 12/15	N_{rec} [kN]	0,8	1,2	2,4	-		
	V_{rec} [kN]	3,9 / 3,7 ^{b)}		6,1 / 5,8 ^{b)} / 6,1 ^{c)}			
Concrete C 16/20 –C 50/60	N_{rec} [kN]	1,2	1,8	3,4	-		
	V_{rec} [kN]	3,9 / 3,7 ^{b)}		6,1 / 5,8 ^{b)} / 6,1 ^{c)}			
Solid clay brick Mz 2,0 DIN V 105-100 / EN 771-1	$f_b \geq 20$ N/mm ² F_{rec} [kN]	0,42	0,85 1,28 ^{d)}	f)	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	0,34	0,57 0,85 ^{d)}	f)	-		
Solid sand-lime brick KS 2,0 DIN V 106 / EN 771-2	$f_b \geq 20$ N/mm ² F_{rec} [kN]	0,7	0,85 1,28 ^{d)}	f)	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	0,57	0,57 0,85 ^{d)}	f)	-		
Lightweight solid block Vbl 0,9 DIN V 18151-100 / EN 771-3	$f_b \geq 20$ N/mm ² F_{rec} [kN]	-	1,0 1,71 ^{d)}	f)	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	-	0,71 1,28 ^{d)}	f)	-		
	$f_b \geq 6$ N/mm ² F_{rec} [kN]	0,14	-	-	-		
Ital. solid brick Tufo	$f_b \geq n/a$ F_{rec} [kN]	0,4	-	-	-		
Hollow clay brick Hz B 12/1,2 A ^{e)}	brick $f_b \geq 12$ N/mm ² F_{rec} [kN]	0,14	-	-	-		
Vertically perforated clay brick Hz 1,2-2DF F ^{e)}	brick $f_b \geq 8$ N/mm ² F_{rec} [kN]	-	0,42	-	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	-	0,57	-	-		
	$f_b \geq 12$ N/mm ² F_{rec} [kN]	-	0,57	-	-		
Vertically perforated clay brick Hz 1,0-2DF G ^{e)}	brick $f_b \geq 8$ N/mm ² F_{rec} [kN]	-	0,11	0,21	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	-	0,14	0,25	-		
	$f_b \geq 12$ N/mm ² F_{rec} [kN]	-	0,17	0,25	-		
	$f_b \geq 20$ N/mm ² F_{rec} [kN]	-	0,25	0,42	-		
Vertically perforated clay brick VHz 1,6-2DF brick H ^{e)}	$f_b \geq 28$ N/mm ² F_{rec} [kN]	-	0,57	0,71	-		
	$f_b \geq 50$ N/mm ² F_{rec} [kN]	-	0,85	1,0	-		
Vertically perforated clay brick Poroton T8 M ^{e)}	brick $f_b \geq 6$ N/mm ² F_{rec} [kN]	-	0,21	0,42	-		
Vertically perforated clay brick Hz 1,0-9DF L ^{e)}	brick $f_b \geq 8$ N/mm ² F_{rec} [kN]	-	0,34	0,42	-		
	$f_b \geq 10$ N/mm ² F_{rec} [kN]	-	0,42	0,42	-		
	$f_b \geq 12$ N/mm ² F_{rec} [kN]	-	0,42	0,57	-		
	$f_b \geq 16$ N/mm ² F_{rec} [kN]	-	0,57	0,85	-		


HRD FRAME ANCHOR (CONTINUED)

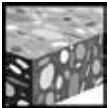
Recommended loads ^{a)}

Anchor size			HRD 8	HRD 10		
			h_{nom} =50mm	h_{nom} =50mm	h_{nom} =70mm	h_{nom} =90mm
Hollow sand-lime brick KSL 12/1,4 brick O ^{e)}	$f_b \geq 12 \text{ N/mm}^2$	F_{rec} [kN]	0,21	-	-	-
Vertically perforated sand-lime brick KSL 1,6-2DF brick P ^{e)}	$f_b \geq 8 \text{ N/mm}^2$	F_{rec} [kN]	-	0,42	-	-
	$f_b \geq 10 \text{ N/mm}^2$	F_{rec} [kN]	-	0,42	-	-
	$f_b \geq 12 \text{ N/mm}^2$	F_{rec} [kN]	-	0,57	-	-
Vertically perforated sand-lime brick KSL 1,4-3DF brick Q ^{e)}	$f_b \geq 8 \text{ N/mm}^2$	F_{rec} [kN]	-	-	0,57	-
	$f_b \geq 10 \text{ N/mm}^2$	F_{rec} [kN]	-	-	0,71	-
	$f_b \geq 12 \text{ N/mm}^2$	F_{rec} [kN]	-	-	0,85	-
Vertically perforated sand-lime brick KSL R 1,6-16DF brick R ^{e)}	$f_b \geq 8 \text{ N/mm}^2$	F_{rec} [kN]	-	0,25	0,34	-
	$f_b \geq 10 \text{ N/mm}^2$	F_{rec} [kN]	-	0,34	0,42	-
	$f_b \geq 12 \text{ N/mm}^2$	F_{rec} [kN]	-	0,42	0,57	-
	$f_b \geq 16 \text{ N/mm}^2$	F_{rec} [kN]	-	0,57	0,71	-
Lightweight hollow brick Hbl 2/0,8 brick S ^{e)}	$f_b \geq 2 \text{ N/mm}^2$	F_{rec} [kN]	0,09	-	-	-
Lightweight concrete hollow block Hbl 1,2-12DF brick T ^{e)}	$f_b \geq 2 \text{ N/mm}^2$	F_{rec} [kN]	-	0,14	0,21	-
	$f_b \geq 6 \text{ N/mm}^2$	F_{rec} [kN]	-	0,34	0,57	-
Ital. Hollow brick Mattone brick E ^{e)}	$f_b \geq 22 \text{ N/mm}^2$	F_{rec} [kN]	0,43	-	-	-
Ital. Hollow brick Poroton P700 brick N ^{e)}	$f_b \geq 15 \text{ N/mm}^2$	F_{rec} [kN]	-	-	0,17	-
Ital. Hollow brick Doppio Uni brick C+I ^{e)}	$f_b \geq 25 \text{ N/mm}^2$	F_{rec} [kN]	0,25 (C)	-	0,42 (I)	-
Span. Hollow brick Rojo hidrofugano brick D ^{e)}	$f_b \geq 40 \text{ N/mm}^2$	F_{rec} [kN]	0,17	-	-	-
Span. Hollow brick Ladrillo perforado brick J ^{e)}	$f_b \geq 26 \text{ N/mm}^2$	F_{rec} [kN]	-	0,42	0,57	-
Span. Hollow brick Clinker mediterraneo brick K ^{e)}	$f_b \geq 75 \text{ N/mm}^2$	F_{rec} [kN]	-	-	0,42	-
French Hollow brick Brique Creuse brick B ^{e)}	$f_b \geq 6 \text{ N/mm}^2$	F_{rec} [kN]	0,14	-	-	-
Autoclaved aerated concrete AAC EN 771-4	AAC 2	F_{rec} [kN]	-	-	0,32	0,32
	AAC 4	F_{rec} [kN]	0,15	-	0,71	0,89
	AAC 6	F_{rec} [kN]	0,15	-	0,71	0,89
		F_{rec} [kN]		-	1,25 ^{d)}	1,6 ^{d)}

- a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.
- b) Values for hot-dip galvanized carbon steel
- c) Values for stainless steel
- d) Valid for edge distance $c \geq 150\text{mm}$, intermediate values can be interpolated
- e) Specification of hollow base material brick types see separate table below
- f) Data can be determined by job-site testing, data for $h_{nom} = 50\text{mm}$ can be applied.

HRV FRAME ANCHOR

	Anchor version	Benefits
	HRV-H 10x80	<ul style="list-style-type: none"> Available in CS and HDG
	HRV-H 10x100	
	HRV-HF 10x80	<ul style="list-style-type: none"> Suitable for concrete and solid brick Integrated plastic and steel washers
	HRV-HF 10x100	



Concrete




Solid brick

Recommended loads ^{a)}

Anchor size			HRV 10	
			$h_{nom} = 70mm$	
Concrete C16/20 – C50/60			N_{rec} [kN]	2,4
			V_{rec} [kN]	4,8
Solid clay brick Mz 1,8 DIN 105-100 / EN 771-1 LxWxH [mm]: 240x115x113 h _{min} [mm]: 115	$f_b \geq 10$ N/mm ²	F_{rec} [kN]	0,57	
	$f_b \geq 20$ N/mm ²	F_{rec} [kN]	0,86	
Russian solid clay brick Density [kg/dm ³]: 1,9 LxWxH [mm]: 250x120x65 h _{min} [mm]: 120	$f_b \geq 10$ N/mm ²	F_{rec} [kN]	0,57	
	$f_b \geq 20$ N/mm ²	F_{rec} [kN]	0,86	

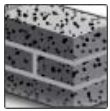
^{a)} With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HT METAL FRAME ANCHOR

Anchor version	Benefits
 HT	<ul style="list-style-type: none"> - fastening door and window frames - no risk of distortion or forces of constraint - expansion cone can not be lost



Concrete



Solid brick



Hollow brick



Autoclaved aerated concrete







Fire resistance

Recommended loads

		HT 8	HT10
Concrete, $f_{cc} = 30 \text{ N/mm}^2$	N_{rec} [kN]	1,4	1,7
	V_{rec} [kN]	0,5	0,5
Aerated Concrete PP2 ^{a)}	N_{rec} [kN]	-	0,1
	V_{rec} [kN]	-	0,15
Solid brick Mz 12	N_{rec} [kN]	0,6	0,8
	V_{rec} [kN]	-	0,5
Sand-lime solid brick, KS 12	N_{rec} [kN]	0,6	0,8
	V_{rec} [kN]	-	0,5
Sand-lime hollow brick, KSL	N_{rec} [kN]	-	0,5
	V_{rec} [kN]	-	0,15

a) Rotary drilling only

HY 200 MORTAR WITH HIT-Z ROD

Injection mortar system		Benefits
	Hilti HIT-HY 200-A 500 ml foil pack (also available as 330 ml foil pack)	<ul style="list-style-type: none"> - SafeSet: drilling and installing the HIT-Z rod without borehole cleaning - unmatched seismic performance with the highest ETA C1 and C2 approvals - maximum load performance in cracked concrete and uncracked concrete - suitable for cracked and non-cracked concrete C 20/25 to C 50/60 - suitable for use with diamond cored holes in non-cracked or cracked concrete with no load reductions - two mortar (Hilti HIT-HY 200-A and Hilti HIT-HY 200-R) versions available with different curing times and same performance
	Hilti HIT-HY 200-R 500 ml foil pack (also available as 330 ml foil pack)	
	Static mixer	
	HIT-Z HIT-Z-R rod	



Concrete



Tensile zone



Seismic
ETA-C1/C2



Fire
resistance



Corrosion
resistance



No cleaning
required for
approved loads

SAFE-ET

Hilti SafeSet
with hollow
drill bit



European
Technical
Approval



CE
conformity





PROFIS
Anchor design
software

Recommended loads ^{a)}: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$, element HIT-Z

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile N_{rec}	HIT-Z	[kN]	11,4	18,1	25,9	42,0	58,1
Shear V_{rec}	HIT-Z	[kN]	6,9	10,9	15,4	27,4	41,7
Cracked concrete							
Tensile N_{rec}	HIT-Z	[kN]	10,0	14,6	19,8	29,9	41,4
Shear V_{rec}	HIT-Z	[kN]	6,9	10,9	15,4	27,4	41,7

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

HIT-HY 270 MORTAR

Injektionsmörtelsystem	Merkmale & Nutzen
 <p>HIT-HY 270</p>  <p>Ankerstangen: HIT-V (Galvanisch verzinkt) HIT-V-R (Nichtrostender Stahl) HIT-V-HCR (HCR-Stahl) HIT-IC</p>	<ul style="list-style-type: none"> Ermöglicht starke, zuverlässige und einfache Montage von Befestigungen in einer Vielzahl von Mauerwerksuntergründen Innen und außen einsetzbar, für trockenes und nasses Grundmaterial geeignet HIT-SC Siebhülsen ermöglichen eine größere Flexibilität durch Verwendung mehrerer Hülsenkombinationen; sie sparen außerdem Mörtel, da sie eine genaue Dosierung in Lochstein-Untergründen ermöglichen Hohe Anwendungsflexibilität durch ETA-Zulassung für Mauerwerkwendungen und technische Daten Befestigungen in Mauerwerk können mit der neuen Mauerwerkssoftware – Teil von PROFIS Anchor – einfach bemessen werden



Verankerungsgrund		Zulassung/Bewertung	ETA-13/1036																													
Vollsteinmauerwerk		Verankerungselement	Ankerstange HIT-V, HIT-V-R, HIT-V-HCR											Innengewindehülse HIT-IC																		
Mauerwerksstein	Druckfestigkeit [N/mm ²]	Dimension des Verankerungselements	M8			M10			M12			M16			M8	M10	M12															
		Bohrdurchmesser	10			12			14			18			14	16	18															
		Effektive Verankerungstiefe	50			80			100			50			80			100														
		Bohrdurchmesser	d ₀ [mm]			10			12			14			18			14			16			18								
		Effektive Verankerungstiefe	h _{ef} [mm]			50			80			100			50			80			100											
		Zulässige Zuglast	Zulässige Zug- und Querlasten																													
Vollziegel Mz, 1DF	12.0	Zulässige Zuglast	N _{zul} [kN]	0.57 (1.1*)			1.0 (2.0*)			1.7 (3.4*)			0.57 (1.1*)			1.0 (2.0*)			1.7 (3.4*)			1.0 (1.1*)										
				0.7 (0.86*)			1.3 (1.6*)			2.6 (3.0*)			0.7 (0.86*)			1.3 (1.6*)			2.6 (3.0*)			1.3 (1.6*)										
				1.0 (1.1*)			1.9 (2.1*)			3.4 (3.4*)			1.0 (1.1*)			1.9 (2.1*)			3.4 (3.4*)			1.9 (2.1*)										
				1.0 (1.1*)			1.9 (2.1*)			3.4 (3.4*)			1.0 (1.1*)			1.9 (2.1*)			3.4 (3.4*)			1.9 (2.1*)										
Vollziegel Mz, 2DF	12.0	Zulässige Querlast	V _{zul} [kN]	0.34																												
				0.43																												
				0.57																												
Vollziegel Mz, 2DF	12.0	Zulässige Zuglast	N _{zul} [kN]	0.7 (0.86*)			1.0 (1.14*)			1.7 (2.0*)			0.7 (0.86*)			1.0 (1.14*)			1.7 (2.0*)			1.0 (1.14*)										
				0.7 (0.86*)			1.0 (1.14*)			1.7 (2.0*)			0.7 (0.86*)			1.0 (1.14*)			1.7 (2.0*)			1.0 (1.14*)										
Kalksandvollstein KS, 8DF	12.0	Zulässige Zuglast	N _{zul} [kN]	2.00			2.43			3.43			2.00			2.43			3.43			3.3			3.4							
				2.60			3.14			3.43			2.57			3.14			3.43			2.57			3.43							
				3.00			3.43			3.43			3.00			3.43			3.43			3.00			3.43							
				2.6			2.57			2.57			2.57			2.57			3.43			3.43			3.43							
Kalksandvollstein KS, 8DF	20.0	Zulässige Querlast	V _{zul} [kN]	3.43																												
				3.43																												
Kalksandvollstein KS, 2DF	12.0	Zulässige Zuglast	N _{zul} [kN]	1.71																												
				2.57																												
				1.71																												
				2.57																												
Leichtbetonvollstein Vbl, 2DF	4.0	Zulässige Zuglast	N _{zul} [kN]	0.86 (1.0*)			1.43			1.86 (2.0*)			0.86 (1.0*)			1.43			1.86 (2.0*)			1.43										
				1.1			1.7 (1.86*)			2.3 (2.43*)			1.1			1.7 (1.86*)			2.3 (2.43*)			1.1			1.7 (1.86*)							
				0.57			0.71			0.71			0.71			0.71			0.71			0.57			0.71							
				0.57			0.71			0.71			0.71			0.71			0.71			0.57			0.71							
Leichtbetonvollstein Vbn, 2DF	6.0	Zulässige Zuglast	N _{zul} [kN]	0.86																												
				1.57																												
				1.14																												
				1.86																												
		Installationsparameter																														
		Die Werte sind abhängig von Art und Größe des Mauerwerkssteins - Details entnehmen Sie bitte der ETA-13/1036																														
		Max. Durchmesser des Durchgangslochs im Anbauteil	d _f [mm]			9			12			14			18			9			12			14								
		Einschraubtiefe	h _s [mm]			80			110			130			80			110			130			86			116			136		
		Mindestbauteildicke	h _{min} [mm]			80			110			130			80			110			130			86			116			136		
		Max. Anzugsdrehmoment	T _{max} [Nm]			5			8			10			10			10			5			8			10					
		Stahlrundbürste HIT-RB	-			10			12			14			18			14			16			18								

Bedingungen der Kategorie d/d - Die Installation und Verwendung erfolgt in Bereichen trockener Innenräumen
 Lastwerte für manuelle Reinigung

Lasten gelten für randferne Einzelbefestigungen mit c >= ccr

Bohrmethode in Vollstein: Hammerbohren

Temperaturbereich nach Einbau: -40°C bis +40°C

*Druckluftreinigung

Für Mauerwerk aus anderen Voll- oder Lochsteinen darf der charakteristische Widerstand mittels Baustellen-/Belastungsversuch gemäß ETAG 029, Anhang B unter Berücksichtigung des beta-Faktors nach Anhang C1, Tabelle C1 bestimmt werden.

Bitte folgen Sie der Montageanweisung der ETA-13/1036 für Gewindestangen, HIT-V... mit HIT-SC Siebhülsen für das Setzen in Durchsteckmontage und/oder durch nichttragende Schichten in Voll- und Lochsteinen.

HIT-HY 270 MORTAR (CONTINUED)

Verankerungsgrund Lochsteinmauerwerk		Zulassung/Bewertung		ETA-13/1036														
		Verankerungselement		Ankerstange HIT-V, HIT-V-R, HIT-V-HCR mit Siebhülse HIT-SC										Innengewindehülse HIT-IC mit Siebhülse HIT-SC				
		Dimension des Verankerungselements		M8			M10			M12			M16			M8	M10	M12
Mauerwerks- stein	Druckfestig- keit [N/mm ²]	Bohrdurchmesser	d ₀ [mm]	16			16			18			22			14	16	18
		Effektive Verankerungstiefe	h _{ef} [mm]	80	130	160	80	130	160	80	130	160	80	130	160	80	80	80
Zulässige Zug- und Querlasten																		
Hochloch- ziegel Hlz, 10DF	12.0	Zulässige Zuglast	N _{zul} [kN]	1.57 (1.71*)										1.57 (1.71*)				
	20.0	Zulässige Zuglast	N _{zul} [kN]	2.0 (2.29*)										2.0 (2.29*)				
Hochloch- ziegel Hlz, 10DF	12.0	Zulässige Querlast	V _{zul} [kN]	0.57						1.0			0.57	1.0				
	20.0	Zulässige Querlast	V _{zul} [kN]	0.86						1.29			0.86	1.29				
Kalksand- lochstein KSL, 8DF	12.0	Zulässige Zuglast	N _{zul} [kN]	1.14	1.57	1.14	1.57	1.14	1.57	1.14	1.57	1.14	1.57	1.14				
	20.0	Zulässige Zuglast	N _{zul} [kN]	1.57	2.14	1.57	2.14	1.57	2.14	1.57	2.14	1.57	2.14	1.43				
Kalksand- lochstein KSL, 8DF	12.0	Zulässige Querlast	V _{zul} [kN]	1.71			2.57			2.86			2.86					
	20.0	Zulässige Querlast	V _{zul} [kN]	2.57			3.43			3.43			3.43					
Leichtbeton Hohlblock- stein	2.0	Zulässige Zuglast	N _{zul} [kN]	0.43	0.43 (0.57*)	0.43	0.43 (0.57*)	0.43	0.43 (0.57*)	0.43	0.43 (0.57*)	0.43	0.43 (0.57*)	0.43				
	6.0	Zulässige Zuglast	N _{zul} [kN]	0.71	0.86 (1.14*)	0.71	0.86 (1.14*)	0.71	0.86 (1.14*)	0.71	0.86 (1.14*)	0.71	0.86 (1.14*)	0.57				
Leichtbeton Hohlblock- stein	2.0	Zulässige Querlast	V _{zul} [kN]	1.00						1.29			1.29					
	6.0	Zulässige Querlast	V _{zul} [kN]	1.71						2.29			2.29					
Normalbeton Lochstein	4.0	Zulässige Zuglast	N _{zul} [kN]	0.26	0.43	0.26	1.50	0.26	0.43	0.26	0.43	0.26	0.43	0.26				
	10.0	Zulässige Zuglast	N _{zul} [kN]	0.57	0.57	0.57	2.00	0.57	0.57	0.57	0.57	0.57	0.57					
Normalbeton Lochstein	4.0	Zulässige Querlast	V _{zul} [kN]	1.00						1.00			1.00					
	10.0	Zulässige Querlast	V _{zul} [kN]	1.71						1.71			1.71					
Lochziegel für Decken	Type DS-1,0 ρ ≥ [kg/dm ³]	Zulässige Zuglast	N _{zul} [kN]	0.43										0.43				
		Zulässige Querlast	V _{zul} [kN]	0.37										0.40				
Installationsparameter																		
Randabstand			[mm]	Die Werte sind abhängig von Art und Größe des Mauerwerkssteins - Details entnehmen Sie bitte der ETA-13/1036														
Achsabstand			[mm]	Die Werte sind abhängig von Art und Größe des Mauerwerkssteins - Details entnehmen Sie bitte der ETA-13/1036														
Max. Durchmesser des Durchgangslochs im Anbauteil			d _f [mm]	9			12			14			18			9	12	14
Einschraubtiefe			h _s [mm]	8...75														
Bohrlochtiefe			h _o [mm]	95	145	180	95	145	180	95	145	180	95	145	180	95	95	95
Mindestbauteildicke			h _{min} [mm]	115	195	230	115	195	230	115	195	230	115	195	230	115	115	115
Max. Anzugsdrehmoment			T _{max} [Nm]	3			4			6			8			3	4	6
Stahlrundbürste HIT-RB			-	16			16			18			22			16	18	22
Anzahl der Hübe HDM			-	6	4+6	6+6	6	4+6	6+6	8	4+8	8+8	10	6+10	10+10	6	8	10
Anzahl der Hübe HDE (nicht Dosiereinstellung)			-	5	3+5	5+5	5	3+5	5+5	6	3+6	6+6	8	5+8	8+8	5	6	8

Bedingungen der Kategorie d/d - Die Installation und Verwendung erfolgt in Bereichen trockener Innenräumen

Lastwerte für manuelle Reinigung

Lasten gelten für randferne Einzelbefestigungen mit c >= ccr

Bohrmethode in Lochstein: Drehbohren (nicht Hammerbohren)

Temperatur nach Einbau: -40°C bis +40°C


*Druckluftreinigung

Für Mauerwerk aus anderen Voll- oder Lochsteinen darf der charakteristische Widerstand mittels Baustellen-/Belastungsversuch gemäß ETAG 029, Anhang B unter

Berücksichtigung des beta-Faktors nach Anhang C1, Tabelle C1 bestimmt werden.

Bitte folgen Sie der Montageanweisung der ETA-13/1036 für Gewindestangen, HIT-V... mit HIT-SC Siebhülsen für das Setzen in Durchsteckmontage und/oder durch nichttragende Schichten in Voll- und Lochsteinen.

IDMS / IDMR INSULATION FASTENER

Anchor version		Benefits
	IDMS Carbon steel	<ul style="list-style-type: none"> - for insulating material up to 15 cm thick - a non-flammable metal fastener - IDMS-T / IDMR-T insulation plate for non self-supporting insulation material
	IDMR Stainless steel	



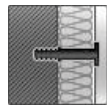
Concrete



Solid brick



Hollow brick



Insulation



Fire
resistance

Recommended loads

		IDMS / IDMR
Concrete \geq C16/20	N_{rec} [kN]	0,1
Solid clay brick Mz 20 – 1,8 – NF	N_{rec} [kN]	0,1
Solid sand-lime brick KS 12 – 1,6 – 2DF	N_{rec} [kN]	0,1
Hollow clay brick Hz 12 – 0,8 – 6DF	N_{rec} [kN]	0,04 ^{a)}
Hollow sand-lime brick KSL 12 – 1,4 – 3DF	N_{rec} [kN]	0,04

a) Drilling without hammering

CONTENT AND OVERVIEW OF THIS SECTION

Section	Page
5 Firestop Systems & Typicals	4

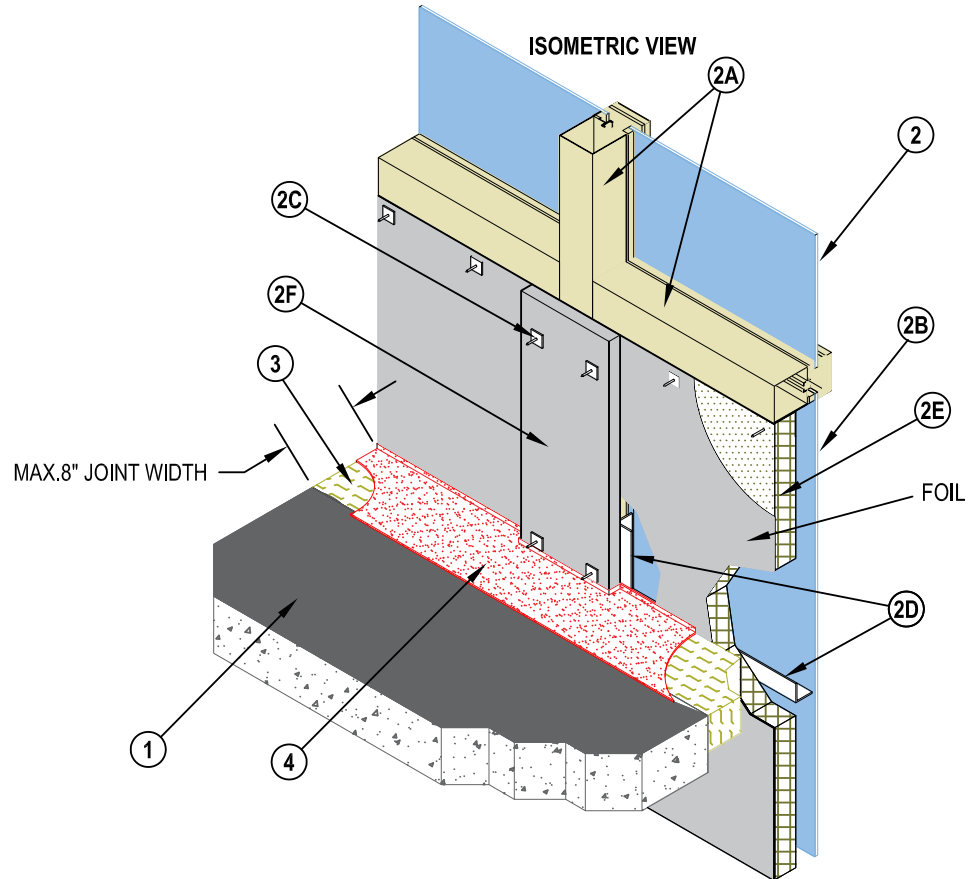
5 FIRESTOP SYSTEMS & TYPICALS

A. TYPICALS

TYPICAL FIRESTOP DETAIL FOR PERIMETER JOINT

F-RATING = 1-HR. OR 2-HR. OR 3-HR.

MOVEMENT CAPABILITIES - 10% - 15% COMPRESSION OR EXTENSION



ITEM NO.	ITEM DESCRIPTION
①	CONCRETE FLOOR ASSEMBLY (1-HR. OR 2-HR. OR 3-HR. FIRE-RATING).
②	CURTAIN WALL ASSEMBLY (NON-FIRE RATED).
②A	ALUMINUM FRAMING : HORIZONTAL TRANSOMS & VERTICAL MULLIONS.
②B	SPANDREL PANEL : GLASS OR ALUMINUM OR STONE PANEL.
②C	STEEL IMPALING PINS.
②D	REINFORCING STEEL ANGLE.
②E	CURTAIN WALL MINERAL WOOL INSULATION *.
②F	VERTICAL MULLION MINERAL WOOL COVER *.
③	COMPRESSED MINERAL WOOL AS BACKING MATERIAL *.
④	HILTI CFS-SP WB FIRESTOP JOINT SPRAY OR CFS-SP SIL SILICONE JOINT SPRAY *

* LISTED WITH UL OR INTERTEK.

Notes:

- The application limitations on this detail are for guidance purpose only. For further details, refer to Hilti Firestop specialist.

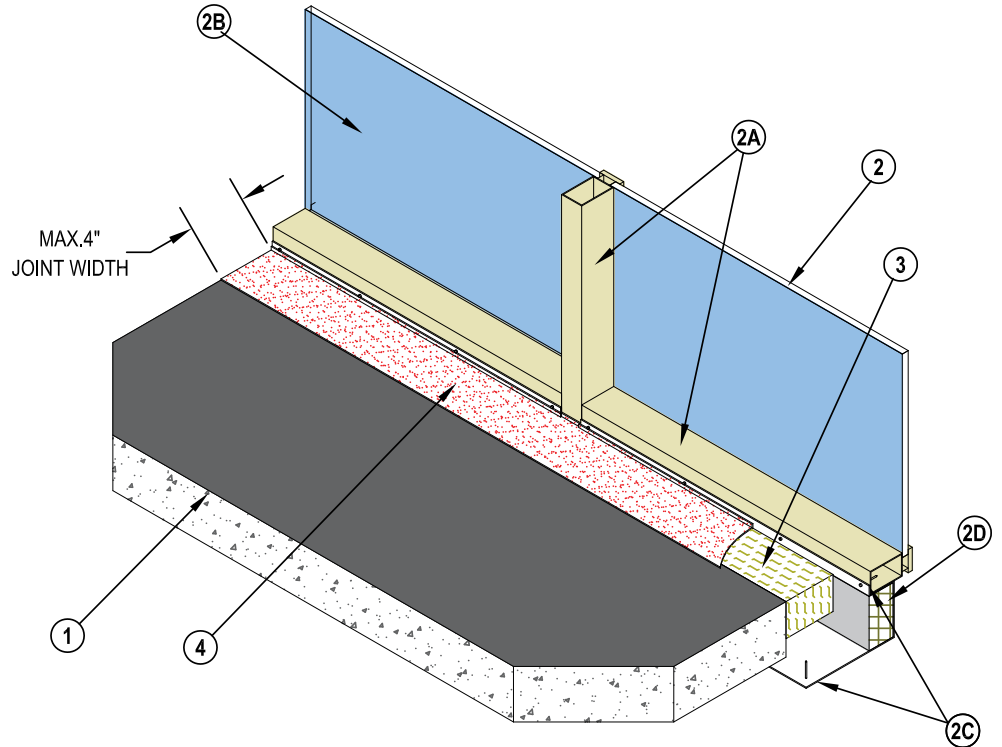
- The application including firestop system has been tested as per ASTM-E 2307 Standard.

- All installations shall be carried out in accordance with Hilti's installation instructions, by competent and experienced installers using Hilti branded products.

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TYPICAL FIRESTOP DETAIL FOR PERIMETER JOINT
F-RATING = 2-HR.
MOVEMENT CAPABILITIES - STATIC SYSTEM

ISOMETRIC VIEW



ITEM NO.	ITEM DESCRIPTION
①	CONCRETE FLOOR ASSEMBLY (2-HR. FIRE-RATING).
②	CURTAIN WALL ASSEMBLY (NON-FIRE RATED).
②A	ALUMINUM FRAMING : HORIZONTAL TRANSOMS & VERTICAL MULLIONS.
②B	GLASS PANEL.
②C	GALVANIZED SHEET METAL PAN: MIN. 18 GA GALVANIZED STEEL SECTION FIXED TO THE ALUMINUM FRAMING AND TO THE CONCRETE FLOOR.
②D	CURTAIN WALL MINERAL WOOL INSULATION*.
③	COMPRESSED MINERAL WOOL AS BACKING MATERIAL*.
④	HILTI CFS-SP WB FIRESTOP JOINT SPRAY OR CFS-SP SIL SILICONE JOINT SPRAY*

* LISTED WITH UL OR INTERTEK.

Notes:

- The application limitations on this detail are for guidance purpose only. For further details, refer to Hilti Firestop specialist.

- The application including firestop system has been tested as per ASTM-E 2307 Standard.

- All installations shall be carried out in accordance with Hilti's installation instructions, by competent and experienced installers using Hilti branded products.

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System No. CW-D-1001 XHDG.CW-D-1001 Perimeter-fire-containment Systems

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Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHDG - Perimeter-fire-containment Systems

[See General Information for Perimeter-fire-containment Systems](#)

System No. CW-D-1001

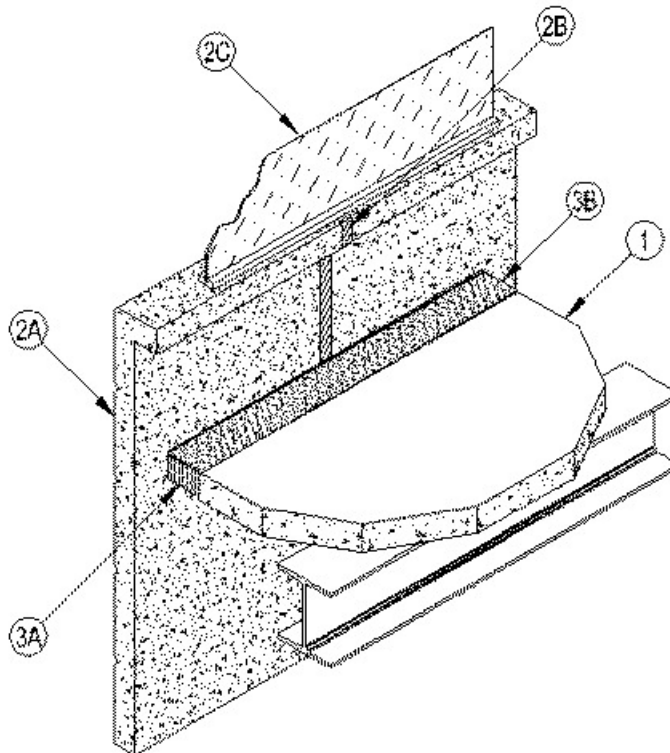
June 23, 2016

F Rating — 2 Hr

T Rating — 1/4 Hr

Linear Opening Width - 6 In. Max

Class II Movement Capabilities - 5% Vertical Shear (See Item 3)



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor assembly to be supported at perimeter edges by spandrel beams having a Restrained or Unrestrained Beam Rating of 2 hr.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Spandrel Panels** — Min 36 in. (914 mm) high by min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete spandrel panels. Wall may also consist of min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight concrete tilt-up panels with a min 36 in. (914 mm) vertical separation between window openings. Panels provided with steel dead load anchors welded to steel reinforcing bars embedded in the concrete for attachment to the steel columns and spandrel beams. Panels also provided with steel lateral anchors or braces. The dead load anchors which are located in the linear gap between the concrete floor slab and the spandrel panel or tilt-up panel are to be spaced max 72 in. (1829 mm) OC. The top of the dead load anchor is to be recessed min 1/2 in. (13 mm) from top surface of floor

B. **Joint System** — (Not Shown) — Vertical joints between spandrel panels or tilt-up panels to be protected using Joint System No. WW-S-0042

C. **Framed Window** — Metal framed window with nom 1/4 in. (6 mm) thick heat-strengthened glass. Sill of window to be min 6 in. (152 mm) above top of floor.

3. **Safing System** — Max separation between edge of floor assembly and concrete spandrel or tilt-up panel is 6 in. (152 mm). The safing system is designed to accommodate vertical shear movement of up to 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Nom 4 in. (102 mm) thick mineral wool batt safing material to be installed between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly-butted seam is permitted between dead load anchors. An additional min 1/2 in. (13 mm) thick piece of mineral wool batt safing material to be installed to cover top surface of each dead load anchor.

THERMAFIBER INC — SAF

B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3.2 mm) wet thickness (1/16 in. or 1.6 mm dry) of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the concrete spandrel panel or tilt-up panel. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Last Updated on 2016-06-23

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System No. CW-D-1015
XHDG.CW-D-1015
Perimeter-fire-containment Systems

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Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHDG - Perimeter-fire-containment Systems

[See General Information for Perimeter-fire-containment Systems](#)

System No. CW-D-1015

June 23, 2016

F Rating — 2 Hr

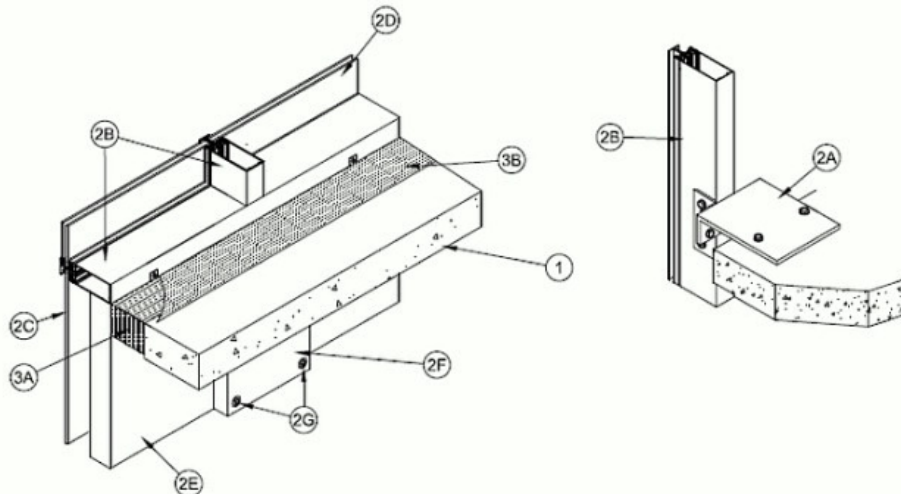
T Rating — 1/2 Hr

Linear Opening Width — 4 In. Max

L Rating At Ambient — Less Than 1 CFM/sq ft

L Rating At 400 F — Less Than 1 CFM/sq ft

Class II Movement Capabilities — 5% Vertical Shear



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Brackets** — Min 3 in. (76 mm) by 3 in. (76 mm) by 1/4 in. steel angles attached through the mullion on each side with min 3/8 in. (10 mm) diam steel bolts with steel nuts and washers. The brackets are attached to a min 8 in. (203 mm) by 3-1/4 in. (83 mm) by 1/2 in. (13 mm) thick steel angles with a min 4 in. (51 mm) long with min 1/2 in. (13 mm) diam steel bolts with steel nuts and washers. The 8 in. (203 mm) by 3-1/4 in. (83 mm) angle is secured to the top of floor with two min 1/2 in. (13 mm) diam steel masonry anchors in conjunction with steel washers.

A1. Mullion Mounting Brackets — As an alternate to Item 2A, min 8 in. (203 mm) wide by 3/4 in. (19 mm) thick extruded aluminum Halfen mounting brackets with one nom 2 in. (51 mm) high leg for support and attachment of mullion and with one leg at least 6 in. (152 mm) longer than width of linear opening between floor assembly and mullion. Mounting bracket attached to top of floor with two min 1/2 in. (13 mm) diam steel masonry anchors in conjunction with washer plates supplied with mounting bracket.

B. Framing — The two-piece rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be min 2-1/2 in. (64 mm) wide by 7-1/2 in. (191 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1.52 m) OC and secured to mullion mounting brackets (Item 2A) at each floor level. Interior face of mullions to be max 4 in. (102 mm) from edge of floor assembly. Transoms to be spaced min 24 in. (610 mm) OC. The minimum height from the top of the floor to the bottom of the vision panel sill is 0 in. The maximum height from the top of the floor to the bottom of horizontal transom is 3 in. (76 mm).

C. Spandrel Panels — The spandrel panels shall consist of one of the following types:

a. **Glass Panels** — Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

b. **Aluminum Panels** — Nom 1/8 in. (3 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

c. **Stone Panels** — Nom 1-3/16 in. (46 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

D. Vision Panels — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass or nom 1 in. (25 mm) thick insulated glass units with two layers of nom 1/4 in. (6 mm) thick transparent heat-strengthened glass separated by a 1/2 in. (25 mm) air space. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. Curtain Wall Insulation* — Min. 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder. Impasse® Horizontal Hangers are installed in the insulation batt 6 in. (152 mm) from each mullion end and spaced max 16 in. (406 mm) OC across at the window sill transom. One Impasse® Vertical Hanger is installed along both vertical mullion sides of the insulation batt at 6 in. (152 mm) up from the bottom of the insulation batt. Insulation batt is then installed in spandrel area flush with the interior surface of the framing with no vertical or horizontal seams. Impasse® Horizontal Hangers are screw attached to top horizontal transom, Impasse® Vertical Hangers are screw attached to vertical mullions using min No. 10 by min. 1/2 in. (13 mm) self-drilling/self-taping screws. No attachment to the lower horizontal transom is required.

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F. Mullion Covers — Curtain Wall Insulation* — Nom 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrim vapor retarder, supplied in min 24 by 48 in. (610 by 1219 mm) boards. Min. 12 in. (305 mm) wide strips to be centered over mullions secured to curtain wall insulation (Item 2E) with a min. of four Spiral Anchors (Item 2G) spaced a max 12 in. (305mm) OC. Mullion covers to tightly abut the bottom of the forming material (Item 3A).

THERMAFIBER INC — FIRESpan® 90

G. Light Gauge Framing* — Spiral Anchor — Galv steel wire spiral anchors used to secure the curtain wall insulation (Item 2F and 2G). Nom length of spiral anchors to be 3-3/4 in. (95 mm), spaced max 12 in. (305 mm) OC.

THERMAFIBER INC — Spiral Anchor

3. Safing System — Max separation between edge of floor assembly and face of framing members (at time of installation) is 4 in. (102 mm). The safing system is designed to accommodate vertical shear movement up to a max of 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. Forming Material* — Nom 4 pcf (64 kg/m³) density mineral wool batt insulation. Batt sections cut to a 4 in. (102 mm) width and stacked to a thickness which is min 25 percent greater than the width of the linear gap between the curtain wall insulation and the edge of the concrete floor slab. The forming material is compressed and inserted cut-edge-first into linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly-butted seam is permitted between mullions. Additional piece of forming material to be friction-fit into gap between batt sections above mullion mounting clip at each mullion location.

THERMAFIBER INC — SAF

B. Fill, Void or Cavity Material* — Min 1/8 in. (3 mm) wet thickness (min 1/16 in. (1.5 mm) dry thickness) of fill material spray-applied over top of forming material and lapping min 1/2 in. (13 mm) onto the top surface of the floor and onto the curtain wall insulation (Item 2E) and mullion covers (Item 2F). When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP WB Firestop Joint Spray, CFS-SP SIL Firestop Silicone Joint Spray

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System No. CW-D-1018
XHDG.CW-D-1018
Perimeter-fire-containment Systems

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System No. CW-D-1018

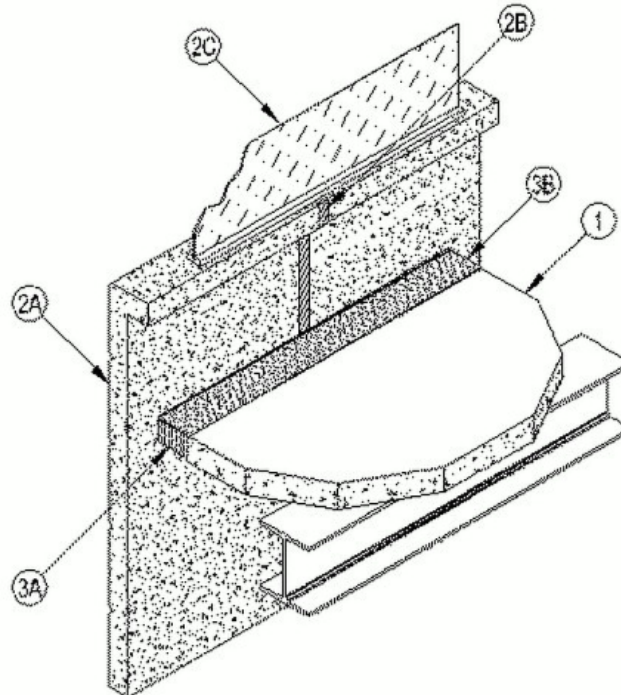
June 23, 2016

F Rating — 3 Hr

T Rating — 1/4 Hr

Linear Opening Width - 3 In. Max

Class II Movement Capabilities - 5% Vertical Shear (See Item 3)



1. **Floor Assembly** — Min 5 in. (127 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor assembly to be supported at perimeter edges by spandrel beams having a Restrained or Unrestrained Beam Rating of 3 hr.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Spandrel Panels** — Min 36 in. (914 mm) high by min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete spandrel panels. Wall may also consist of min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight concrete tilt-up panels with a min 36 in. (914 mm) vertical separation between window openings. Panels provided with steel dead load anchors welded to steel reinforcing bars embedded in the concrete for attachment to the steel columns and spandrel beams. Panels also provided with steel lateral anchors or braces. The dead load anchors which are located in the linear gap between the concrete floor slab and the spandrel panel or tilt-up panel are to be spaced max 72 in. (1829 mm) OC. The top of the dead load anchor is to be recessed min 1/2 in. (13 mm) from top surface of floor.

B. **Joint System** — (Not Shown) — Vertical joints between spandrel panels or tilt-up panels to be protected using Joint System No. WW-S-0042.

C. **Framed Window** — Metal framed window with nom 1/4 in. (6 mm) thick heat-strengthened glass. Sill of window to be min 6 in. (152 mm) above top of floor.

3. **Safing System** — Max separation between edge of floor assembly and concrete spandrel or tilt-up panel is 3 in. (76 mm). The safing system is designed to accommodate vertical shear movement of up to 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Nom 4 pcf (64 kg/m³) density mineral wool batt safing material to be installed between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. Safing material to be cut to a min 4-3/4 in. (121 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly-butted seam is permitted between dead load anchors. An additional min 1/2 in. (13 mm) thick piece of mineral wool batt safing material to be installed to cover top surface of each dead load anchor.

THERMAFIBER INC — SAF

B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3.2 mm) wet thickness (1/16 in. or 1.6 mm dry) of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the concrete spandrel panel or tilt-up panel. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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**System No. CW-D-2025
XHDG.CW-D-2025
Perimeter-fire-containment Systems**

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System No. CW-D-2025

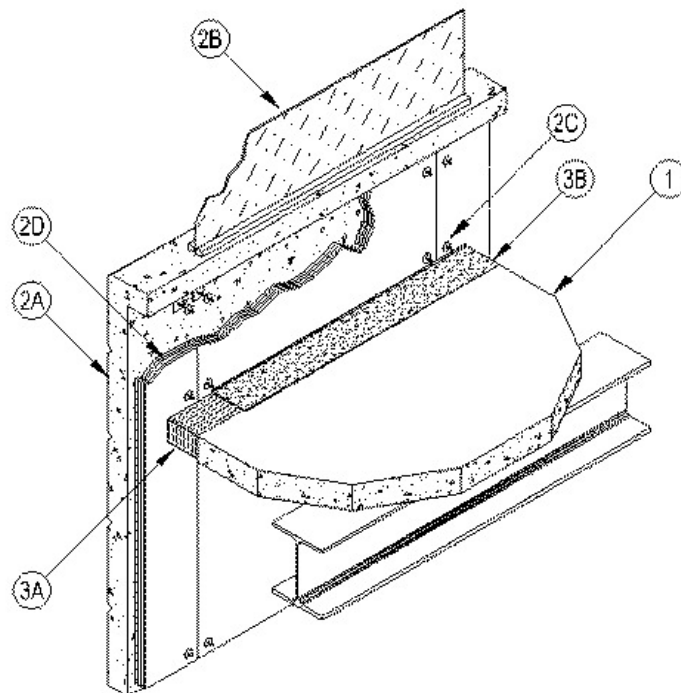
June 23, 2016

F Rating — 2 Hr

T Rating — 1/4 Hr

Linear Opening Width - 8 In. Max

Class II Movement Capabilities - 5% Vertical Shear (See Item 3)



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor assembly to be supported at perimeter edges by spandrel beams having a Restrained or Unrestrained Beam Rating of 2 hr. Edge of concrete floor to be max 8 in. from interior surface of spandrel panel (Item 2A).

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Spandrel Panels** — Min 36 in. (914 mm) high by min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete spandrel panels. Wall may also consist of min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight concrete tilt-up panels with a min 36 in. (914 mm) vertical separation between window openings. Panels provided with steel dead load anchors welded to steel reinforcing bars embedded in the concrete for attachment to the steel columns and spandrel beams. Panels also provided with steel lateral anchors or braces. The dead load anchors, which are located in the linear gap between the concrete floor slab and the spandrel panel or tilt-up panel, are to be spaced max 72 in. (1829 mm) OC. The top of the dead load anchor is to be recessed min 1/2 in. (13 mm) from top surface of floor.

B. **Framed Window** — Metal framed window with nom 1 in. thick (double pane) transparent heat-strengthened glass panels. Sill of window to be min 6 in. above top of floor.

C. **Impaling Pins** — No. 12 gauge steel pins, min 1/2 in. (13 mm) longer than thickness of insulation boards (Item 2D), swaged to nom 2 by 2 in. (51 by 51 mm) galv steel base plate. Steel base plates secured to concrete spandrel panel with steel concrete screws or powder-driven steel fasteners. Impaling pins to be spaced 3 in. (76 mm) from edges of insulation boards (Item 2D) on each side of seams and spaced max 24 in. (610 mm) OC both vertically and horizontally. A min of two horizontal arrays of impaling pins are required to be located on spandrel panel above top surface of floor.

C1. **Clutch Clips** — (Optional, Not Shown) — Nom 2 by 2 in. (51 by 51 mm) wide by 1-1/4 in. (32 mm) high V-shaped steel clutch clips used in conjunction with impaling pins (Item 2C) to offset curtain wall insulation (Item 2D) from spandrel panel (Item 2A). Clutch clips to be used on all impaling pins. When clutch clips are used, a row of impaling pins shall be located max 3 in. (76 mm) from top and bottom surfaces of floor assembly and spaced max 18 in. (457 mm) OC.

D. **Curtain Wall Insulation*** — Min 2 in. (51 mm) thick mineral wool board insulation, faced on one side with aluminum foil/scrims vapor retarder, supplied in min 24 by 48 in. (610 by 1219 mm) boards. Insulation boards installed vertically with tightly-butted seams to cover interior surface of concrete spandrel panel. Horizontal seams of insulation boards (if necessary) to be located min 24 in. (610 mm) above and min 6 in. (152 mm) below planes of floor. Insulation boards secured to spandrel panel with impaling pins in conjunction with min 1-1/2 in. (38 mm) diameter galv steel clinch shields. Butted seams to be covered with aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

3. **Safing System** — Max separation between edge of floor assembly and curtain wall insulation is 8 in. The safing system is designed to accommodate vertical shear movement of up to 5% of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Mineral wool batt safing material to be cut into min 4-1/2 in. (114 mm) wide pieces and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall insulation (Item 2D) and the edge of the concrete floor slab. The stacked safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly butted seam is permitted between spandrel panel attachment plates or tubes. An additional min 1/2 in. (13 mm) thick piece of mineral wool batt safing material is to be installed to cover top surface of each dead load anchor.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3.2 mm) wet thickness (1/16 in. or 1.6 mm dry) of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the curtain wall insulation. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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**System No. CW-D-2027
XHDG.CW-D-2027
Perimeter-fire-containment Systems**

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System No. CW-D-2027

June 24, 2016

F Rating – 2 Hr

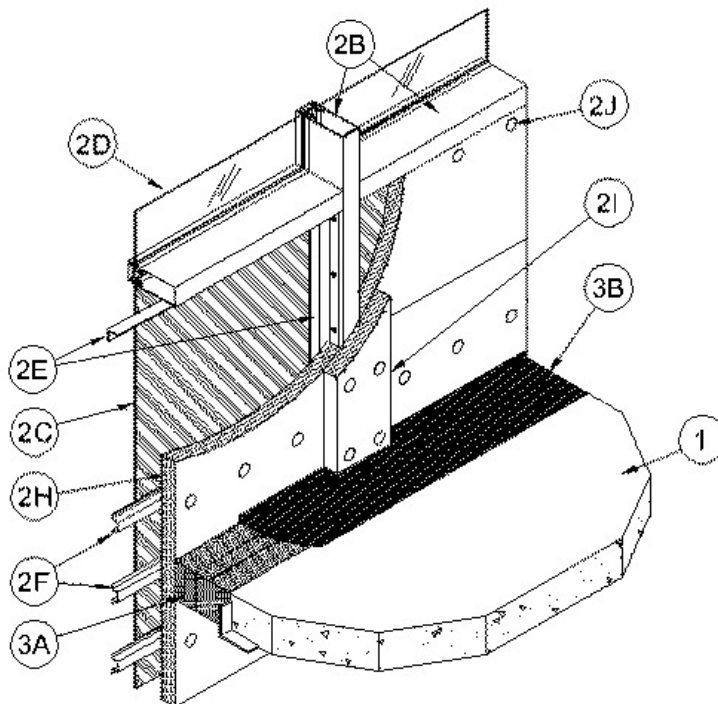
T Rating – 1/4 Hr

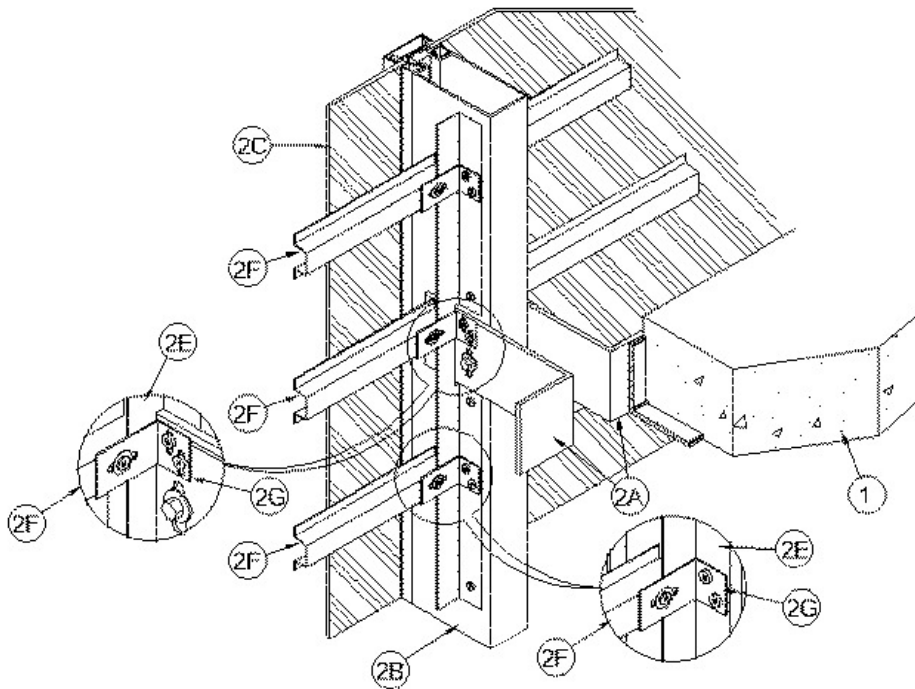
Integrity Rating – 2 Hr

Insulation Rating – 1/4 Hr

Linear Opening Width – 8 In. Max

Class II Movement Capabilities – 5% Vertical Shear (See Item 3)





1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Perimeter of floor assembly to be provided with min 4 by 4 by 1/4 in. thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Clips** — Min 4 in. (102 mm) long angles with one nom 4 in. (102 mm) leg for attachment to edge of floor assembly and with one leg approx 4 in. (102 mm) longer than distance to nearest face of mullion. Clips welded to steel angle at edge of floor assembly (Item 1) on each side of vertical mullion (Item 2B) at each floor level. Each clip to be provided with elongated holes to accommodate designed amount of movement. Top edge of each mounting angle to be recessed min 3/4 in. (19 mm) below top surface of floor.

B. **Framing** — The rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be min 2-1/2 in. (64 mm) wide by 5 in. (127 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1524 mm) OC and secured to mullion mounting clips (Item 2A) at each floor level with two 1/2 in. (13 mm) diam by 4 in. (102 mm) long hex head steel bolts in conjunction with steel nuts and washers. Interior face of mullions to be max 8 in. (203 mm) from edge of floor assembly. Transoms framing top and bottom edges of spandrel panels (Item 2C) to be spaced min 72 in. (1829 mm) OC. Transom forming sill of vision panel (Item 2D) to be located such that its bottom surface is at height of 33 in. (838 mm) above the top surface of the floor (Item 1).

C. **Spandrel Panels** — Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass, nom 1/8 in. (3.2 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges or nom 1-3/16 in. (30 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

D. **Vision Panels** — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. **Spandrel Panel Perimeter Angles** — Nom 1-1/2 by 1-1/2 in. (38 by 38 mm) No. 22 gauge galvanized steel angles installed around entire perimeter of each spandrel panel. Angles recessed from interior face of framing as necessary to accommodate thickness of curtain wall insulation (Item 2H). Angles notched as necessary to be continuous over mullion mounting clips (Item 2A). Angles screw-attached to mullions and transom along sides and top of each spandrel panel with No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws spaced max 12 in. (305 mm) OC. Angle along bottom of each spandrel panel to be screw-attached to leg of angle on mullion at each end without any direct attachment to transom.

F. **Stiff Back Channel** — Nom 2-1/2 in. (64 mm) wide by 7/8 in. (22 mm) deep hat-shaped channel formed of 22 gauge galv steel to be installed to stiffen curtain wall insulation between mullions above, below and at elevation of safin joint. One stiff back channel to be located with its centerline approx 6 in. below floor and one stiff back channel to be located with its centerline approx 6 in. above floor. A third stiff back channel is to be located near the midheight of the safin joint. A clearance of 1/4 to 1/2 in. (6 to 13 mm) shall be maintained between the ends of the stiff back channels and the mullions. Stiff back channel secured to mullion at each end with channel attachment clip (Item 2G) in conjunction with a No. 8 by 1/2 in. (13 mm) long self-drilling, self-tapping wafer head steel screw or a 3/16 in. diam steel bolt with nut and washer.

G. **Channel Attachment Clips** — Nom 1-1/2 by 2-1/2 by 1-1/2 in. (38 by 64 by 38 mm) long angle formed of 16 gauge galv steel. The 2-1/2 in. (64 mm) leg is provided with a 1/4 in. (6 mm) wide by 1-1/2 in. (38 mm) long slot along its centerline for attachment of the stiff back channel.

Clips secured to mullions mounting clips (Item 2A) and mullions, through perimeter angles, with two No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws. Channel attachment clips attached to mullion mounting clips to be provided with elongated holes to accommodate designed amount of movement. Channel clips installed with 2-1/2 in. (64 mm) leg recessed from interior face of mullion to accommodate thickness of curtain wall insulation (Item 2H).

H. Curtain Wall Insulation* — Min 2 in. (51 mm) thick mineral wool board insulation, unfaced or faced on one side with aluminum foil/scrim vapor retarder, supplied in min 36 in. (914 mm) wide boards. Insulation boards to be installed with no vertical seams. A full-width board shall be centered at the midheight of floor and tightly fitted between vertical mullions, flush with interior surface of framing. The centered board shall be secured to the stiff back channels (Item 2F) located approx 6 in. (152 mm) above and below the floor with cup head weld pins (Item 2J) spaced max 10 in. (254 mm) OC along each channel. The remainder of the spandrel panel framing above and below the centered full-width board shall be filled in with additional lengths of board cut to fit tightly between mullions and with the horizontal seams between boards sections tightly butted. The boards shall be secured to the spandrel panel perimeter angles with cup head weld pins at each corner of each board and spaced max 10 in. (254 mm) OC. When faced boards are used, butted seams to be covered with min 4 in. (102 mm) wide aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

I. Framing Covers — Curtain Wall Insulation* — Min 8 in. (203 mm) wide strips cut from the same min 2 in. (51 mm) thick mineral wool batt insulation used for the curtain wall insulation (Item 2H). Framing covers to be centered over mullions, and secured to the spandrel panel perimeter angles (Item 2E) with cup head weld pins (Item 2J) spaced max 12 in. (305 mm) OC. Where more than one spandrel panel occurs between vertically separated vision panels, the horizontal transom between spandrel panels shall also be covered with an 8 in. (203 mm) wide framing cover in the same manner as on the vertical mullions. Framing covers on mullions to abut the mineral wool batt safing material (Item 3A) above and below floor.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

J. Weld Pin — No. 12 gauge galv steel weld pin with nom 1-3/16 in. (30 mm) diam galv steel cup head. Cup head weld pins provided in two lengths. One length to be equal to thickness of curtain wall insulation (Item 2H) and second length to be equal to thickness of curtain wall insulation plus thickness of framing cover (Item 2I). Cup head weld pins inserted through curtain wall insulation and mullion covers and welded to spandrel panel perimeter angles at max OC spacings referenced in Items 2H and 2I.

3. Safing System — Max separation between edge of floor assembly and face of framing member at time of installation is 8 in. (203 mm). The safing system is designed to accommodate vertical shear up to 5% of its installed width. The safing system shall incorporate the following construction features:

A. Forming Material* — Nom 4 in. (102 mm) thick, mineral wool batt safing material to be installed in continuous pieces between mullion clips. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top-surface of the floor assembly and such that it is friction-fit between mullion mounting angles. Additional pieces of safing material to be friction-fit into space between mullion mounting clips at each mullion location with top edges of mullion clips covered with a min 1/2 in. (13 mm) thickness of compressed safing material.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. Fill, Void or Cavity Material* — Min 1/16 in. (1.6 mm) dry (1/8 in. or 3.2 mm wet) thickness of fill material applied over top of forming material and lapping min 1 in. onto top surface of concrete floor and onto the curtain wall insulation and framing covers. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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System No. CW-D-2046

June 23, 2016

F Rating — 2 Hr

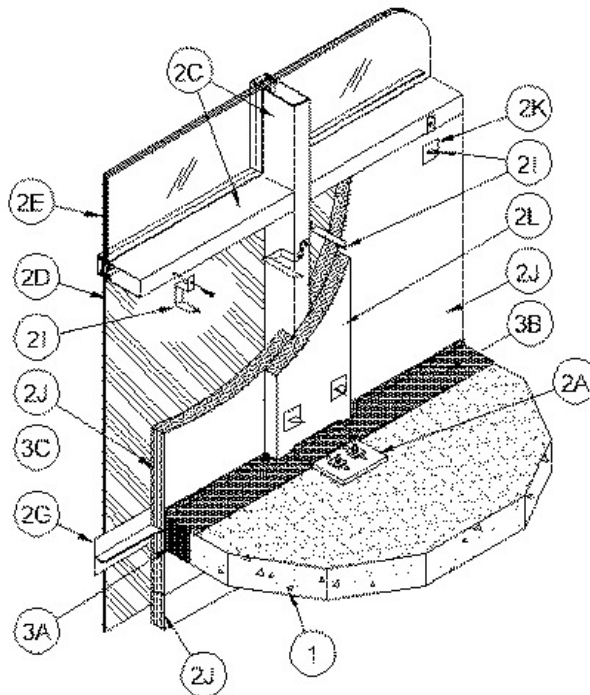
T Rating — 1/4 Hr

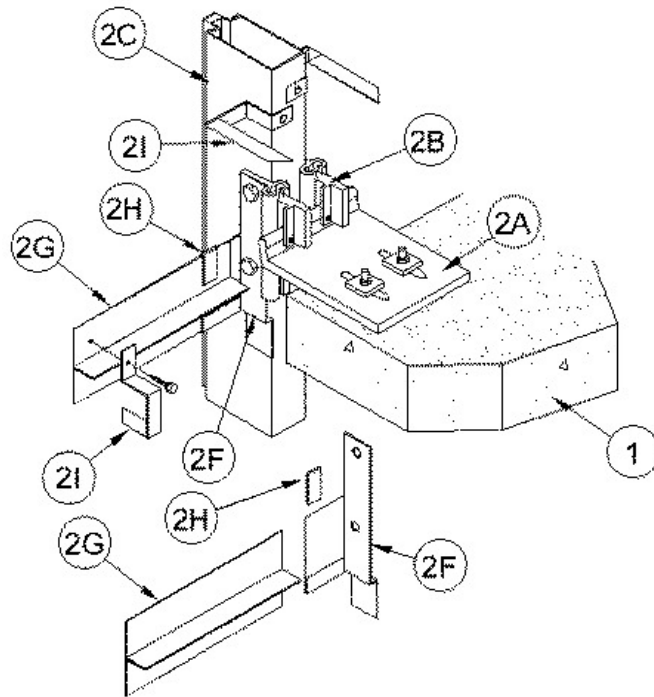
Integrity Rating — 2 Hr

Insulation Rating — 1/4 Hr

Linear Opening Width — 4 In. Max

Class II Movement Capabilities - 5% Vertical Shear (See Item 3)





1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Anchor Plates** — Nom 7 in. (178 mm) wide by 9-1/4 in. (235 mm) long by 5/8 in. (16 mm) thick extruded aluminum plates with a nominal 1-3/4 in. (44 mm) high raised lip along one end to engage hooked ends of mullion mounting clips (Item 2B). Plates anchored to top surface of floor at each mullion location with steel wedge anchor bolts in conjunction with extruded aluminum washers.

B. **Mullion Mounting Clips** — Nominal 3 in. (76 mm) wide by 7 in. (178 mm) high extruded aluminum anchor slides with tapped holes and with separate extruded aluminum hooks designed to engage the raised lip of the anchor plate (Item 2A). Anchor slides bolted to each side of mullion at each floor with 1/2 in. (13 mm) diam stainless steel screws with locking washers. Anchor hooks secured to anchor slides with steel jacking screws and secured to raised lip of anchor plate with steel set screw.

C. **Framing** — The one-piece or split rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be min 2-1/2 in. wide by 6 in. deep and shall be formed from min 0.125 in. (3.2 mm) thick aluminum. Mullions spaced max 60 in. (1524 mm) OC and secured to mullion anchor plates (Item 2A) with mounting clips (Item 2B) at each floor level. Interior face of mullions to be max 4 in. (102 mm) from edge of floor assembly. Transoms to be spaced min 69 in. (1753 mm) OC. The minimum height from the top of the floor to the bottom of the vision panel sill is 33 in. (838 mm).

D. **Spandrel Panels** — The spandrel panels shall consist of one of the following types:

a. **Glass Panels** — Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

b. **Aluminum Panels** — Nom 1/8 in. (3 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

c. **Stone Panels** — Nom 1-3/16 in. (46 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

E. **Vision Panels** — Nom 1 in. (25 mm) thick insulated glass units with two layers of nom 1/4 in. (6 mm) thick transparent heat-strengthened glass separated by a 1/2 in. (13 mm) air space. Each panel installed on silicone rubber setting blocks and secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

F. **Light Gauge Framing* — T-Bar Support Brackets** — Nom 2 in. (51 mm) wide brackets formed from galv steel and designed to bridge extruded aluminum anchor slides of mullion mounting clips (Item 2B). Each T Bar support bracket provided with nominal 3 in. (76 mm) wide by 3 in. (76 mm) high leg with a nominal 3/4 in. (19 mm) hemmed edge to receive the bottom edge of the T-Bar (Item 2G). T Bar support bracket secured to each side of mullion using the same bolts used to attach the anchor slides of the mullion mounting clips. The hemmed edge of the T Bar support bracket is to be located 3-1/2 in. (89 mm) below the top surface of the floor slab such that, when installed, the stem of the T Bar (Item 2G) will be located 2 in. below the top

plane of the floor slab. Angle of T Bar support bracket to be recessed from interior face of framing as necessary to accommodate the thickness of the curtain wall insulation (Item 2J).

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G. **Light Gauge Framing* — T-Bar** — Nom 3 in. (76 mm) wide by 1-1/2 in. (38 mm) high tee section formed from galv steel. T Bar installed between mullions at each floor level to restrain curtain wall insulation (Item 2J) against outward movement when forming material (Item 3A) is installed. The T Bar shall be installed with a clearance of 1/2 to 3/4 in. (13 to 19 mm) at each end. The bottom edge of the T Bar shall rest in and be supported by the hemmed edge of the T Bar support bracket (Item 2F) at each end. The top edge of the T Bar shall be locked in place with a locking clip (Item 2H) at one end and by a min No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screw at the opposite end. Each T Bar shall be located with its stem at an elevation 2 in. (51 mm) below the top plane of the floor.

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H. **Light Gauge Framing* — T-Bar Locking Clip** — Nom 1 by 1-1/4 in. (25 to 32 mm) clips formed from galv steel and designed to lock top of T Bar (Item 2G) to T Bar support brackets (Item 2F).

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I. **Light Gauge Framing* — Vertical and Horizontal Hangers** — Vertical and horizontal hangers formed from 1 in. (25 mm) wide galv steel strips, supplied in two configurations with length as needed to accommodate thickness of curtain wall insulation (Item 2J) and mullion cover (Item 2L). Vertical hangers (with 90 deg twist) screw-attached to interior face of mullions with No. 10 by min 1/2 in. (13 mm) long self-drilling, self-tapping steel screws. Vertical hangers on mullions to be located near each corner of each piece of curtain wall insulation except for the nominal 7 to 9 in. (178 to 229 mm) high piece of curtain wall insulation located immediately beneath the stem of the T Bar. The 7 to 9 in. (178 to 229 mm) high piece of curtain wall insulation immediately beneath the stem of the T Bar requires only one vertical hanger near its midheight at each end. Horizontal hangers (without twist) screw-attached to T Bar (Item 2G) and to transom at top of spandrel panel (sill of vision panel) with No. 10 by min 1/2 in. (13 mm) long self-drilling, self-tapping steel screws. Horizontal hangers on T Bar to be located within 6 in. (152 mm) of mullion at each end and spaced max 16 in. (406 mm) OC. Horizontal hanger on transom at top of spandrel panel to be located at center of transom. No hangers are to be used on the transom at the bottom of spandrel panel (lintel of vision panel).

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J. **Curtain Wall Insulation*** — Min 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrims vapor retarder, supplied in min 36 in. (914 mm) wide batts. Insulation batts to be installed with no vertical seams. A horizontal seam is to be located 7 to 9 in. (178 to 229 mm) below the stem of the T Bar in each spandrel area and is to be sealed with aluminum foil tape. In the spandrel area beneath the stem of the T Bar, insulation panels tightly-fitted between vertical mullions and between the stem of the T Bar (Item 2G) and the transom, flush with the interior surface of framing. Insulation panels impaled on vertical and horizontal hangers (Item 2I) and secured in place with nom 2 by 2 in. (51 by 51 mm) steel locking washers (Item 2K).

THERMAFIBER INC — Firespan 90

K. **Light Gauge Framing* — Locking Washers** — Nom 2 by 2 in. (51 by 51 mm) clips formed from galv steel and designed to secure curtain wall insulation and mullion covers on vertical and horizontal hangers (Item 2I).

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L. **Mullion Covers — Curtain Wall Insulation*** — Nom 2 in. (51 mm) thick mineral wool batt insulation faced on one side with aluminum foil/scrims vapor retarder, supplied in min 24 by 48 in. (610 by 1219 mm) boards. Nom 12 in. (305 mm) wide strips to be centered over mullions and impaled on the same vertical hangers used to secure the spandrel panel insulation and secured in place with nom 2 by 2 in. (51 by 51 mm) locking washers (Item 2K). Mullion covers to abut the forming material (Item 3A) above and below the floor.

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M. **Light Gauge Framing* — Spiral Anchor** — (Not Shown) — As an alternate to the vertical hangers (Item 2I), galv steel wire spiral anchors may be used to secure the framing covers (Item 2L) to the curtain wall insulation (Item 2J) on each side of the mullion. Nom length of spiral anchors to be equal to thickness of curtain wall insulation plus thickness of framing cover. Spiral anchors driven through mullion covers and into curtain wall insulation and spaced max 12 in. (305 mm) OC.

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3. **Safing System** — Max separation between the edge of the floor and the face of the framing members (at time of installation) is 4 in. (102 mm). The safing system is designed to accommodate vertical shear movement up to a max of 5 percent of its installed width. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Nom 4 pcf (64 kg/m³) density mineral wool batt insulation. Batt sections cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is min 25 percent greater than the width of linear gap between the curtain wall insulation and the edge of the concrete floor slab to attain a min 20 percent compression in the thickness direction. The forming material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. Forming material to extend completely beneath mullion mounting plate (Item 2A). A max of two tightly-butted seams are permitted in the forming material between mullions.

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B. Fill, Void or Cavity Material* — Min 1/8 in. (3.2 mm) wet thickness (min 1/16 in. or 1.6 mm dry thickness) of fill material spray-applied over top of forming material and lapping min 1/2 in. (13 mm) onto the top surface of the floor and onto the curtain wall insulation, mullion anchor plate (Item 2A) and framing covers. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

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System No. CW-S-1007
XHDG.CW-S-1007
Perimeter-fire-containment Systems

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System No. CW-S-1007

June 23, 2016

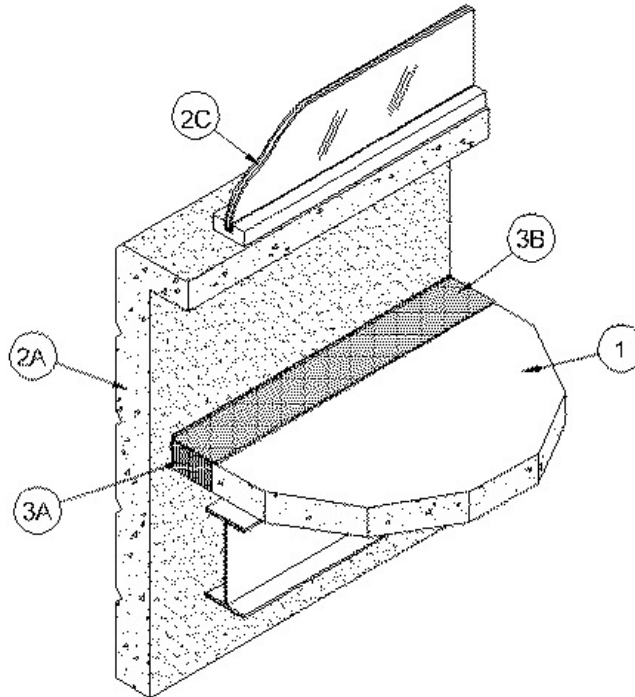
F Rating — 2 Hr

T Rating — 1/4 Hr

Integrity Rating — 2 Hr

Insulation Rating — 1/4 Hr

Linear Opening Width — 6 In. Max



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor assembly to be supported at perimeter edges by spandrel beams having a Restrained or Unrestrained Beam Rating of 2 hr.

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Spandrel Panels** — Min 72 in. (1829 mm) high by min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete spandrel panels. Wall may also consist of min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight concrete tilt-up panels with a min 72 in. (1829 mm) vertical separation between window openings. Panels provided with steel dead load anchors welded to steel reinforcing bars embedded in the concrete for attachment to the steel columns and spandrel beams. Panels also provided with steel lateral anchors or braces. The dead load anchors which are located in the linear gap between the concrete floor slab and the spandrel panel or tilt-up panel are to be spaced max 72 in. (1829 mm) OC. The top of the dead load anchor is to be recessed min 1/2 in. (13 mm) from top surface of floor.

B. **Joint System** — (Not Shown) — Vertical joints between spandrel panels or tilt-up panels to be protected using Joint System No. WW-S-0042.

C. **Framed Window** — Metal framed window with nom 1/4 in. (6 mm) thick heat-strengthened glass. Sill of window to be min 34 in. (864 mm) above top of floor.

3. **Safing System** — Max separation between edge of floor assembly and concrete spandrel or tilt-up panel is 6 in. (152 mm). The safing system shall incorporate the following construction features:

A. **Forming Material*** — Nom 4 in. (102 mm) thick mineral wool batt safing material to be installed between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the concrete spandrel or tilt-up panel and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly-butted seam is permitted between dead load anchors. An additional min 1/2 in. (13 mm) thick piece of mineral wool batt safing material to be installed to cover top surface of each dead load anchor.

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B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3.2 mm) wet thickness (1/16 in. or 1.6 mm dry) of fill material spray-applied over top of forming material and lapping min 1 in. onto the top surface of the concrete floor and onto the concrete spandrel panel or tilt-up panel. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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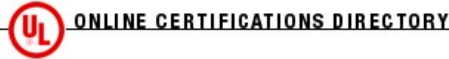
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**System No. CW-S-2028
XHDG.CW-S-2028
Perimeter-fire-containment Systems**

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System No. CW-S-2028

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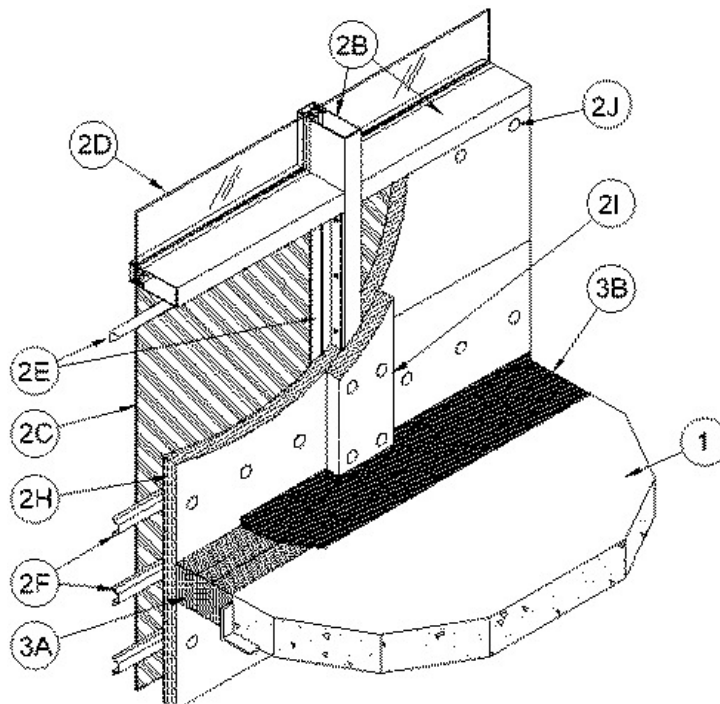
F Rating – 2 Hr

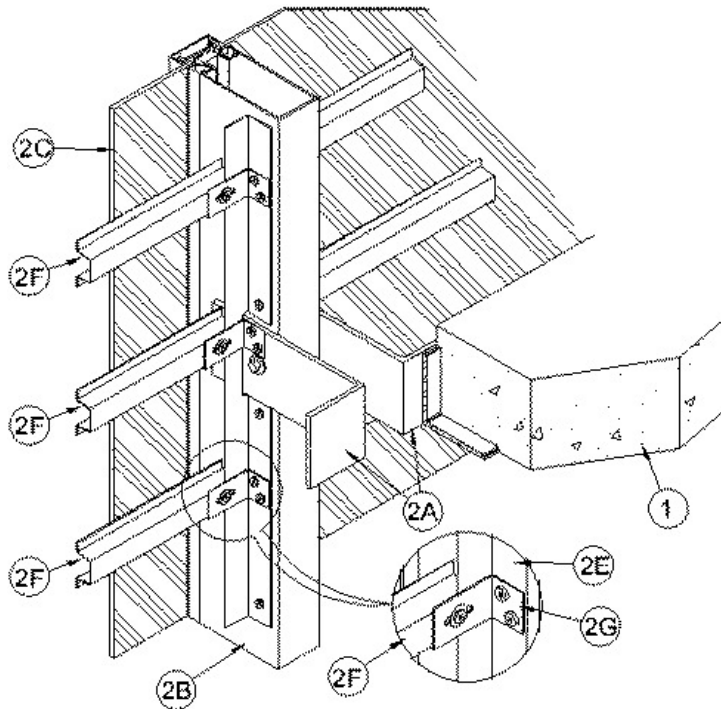
T Rating – 1/4 Hr

Integrity Rating – 2 Hr

Insulation Rating – 1/4 Hr

Linear Opening Width – 8 In. Max





1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Perimeter of floor assembly to be provided with min 4 by 4 by 1/4 in. (102 by 102 by 6 mm) thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Clips** — Min 4 in. (102 mm) long angles with one nom 4 in. (102 mm) leg for attachment to edge of floor assembly and with one leg approx 4 in. (102 mm) longer than distance to nearest face of mullion. Clips welded to steel angle at edge of floor assembly (Item 1) on each side of vertical mullion (Item 2B) at each floor level. Top edge of each mounting angle to be recessed min 1/2 in. (13 mm) below top surface of floor.

B. **Framing** — The rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be minimum 2-1/2 in. (64 mm) wide by 5 in. (127 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1524 mm) OC and secured to mullion mounting clips (Item 2A) at each floor level with two 1/2 in. (13 mm) diam by 4 in. (102 mm) long hex head steel bolts in conjunction with steel nuts and washers. Interior face of mullions to be max 8 in. from edge of floor assembly. Transoms framing top and bottom edges of spandrel panels (Item 2C) to be spaced min 72 in. (1829 mm) OC. Transom forming sill of vision panel (Item 2D) to be located such that its bottom surface is at height of 33 in. (838 mm) above the top surface of the floor (Item 1).

C. **Spandrel Panels** — Nom 1/4 in. (6 mm) thick opaque heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

D. **Vision Panels** — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. **Spandrel Panel Perimeter Angles** — Nom 1-1/2 by 1-1/2 in. (38 by 38 mm) No. 22 gauge galvanized steel angles installed around entire perimeter of each spandrel panel. Angles recessed from interior face of framing as necessary to accommodate thickness of curtain wall insulation (Item 2H). Angles notched as necessary to be continuous over mullion mounting clips (Item 2A). Angles screw-attached to mullions and transom along sides and top of each spandrel panel with No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws spaced max 12 in. (305 mm) OC. Angle along bottom of each spandrel panel to be screw-attached to leg of angle on mullion at each end without any direct attachment to transom.

F. **Stiff Back Channel** — Nom 2-1/2 in. (38 mm) wide by 7/8 in. (22 mm) deep hat-shaped channel formed of 22 gauge galv steel to be installed to stiffen curtain wall insulation between mullions above, below and at elevation of safin joint. One stiff back channel to be located with its centerline approx 6 in. (152 mm) below floor and one stiff back channel to be located with its centerline approx 6 in. (152 mm) above floor. A third stiff back channel is to be located near the midheight of the safin joint. A clearance of 1/4 to 1/2 in. (6 to 13 mm) shall be maintained between the ends of the stiff back channels and the mullions. Stiff back channel secured to mullion at each end with channel attachment clip (Item 2G) in conjunction with a No. 8 by 1/2 in. (13 mm) long self-drilling, self-tapping wafer head steel screw or a 3/16 in. (4.8 mm) diam steel bolt with nut and washer.

G. **Channel Attachment Clip** — Nom 1-1/2 by 2-1/2 by 1-1/2 in. (38 by 64 by 38 mm) long angle formed of 16 gauge galv steel. The 2-1/2 in. (64 mm) leg is provided with a 1/4 in. (6 mm) wide by 1-1/2 in. (38 mm) long slot along its centerline for attachment of the stiff back channel. Clips secured to mullions mounting clips (Item 2A) and mullions, through perimeter angles, with

two No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws . Channel clips installed with 2-1/2 in. (64 mm) leg recessed from interior face of mullion to accommodate thickness of curtain wall insulation (Item 2H).

H. **Curtain Wall Insulation*** — Min 2 in. (51 mm) thick mineral wool board insulation, unfaced or faced on one side with aluminum foil/scrims vapor retarder, supplied in min 36 in. (914 mm) wide boards. Insulation boards to be installed with no vertical seams . A full-width board shall be centered at the midheight of floor and tightly-fitted between vertical mullions , flush with interior surface of framing. The centered board shall be secured to the stiff back channels (Item 2F) located approx 6 in. above and below the floor with cup head weld pins (Item 2J) spaced max 10 in. (254 mm) OC along each channel. The remainder of the spandrel panel framing above and below the centered full-width board shall be filled in with additional lengths of board cut to fit tightly between mullions and with the horizontal seams between board sections tightly butted. The boards shall be secured to the spandrel panel perimeter angles with cup head weld pins at each corner of each board and spaced max 10 in. (254 mm) OC. When faced boards are used, butted seams to be covered with min 4 in. (102 mm) wide aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

I. **Framing Covers - Curtain Wall Insulation*** — Min 8 in. (203 mm) wide strips cut from the same min 2 in. (51 mm) thick mineral wool batt insulation used for the curtain wall insulation (Item 2H). Framing covers to be centered over mullions, and secured to the spandrel panel perimeter angles (Item 2E) with cup head weld pins (Item 2J) spaced max 12 in. (305 mm) OC. Where more than one spandrel panel occurs between vertically separated vision panels, the horizontal transom between spandrel panels shall also be covered with an 8 in. (203 mm) wide framing cover in the same manner as on the vertical mullions. Framing covers on mullions to abut the mineral wool batt safing material (Item 3A) above and below floor.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

J. **Weld Pin** — No. 12 gauge galv steel weld pin with nom 1-3/16 in. (30 mm) diam galv steel cup head. Cup head weld pins provided in two lengths. One length to be equal to thickness of curtain wall insulation (Item 2H) and second length to be equal to thickness of curtain wall insulation plus thickness of framing cover (Item 2I). Cup head weld pins inserted through curtain wall insulation and mullion covers and welded to spandrel panel perimeter angles at max OC spacings referenced in Items 2H and 2I.

3. **Perimeter Fire Containment System** — The perimeter fire containment system shall incorporated the following construction features:

A. **Forming Material*** — Nom 4 in. (102 mm) thick, mineral wool batt safing material to be installed in continuous pieces between mullion clips. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top-surfaces of the floor assembly and such that it is friction-fit between mullion mounting angles. Additional pieces of safing material to be friction-fit into space between mullion mounting clips at each mullion location with top edges of mullion clips covered with a min 1/2 in. (13 mm) thickness of compressed safing material.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. **Fill, Void or Cavity Material*** — Min 1/16 in. (1.6 mm) dry (1/8 in. or 3.2 mm wet) thickness of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the curtain wall insulation and framing covers. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

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Perimeter-fire-containment Systems

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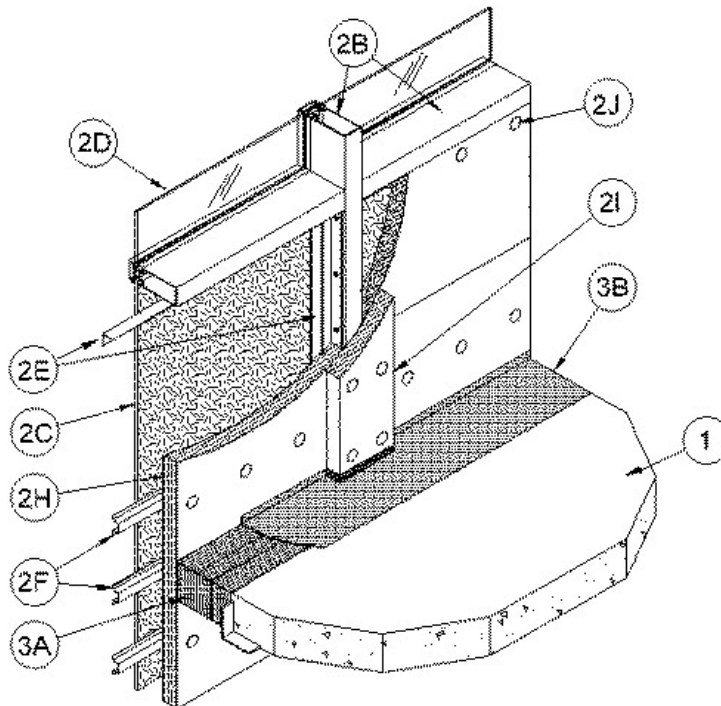
F Rating — 2 Hr

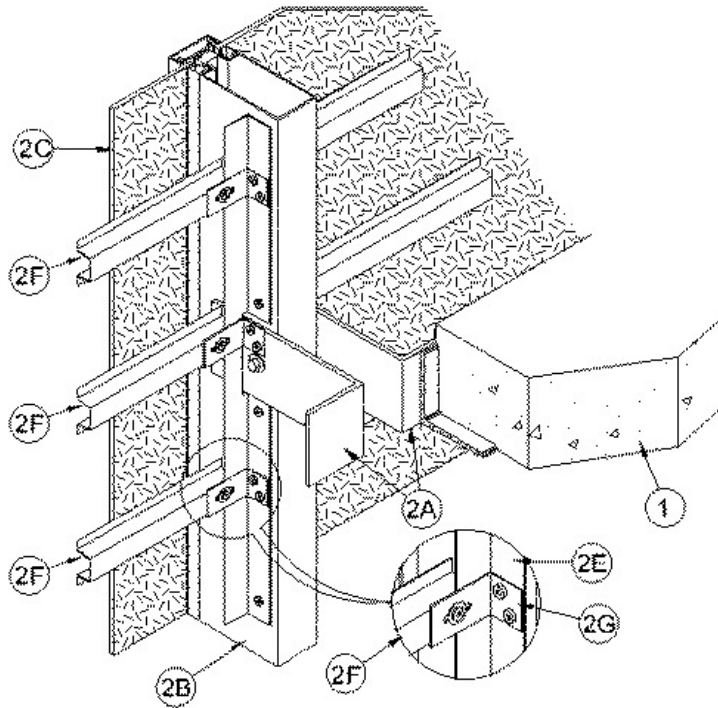
T Rating — 1/4 Hr

Integrity Rating — 2 Hr

Insulation Rating — 1/4 Hr

Linear Opening Width — 8 In. Max





1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Perimeter of floor assembly to be provided with min 4 by 4 by 1/4 in. (102 by 102 by 6 mm) thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Clips** — Min 4 in. (102 mm) long angles with one nom 4 in. (102 mm) leg for attachment to edge of floor assembly and with one leg approx 4 in. (102 mm) longer than distance to nearest face of mullion. Clips welded to steel angle at edge of floor assembly (Item 1) on each side of vertical mullion (Item 2B) at each floor level. Top edge of each mounting angle to be recessed min 1/2 in. (13 mm) below top surface of floor.

B. **Framing** — The rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be minimum 2-1/2 in. (64 mm) wide by 5 in. (127 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1524 mm) OC and secured to mullion mounting clips (Item 2A) at each floor level with two 1/2 in. (13 mm) diam by 4 in. (102 mm) long hex head steel bolts in conjunction with steel nuts and washers. Interior face of mullions to be max 8 in. (203 mm) from edge of floor assembly. Transoms framing top and bottom edges of spandrel panels (Item 2C) to be spaced min 72 in. (1829 mm) OC. Transom forming sill of vision panel (Item 2D) to be located such that its bottom surface is at height of 33 in. (838 mm) above the top surface of the floor (Item 1).

C. **Spandrel Panels** — Nom 1/8 in. (3.2 mm) thick aluminum panels with 1/4 in. (6 mm) thick edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

D. **Vision Panels** — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. **Spandrel Panel Perimeter Angles** — Nom 1-1/2 by 1-1/2 in. (38 by 38 mm) No. 22 gauge galvanized steel angles installed around entire perimeter of each spandrel panel. Angles recessed from interior face of framing as necessary to accommodate thickness of curtain wall insulation (Item 2H). Angles notched as necessary to be continuous over mullion mounting clips (Item 2A). Angles screw-attached to mullions and transom along sides and top of each spandrel panel with No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws spaced max 12 in. (305 mm) OC. Angle along bottom of each spandrel panel to be screw-attached to leg of angle on mullion at each end without any direct attachment to transom.

F. **Stiff Back Channel** — Nom 2-1/2 in. (64 mm) wide by 7/8 in. (22 mm) deep hat-shaped channel formed of 22 gauge galv steel to be installed to stiffen curtain wall insulation between mullions above, below and at elevation of safin joint. One stiff back channel to be located with its centerline approx 6 in. (152 mm) below floor and one stiff back channel to be located with its centerline approx 6 in. (152 mm) above floor. A third stiff back channel is to be located near the midheight of the safin joint. A clearance of 1/4 to 1/2 in. (6 to 13 mm) shall be maintained between the ends of the stiff back channels and the mullions. Stiff back channel secured to mullion at each end with channel attachment clip (Item 2G) in conjunction with a No. 8 by 1/2 in. (13 mm) long self-drilling, self-tapping wafer head steel screw or a 3/16 in. (4.8 mm) diam steel bolt with nut and washer.

G. **Channel Attachment Clips** — Nom 1-1/2 by 2-1/2 by 1-1/2 in. (38 by 64 by 38 mm) long angle formed of 16 gauge galv steel. The 2-1/2 in. (64 mm) leg is provided with a 1/4 in. (6 mm) wide by 1-1/2 in. (38 mm) long slot along its centerline for attachment of the stiff back channel. Clips secured to mullion mounting clips (Item 2A) and mullions, through perimeter angles, with

two No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws. Channel clips installed with 2-1/2 in. (64 mm) leg recessed from interior face of mullion to accommodate thickness of curtain wall insulation (Item 2H).

H. Curtain Wall Insulation* — Min 2 in. (51 mm) thick mineral wool board insulation, unfaced or faced on one side with aluminum foil/scrim vapor retarder, supplied in min 36 in. (914 mm) wide boards. Insulation boards to be installed with no vertical seams. A full-width board shall be centered at the midheight of floor and tightly-fitted between vertical mullions, flush with interior surface of framing. The centered board shall be secured to the stiff back channels (Item 2F) located approx 6 in. (152 mm) above and below the floor with cup head weld pins (Item 2J) spaced max 10 in. (254 mm) OC along each channel. The remainder of the spandrel panel framing above and below the centered full-width board shall be filled in with additional lengths of board cut to fit tightly between mullions and with the horizontal seams between board sections tightly butted. The boards shall be secured to the spandrel panel perimeter angles with cup head weld pins at each corner of each board and spaced max 10 in. (254 mm) OC. When faced boards are used, butted seams to be covered with min 4 in. wide aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

I. Framing Covers — Curtain Wall Insulation* — Min 8 in. (203 mm) wide strips cut from the same min 2 in. (51 mm) thick mineral wool batt insulation used for the curtain wall insulation (Item 2H). Framing covers to be centered over mullions and secured to the spandrel panel perimeter angles (Item 2E) with cup head weld pins (Item 2J) spaced max 12 in. (305 mm) OC. Where more than one spandrel panel occurs between vertically separated vision panels, the horizontal transom between spandrel panels shall also be covered with an 8 in. (203 mm) wide framing cover in the same manner as on the vertical mullions. Framing covers on mullions to abut the mineral wool batt safing material (Item 3A) above and below floor.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

J. Weld Pin — No. 12 gauge galv steel weld pin with nom 1-3/16 in. (30 mm) diam galv steel cup head. Cup head weld pins provided in two lengths. One length to be equal to thickness of curtain wall insulation (Item 2H) and second length to be equal to thickness of curtain wall insulation plus thickness of framing cover (Item 2I). Cup head weld pins inserted through curtain wall insulation and mullion covers and welded to spandrel panel perimeter angles at max OC spacings referenced in Items 2H and 2I.

3. Perimeter Fire Containment System — The perimeter fire containment system shall incorporated the following construction features:

A. Forming Material* — Nom 4 in. (102 mm) thick mineral wool batt safing material to be installed in continuous pieces between mullion clips. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly and such that it is friction-fit between mullion mounting angles. Additional pieces of safing material to be friction-fit into space between mullion mounting clips at each mullion location with top edges of mullion clips covered with a min 1/2 in. (13 mm) thickness of compressed safing material.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. Fill, Void or Cavity Material* — Min 1/8 in (3.2 mm) wet (1/16 in. or 1.6 mm dry) thickness of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto top surface of the concrete floor and onto the curtain wall insulation and framing covers. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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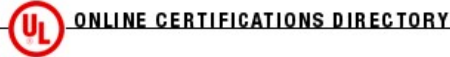
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System No. CW-S-2032
XHDG.CW-S-2032
Perimeter-fire-containment Systems

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHDG - Perimeter-fire-containment Systems

[See General Information for Perimeter-fire-containment Systems](#)

System No. CW-S-2032

June 23, 2016

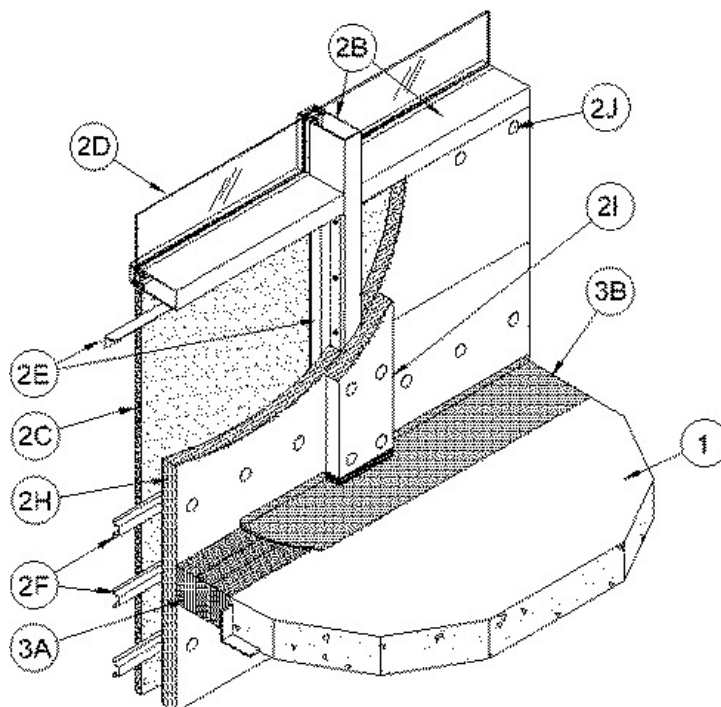
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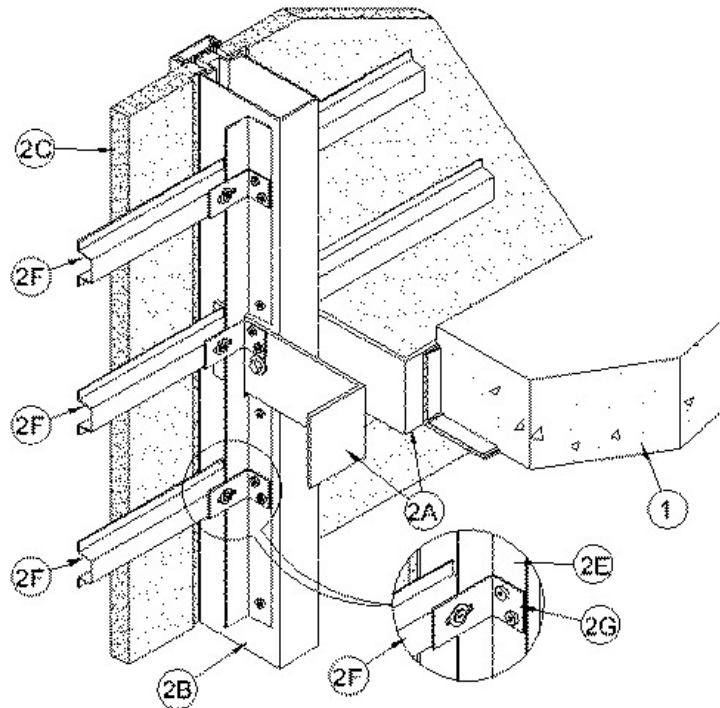
T Rating — 1/4 Hr

Integrity Rating — 2 Hr

Insulation Rating — 1/4 Hr

Linear Opening Width — 8 In. Max





1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Perimeter of floor assembly to be provided with min 4 by 4 by 1/4 in. (102 by 102 by 6 mm) thick cast-in-place structural steel angle for weld-attachment of mullion mounting clips (Item 2A).

2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Mullion Mounting Clips** — Min 4 in. (102 mm) long angles with one nom 4 in. (102 mm) leg for attachment to edge of floor assembly and with one leg approx 4 in. (102 mm) longer than distance to nearest face of mullion. Clips welded to steel angle at edge of floor assembly (Item 1) on each side of vertical mullion (Item 2B) at each floor level. Top edge of each mounting angle to be recessed min 1/2 in. (13 mm) below top surface of floor.

B. **Framing** — The rectangular tubing mullions (vertical members) and transoms (horizontal members) shall be minimum 2-1/2 in. (64 mm) wide by 5 in. (127 mm) deep and shall be formed from min 0.100 in. (2.5 mm) thick aluminum. Mullions spaced max 60 in. (1524 mm) OC and secured to mullion mounting clips (Item 2A) at each floor level with two 1/2 in. (13 mm) diam by 4 in. (102 mm) long hex head steel bolts in conjunction with steel nuts and washers. Interior face of mullions to be max 8 in. from edge of floor assembly. Transoms framing top and bottom edges of spandrel panels (Item 2C) to be spaced min 72 in. (1829 mm) OC. Transom forming sill of vision panel (Item 2D) to be located such that its bottom surface is at height of 33 in. (838 mm) above the top surface of the floor (Item 1).

C. **Spandrel Panels** — Nom 1-3/16 in. (30 mm) thick polished granite spandrel panels with 1 in. (25 mm) thick gauged edges. Each panel secured in position with aluminum pressure plates in conjunction with gaskets and steel screws.

D. **Vision Panels** — Nom 1/4 in. (6 mm) thick transparent heat-strengthened glass. Each panel secured in position with aluminum pressure plates in conjunction with glazing gaskets and steel screws.

E. **Spandrel Panel Perimeter Angles** — Nom 1-1/2 by 1-1/2 in. (38 by 38 mm) No. 22 gauge galvanized steel angles installed around entire perimeter of each spandrel panel. Angles recessed from interior face of framing as necessary to accommodate thickness of curtain wall insulation (Item 2H). Angles notched as necessary to be continuous over mullion mounting clips (Item 2A). Angles screw-attached to mullions and transom along sides and top of each spandrel panel with No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws spaced max 12 in. (305 mm) OC. Angle along bottom of each spandrel panel to be screw-attached to leg of angle on mullion at each end without any direct attachment to transom.

F. **Stiff Back Channel** — Nom 2-1/2 in. (64 mm) wide by 7/8 in. (22 mm) deep hat-shaped channel formed of 22 gauge galv steel to be installed to stiffen curtain wall insulation between mullions above, below and at elevation of safin joint. One stiff back channel to be located with its centerline approx 6 in. (152 mm) below floor and one stiff back channel to be located with its centerline approx 6 in. (152 mm) above floor. A third stiff back channel is to be located near the midheight of the safin joint. A clearance of 1/4 to 1/2 in. (6 to 13 mm) shall be maintained between the ends of the stiff back channels and the mullions. Stiff back channel secured to mullion at each end with channel attachment clip (Item 2G) in conjunction with a No. 8 by 1/2 in. (13 mm) long self-drilling, self-tapping wafer head steel screw or a 3/16 in. (4.8 mm) diam steel bolt with nut and washer.

G. **Channel Attachment Clips** — Nom 1-1/2 by 2-1/2 by 1-1/2 in. (38 by 64 by 38 mm) long angle formed of 16 gauge galv steel. The 2-1/2 in. (64 mm) leg is provided with a 1/4 in. (6 mm) wide by 1-1/2 in. (38 mm) long slot along its centerline for attachment of the stiff back channel. Clips secured to mullions mounting clips (Item 2A) and mullions, through perimeter angles, with

two No. 10 by 1/2 in. (13 mm) long self-drilling, self-tapping steel screws . Channel clips installed with 2-1/2 in. (64 mm) leg recessed from interior face of mullion to accommodate thickness of curtain wall insulation (Item 2H) .

H. Curtain Wall Insulation* — Min 2 in. (51 mm) thick mineral wool board insulation, unfaced or faced on one side with aluminum foil/scrim vapor retarder, supplied in min 36 in. (914 mm) wide boards. Insulation boards to be installed with no vertical seams. A full-width board shall be centered at the midheight of floor and tightly-fitted between vertical mullions , flush with interior surface of framing. The centered board shall be secured to the stiff back channels (Item 2F) located approx 6 in. (152 mm) above and below the floor with cup head weld pins (Item 2J) spaced max 10 in. (254 mm) OC along each channel. The remainder of the spandrel panel framing above and below the centered full-width board shall be filled in with additional lengths of board cut to fit tightly between mullions and with the horizontal seams between board sections tightly butted. The boards shall be secured to the spandrel panel perimeter angles with cup head weld pins at each corner of each board and spaced max 10 in. (254 mm) OC. When faced boards are used, butted seams to be covered with min 4 in. (102 mm) wide aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

I. Framing Covers — Curtain Wall Insulation* — Min 8 in. (203 mm) wide strips cut from the same min 2 in. (51 mm) thick mineral wool batt insulation used for the curtain wall insulation (Item 2H) . Framing covers to be centered over mullions, and secured to the spandrel panel perimeter angles (Item 2E) with cup head weld pins (Item 2J) spaced max 12 in. (305 mm) OC. Where more than one spandrel panel occurs between vertically separated vision panels, the horizontal transom between spandrel panels shall also be covered with an 8 in. (203 mm) wide framing cover in the same manner as on the vertical mullions. Framing covers on mullions to abut the mineral wool batt safing material (Item 3A) above and below floor.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

J. Weld Pin — No. 12 gauge galv steel weld pin with nom 1-3/16 in. (30 mm) diam galv steel cup head. Cup head weld pins provided in two lengths. One length to be equal to thickness of curtain wall insulation (Item 2H) and second length to be equal to thickness of curtain wall insulation plus thickness of framing cover (Item 2I). Cup head weld pins inserted through curtain wall insulation and mullion covers and welded to spandrel panel perimeter angles at max OC spacings referenced in Items 2H and 2I.

3. Perimeter Fire Containment System — The perimeter fire containment system shall incorporate the following construction features:

A. Forming Material* — Nom 4 in. (102 mm) thick, mineral wool batt safing material to be installed in continuous pieces between mullion clips. Safing material to be cut to a min 4-1/2 in. (114 mm) width and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall and the edge of the concrete floor slab. The safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top-surfaces of the floor assembly and such that it is friction-fit between mullion mounting angles. Additional pieces of safing material to be friction-fit into space between mullion mounting clips at each mullion location with top edges of mullion clips covered with a min 1/2 in. (13 mm) thickness of compressed safing material.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. Fill, Void or Cavity Material* — Min 1/8 in. (3.2 mm) wet (1/16 in. or 1.6 mm dry) thickness of fill material applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the curtain wall insulation and framing covers. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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System No. CW-S-2053
XHDG.CW-S-2053
Perimeter-fire-containment Systems

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHDG - Perimeter-fire-containment Systems

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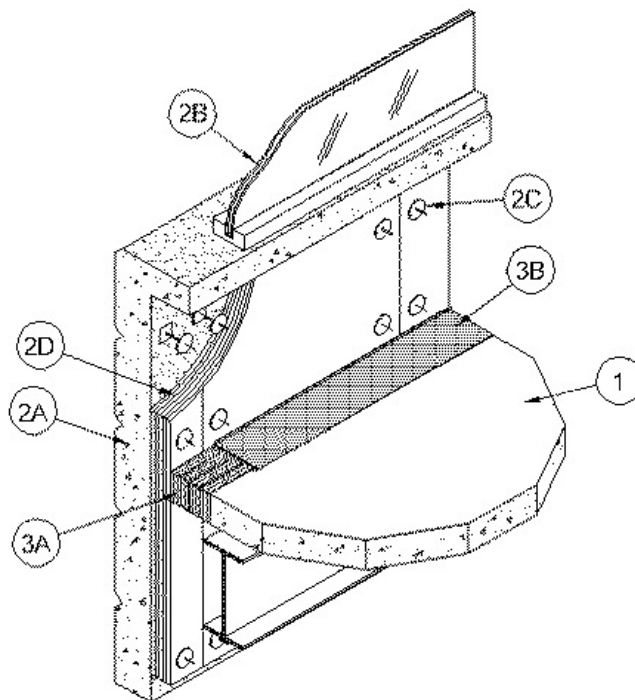
System No. CW-S-2053

June 23, 2016

F Rating — 2 Hr

T Rating — 1/4 Hr

Linear Opening Width — 8 In. Max



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor assembly to be supported at perimeter edges by spandrel beams having a Restrained or Unrestrained Beam Rating of 2 hr. Edge of concrete floor to be max 8 in. (203 mm) from interior surface of spandrel panel (Item 2A).
2. **Curtain Wall Assembly** — The curtain wall assembly shall incorporate the following construction features:

A. **Spandrel Panels** — Min 36 in. (914 mm) high by min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete spandrel panels. Wall may also consist of min 4 in. (102 mm) thick steel-reinforced lightweight or normal weight concrete tilt-up panels with a min 36 in. (914 mm) vertical separation between window openings. Panels provided with steel dead load anchors welded to steel reinforcing bars embedded in the concrete for attachment to the steel columns and spandrel beams. Panels also provided with steel lateral anchors or braces. The dead load anchors, which are located in the linear gap between the concrete floor slab and the spandrel panel or tilt-up panel, are to be spaced max 72 in. (1829 mm) OC. The top of the dead load anchor is to be recessed min 1/2 in. (13 mm) from top surface of floor

B. **Framed Window** — Metal framed window with nom 1 in. (25 mm) thick (double pane) transparent heat-strengthened glass panels. Sill of window to be min 6 in. above top of floor.

C. **Impaling Pins** — No. 12 gauge steel pins, min 1/2 in. (13 mm) longer than thickness of insulation boards (Item 2D), swaged to nom 2 by 2 in. (51 by 51 mm) galv steel base plate. Steel base plates secured to concrete spandrel panel with steel concrete screws or powder-driven steel fasteners. Impaling pins to be spaced 3 in. (76 mm) from edges of insulation boards (Item 2D) on each side of seams and spaced max 24 in. (610 mm)OC both vertically and horizontally. A min of two horizontal arrays of impaling pins are required to be located on spandrel panel above top surface of floor.

C1. **Clutch Clips** — (Optional, Not Shown) — Nom 2 by 2 in. (51 by 51 mm) wide by 1-1/4 in. (32 mm) high V-shaped steel clutch clips used in conjunction with impaling pins (Item 2C) to offset curtain wall insulation (Item 2D) from spandrel panel (Item 2A). Clutch clips to be used on all impaling pins. When clutch clips are used, a row of impaling pins shall be located max 3 in. (76 mm) from top and bottom surfaces of floor assembly and spaced max 18 in. (457 mm) OC.

D. **Curtain Wall Insulation*** — Min 2 in. (51 mm) thick mineral wool board insulation, faced on one side with aluminum foil/scrims vapor retarder, supplied in min 24 by 48 in. (610 by 1219 mm) boards. Insulation boards installed vertically with tightly-butted seams to cover interior surface of concrete spandrel panel. Horizontal seams of insulation boards (if necessary) to be located min 24 in. (610 mm) above and min 6 in. (152 mm) below planes of floor. Insulation boards secured to spandrel panel with impaling pins in conjunction with min 1-1/2 in. (38 mm) diameter galv steel clinch shields. Butted seams to be covered with aluminum foil tape.

ROCKWOOL MALAYSIA SDN BHD — CurtainRock 80

ROXUL INC — CurtainRock 80

3. **Safing System** — Max separation between edge of floor assembly and curtain wall insulation is 6 in. The safing system shall incorporate the following construction features:

A. **Forming Material*** — Mineral wool batt safing material to be cut into min 4-1/2 in. (114 mm) wide pieces and stacked to a thickness which is at least 25 percent greater than the width of the linear gap between the curtain wall insulation (Item 2D) and the edge of the concrete floor slab. The stacked safing material is compressed and inserted cut-edge-first into the linear gap such that its top surface is flush with the top surface of the floor assembly. A max of one tightly butted seam is permitted between spandrel panel attachment plates or tubes. An additional min 1/2 in. (13 mm) thick piece of mineral wool batt safing material is to be installed to cover top surface of each dead load anchor.

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROXUL INC — SAFE

B. **Fill, Void or Cavity Material*** — Min 1/8 in. (3.2 mm) wet thickness (1/16 in. or 1.6 mm dry) of fill material spray-applied over top of forming material and lapping min 1 in. (25 mm) onto the top surface of the concrete floor and onto the curtain wall insulation. When CFS-SP SIL is used, min wet (and dry) thickness of spray is 2 mm.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP SIL Firestop Silicone Joint Spray or CFS-SP WB Firestop Joint Spray

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6 FIRESTOP SYSTEMS & TYPICALS

B. SYSTEMS

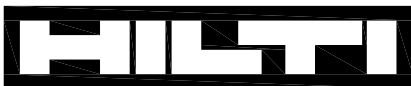
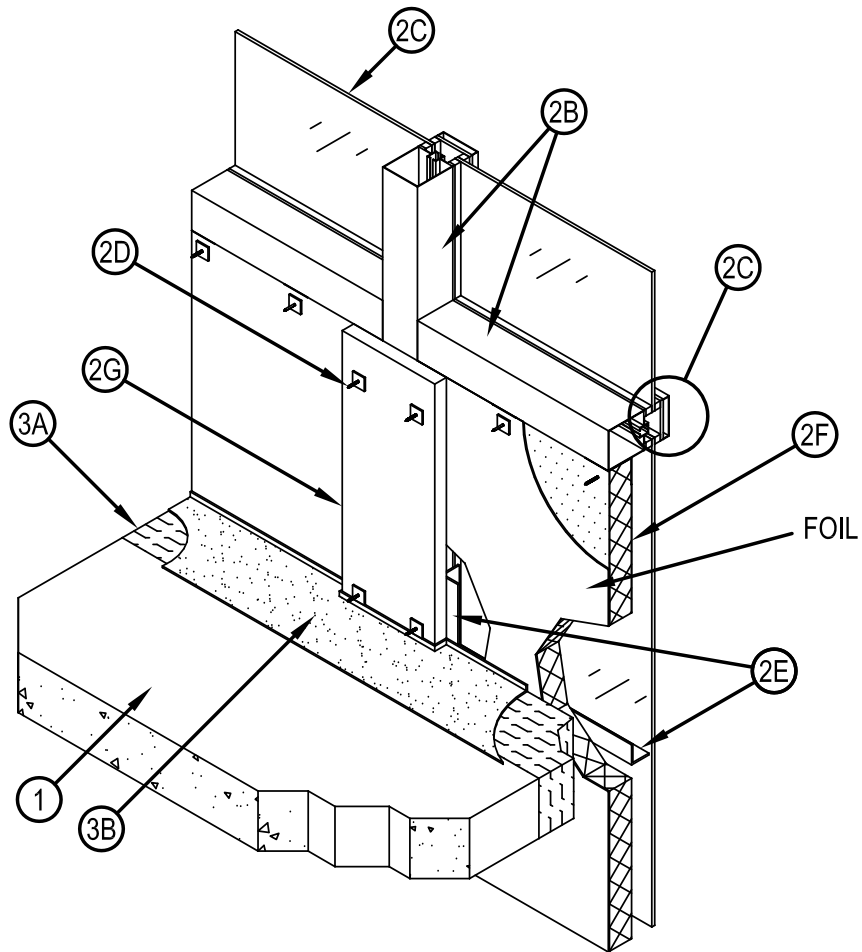
Design No. CEJ 127 P (HI/JS 120-05) PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	2-HR.	2-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE ITEM 3A	NONE ±6.25 (25% COMPRESSION)	NONE ±6.25 (25% COMPRESSION)

CEJ 127 P



Hilti Firestop Systems

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June 20, 2014



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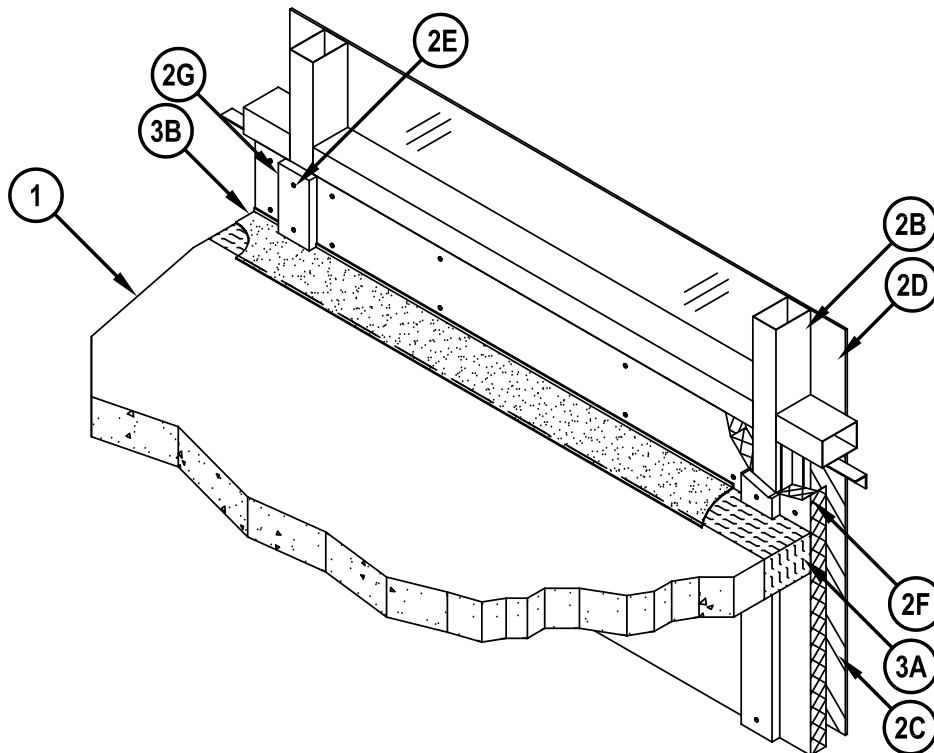
Design No. CEJ 216 P (HI/BP 120-06)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 15 ± 5	± 7.5 ± 5

L-Rating N/A



Hilti Firestop Systems

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Design No. CEJ 244 P (HI/BP 120-07)

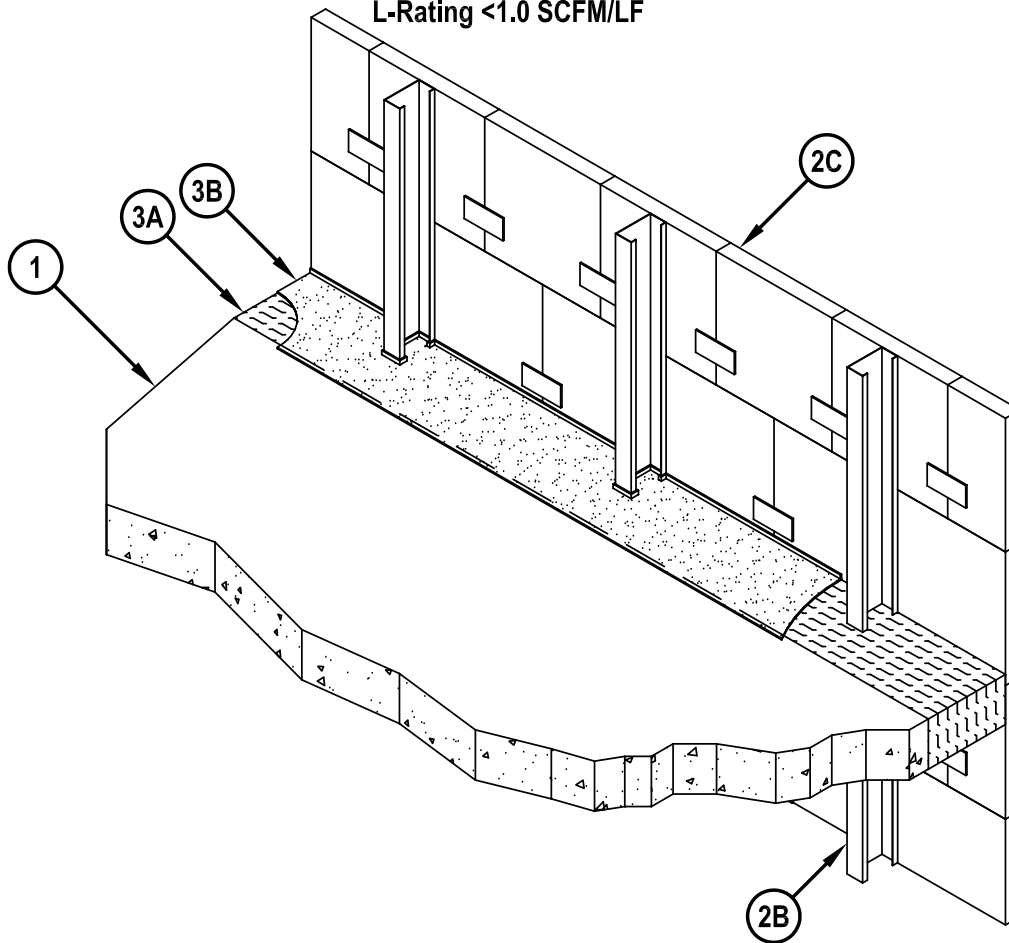
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 9.5 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



Hilti Firestop Systems

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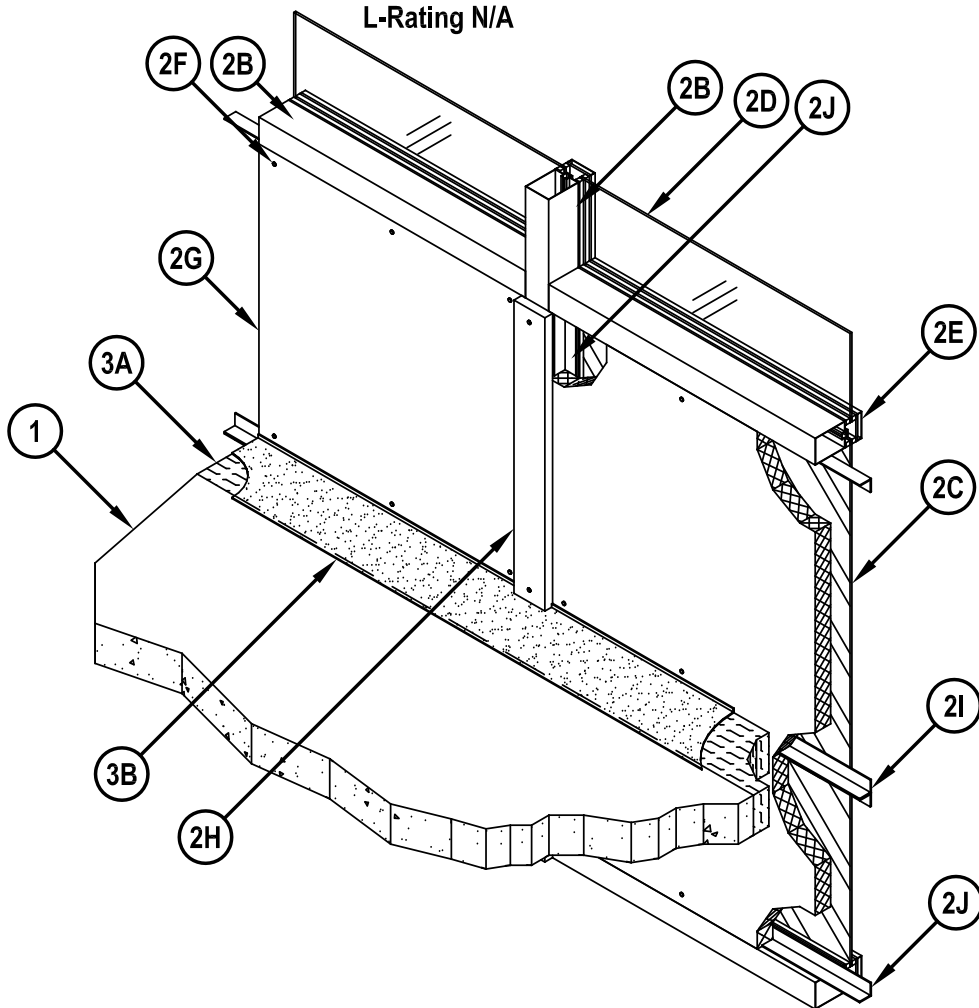
Design No. CEJ 246 P (HI/BP 120-01)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307
Table 1

CEJ 246 P

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	1 3/4-HR.	1 3/4-HR.
T-RATING	1 1/4-HR.	1 1/4-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 15 ± 5	± 7.5 ± 5

L-Rating N/A



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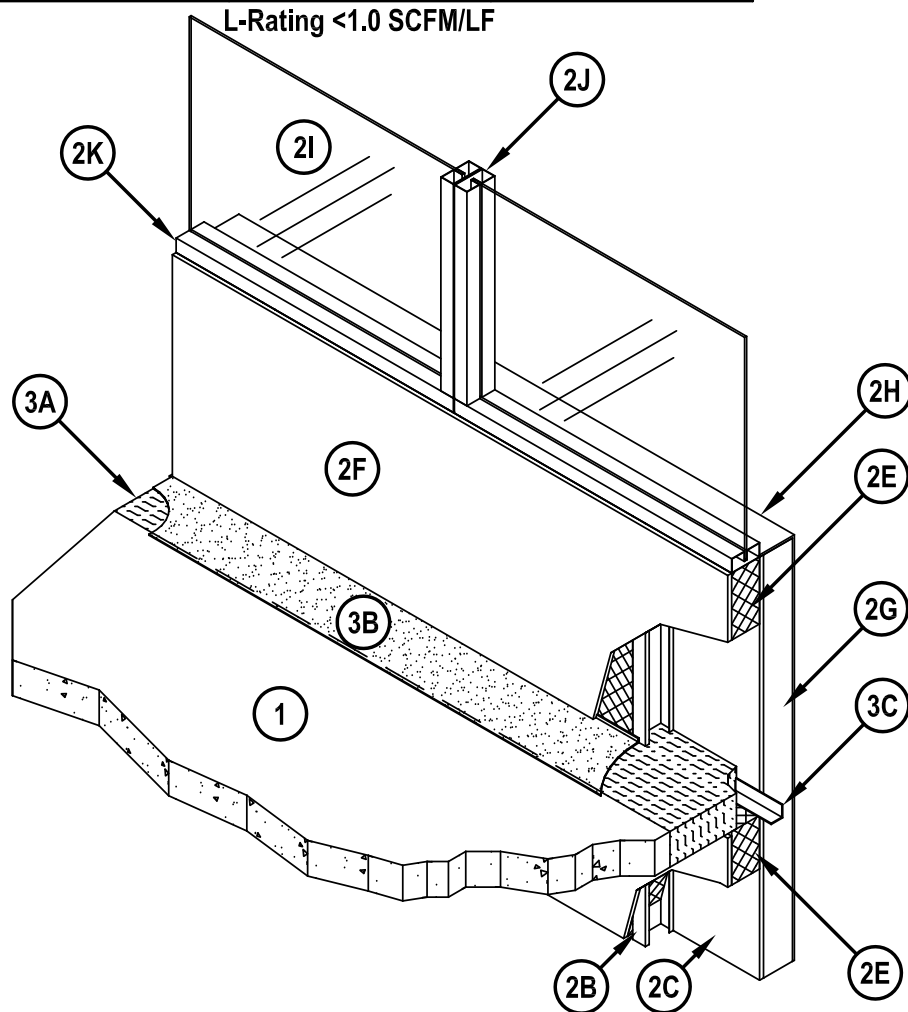
Page: 1 of 3

Design No. CEJ 259 P (HI/BP 120-08)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 7.5 ± 5	± 7.5 ± 5



CEJ 259 P



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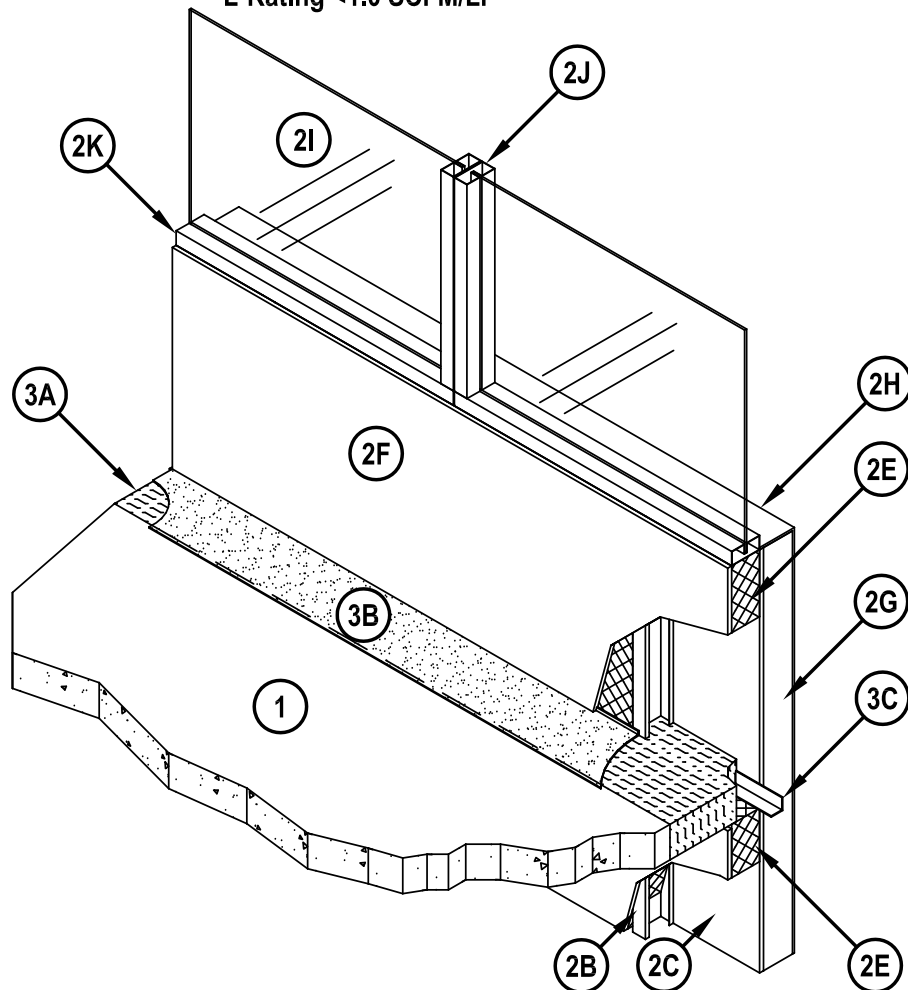
Design No. CEJ 260 P (HI/PHV 120-06)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 7.5 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



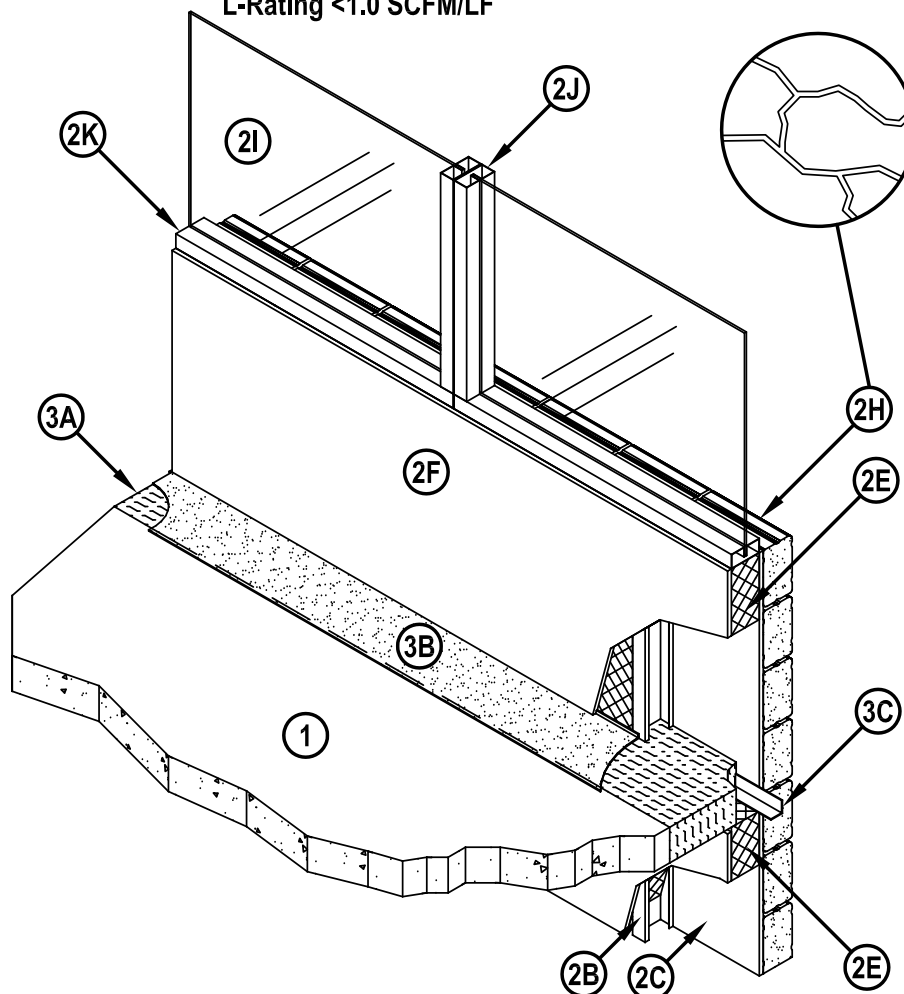
Design No. CEJ 261 P (HI/PHV 120-07)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 7.5 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



CEJ 261 P



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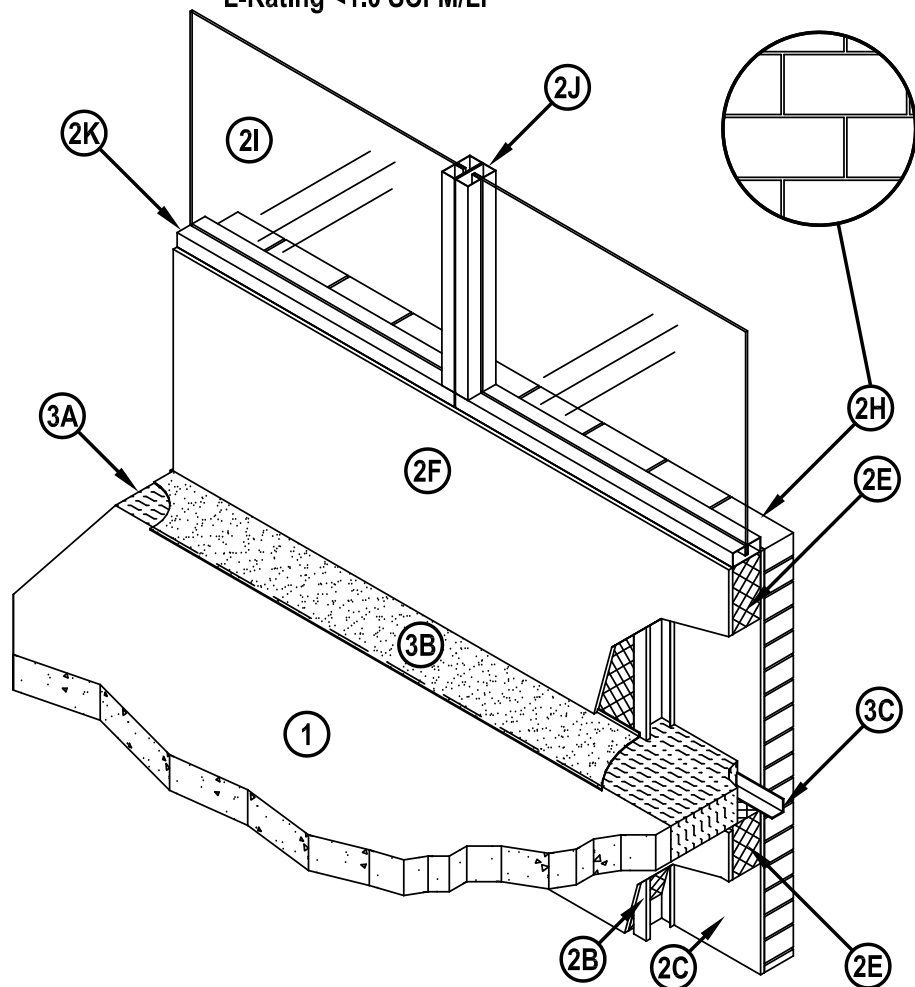


Design No. CEJ 262 P (HI/PHV 120-08)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307
Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 7.5 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



CEJ 262 P



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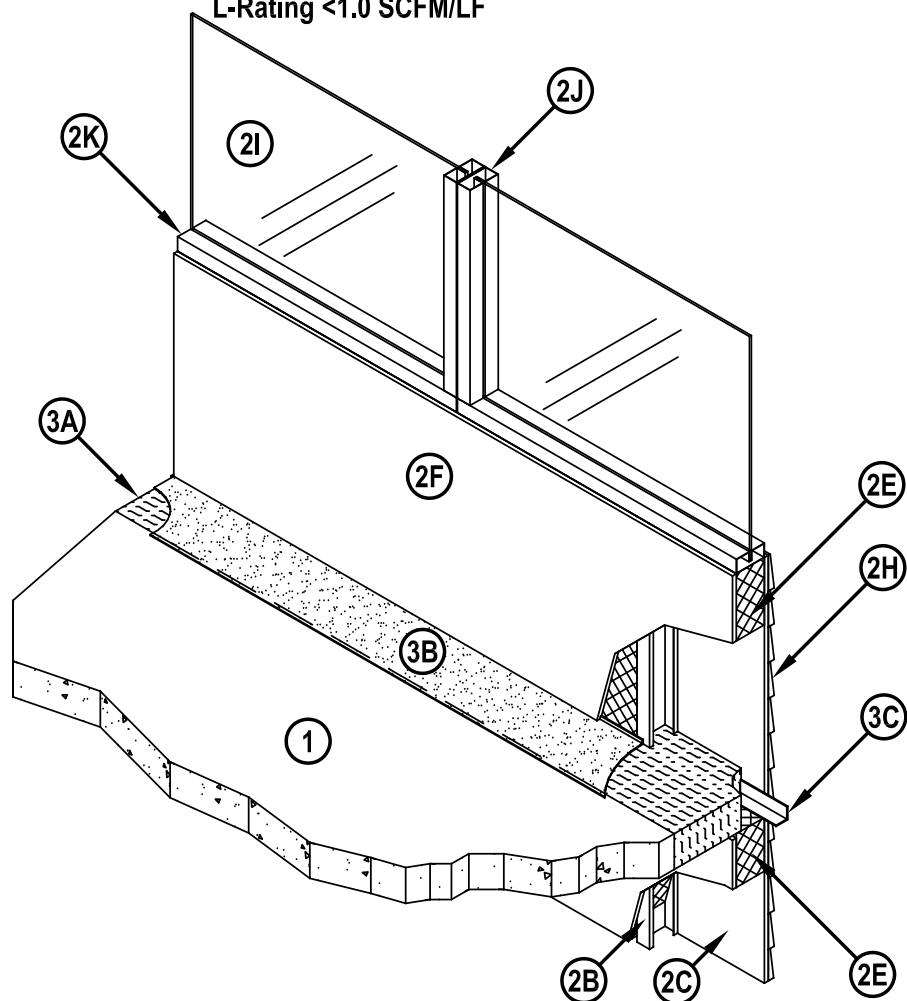
Page: 1 of 3

Design No. CEJ 263 P (HI/PHV 120-09)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307
 Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 7.5 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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Design No. CEJ 264 P (HI/PHV 120-10)
PERIMETER FIRE BARRIER SYSTEM

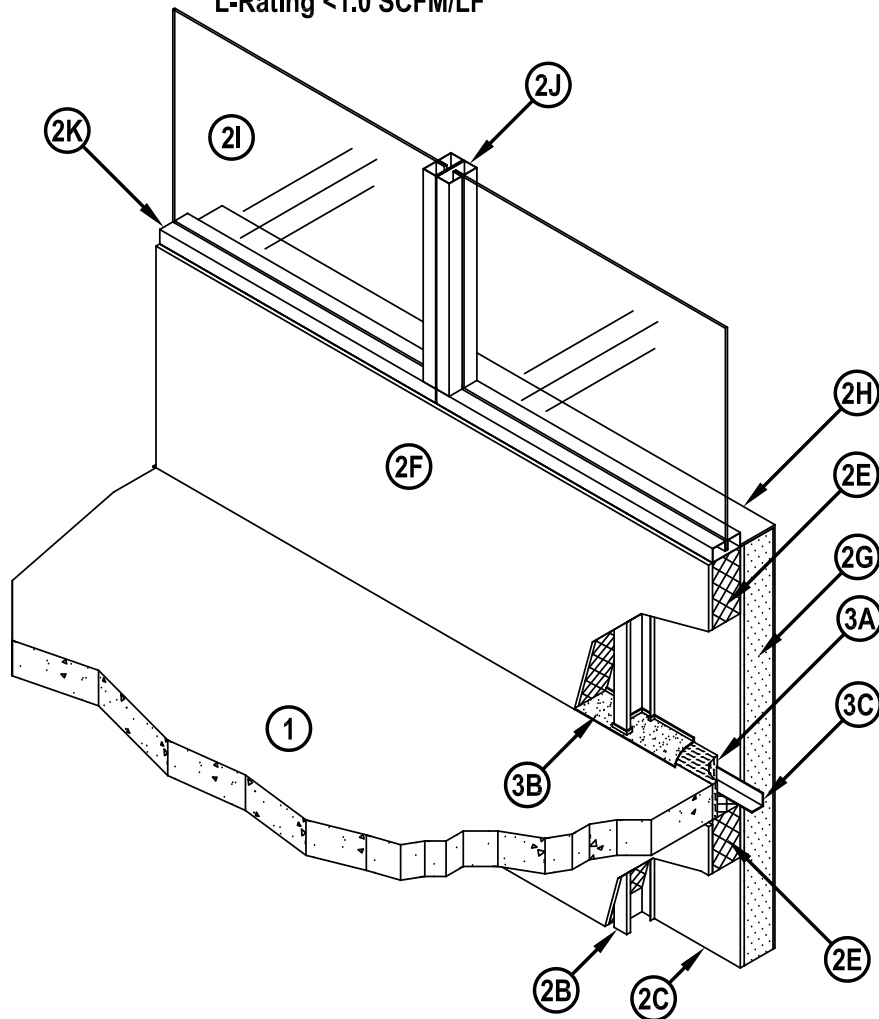
Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%)	NONE	NONE

CEJ 264 P

L-Rating <1.0 SCFM/LF



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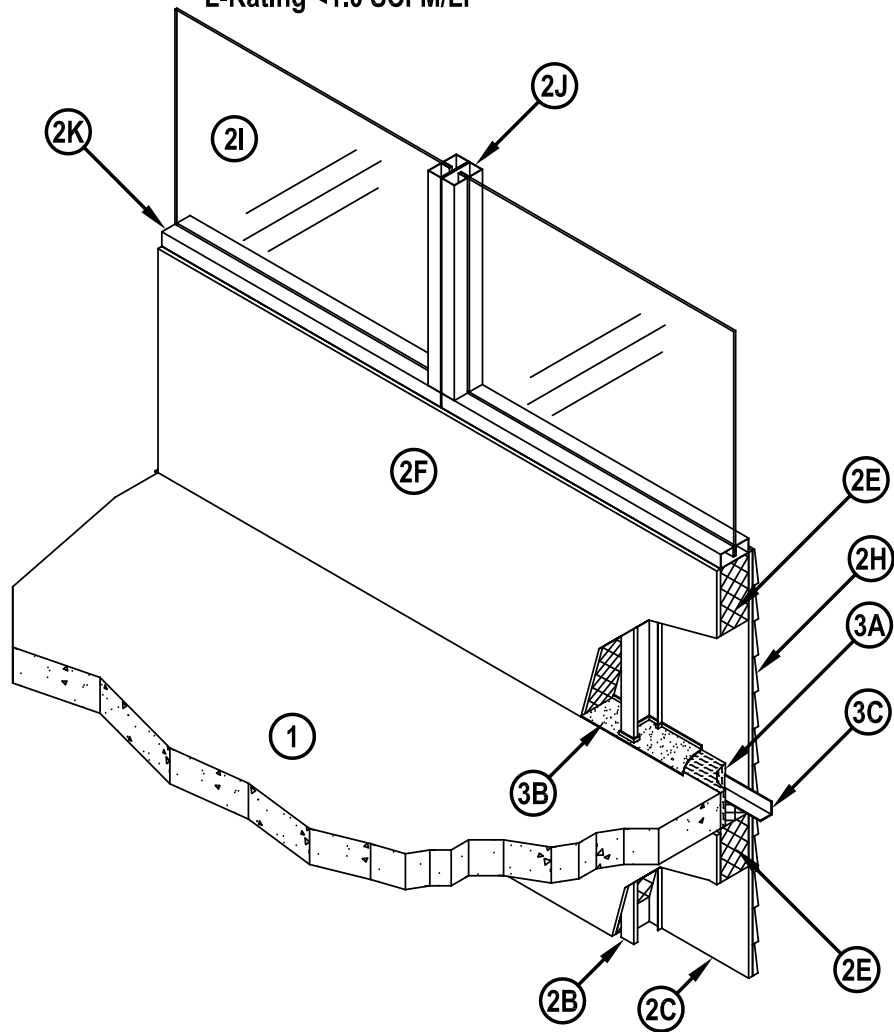
Design No. CEJ 265 P (HI/PHV 120-11)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%)	NONE	NONE

L-Rating <1.0 SCFM/LF



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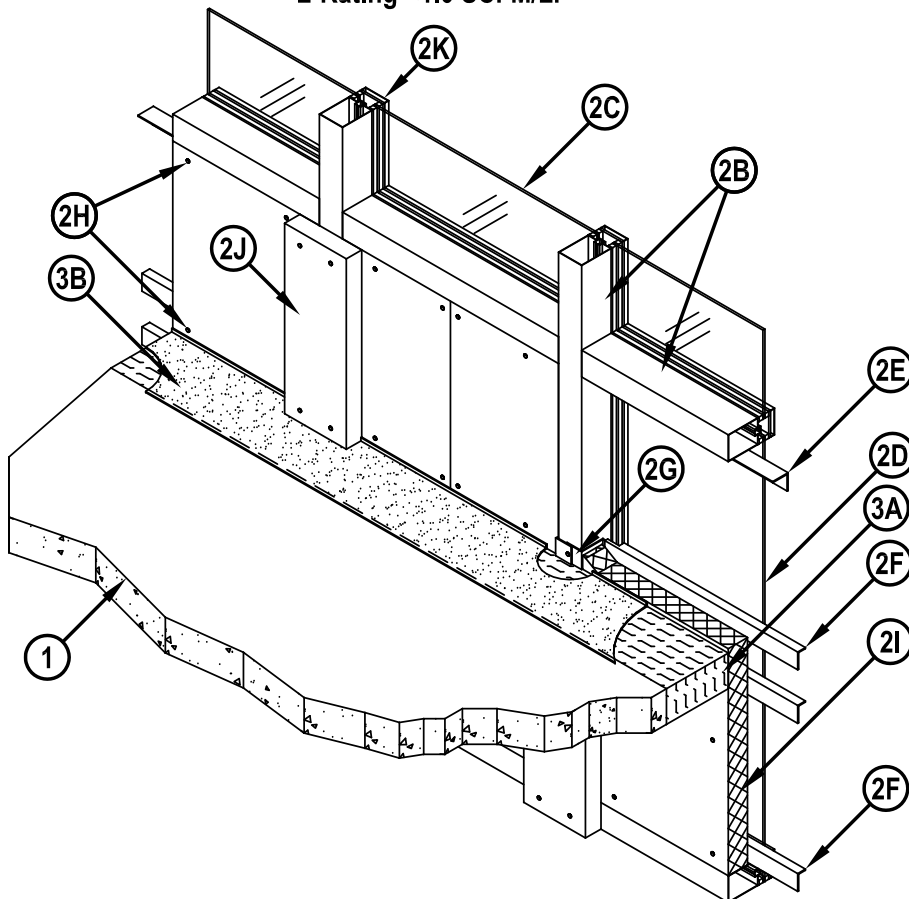


Design No. CEJ 307 P (HI/BP 180-01)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307
Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	3-HR.	3-HR.
T-RATING	1 3/4-HR.	1 3/4-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 11.25 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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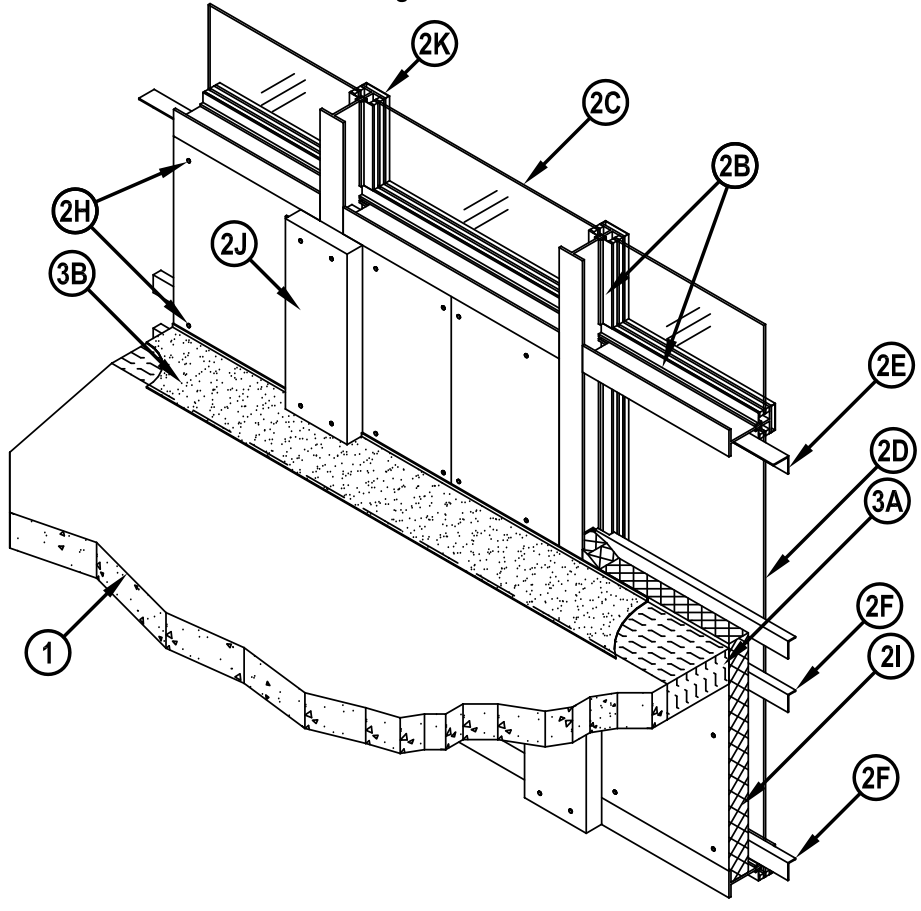
Design No. CEJ 308 P (HI/BP 180-02)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	3-HR.	3-HR.
T-RATING	1 3/4-HR.	1 3/4-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 11.25 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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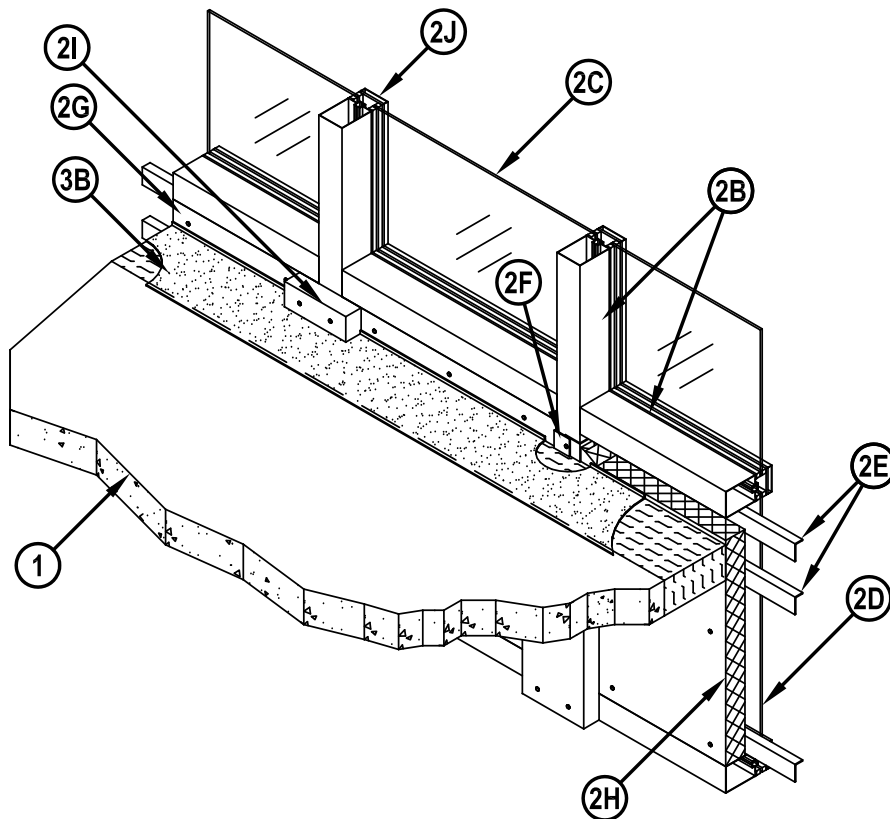


Design No. CEJ 309 P (HI/BP 105-01)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307
Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	1 3/4-HR.	1 3/4-HR.
T-RATING	1 1/4-HR.	1 1/4-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 11.25 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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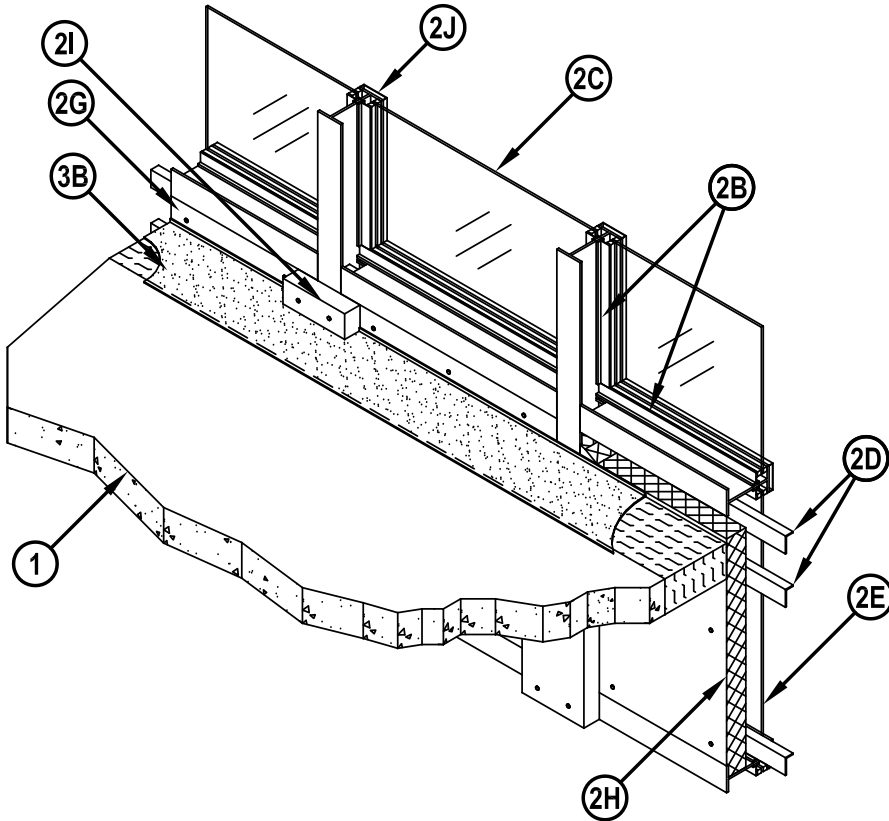
Design No. CEJ 310 P (HI/BP 105-02)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	1 3/4-HR.	1 3/4-HR.
T-RATING	1 1/4-HR.	1 1/4-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 11.25 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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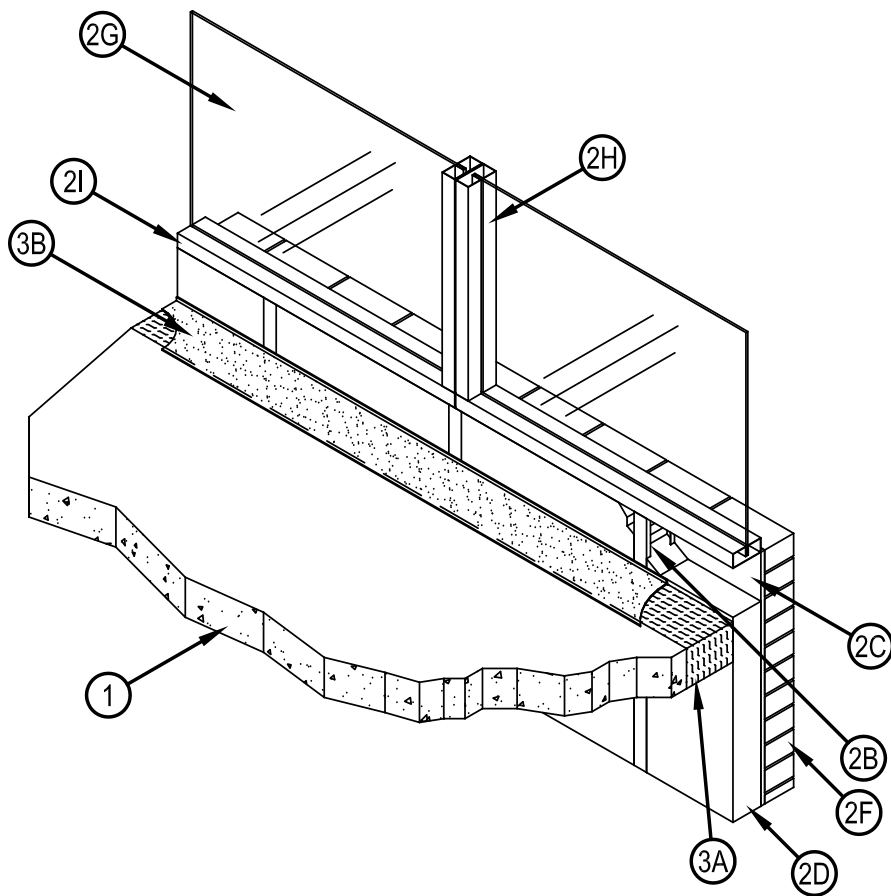
Design No. CEJ 314 P (HI/BP 165-01)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2 3/4-HR.	2 3/4-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 8.3 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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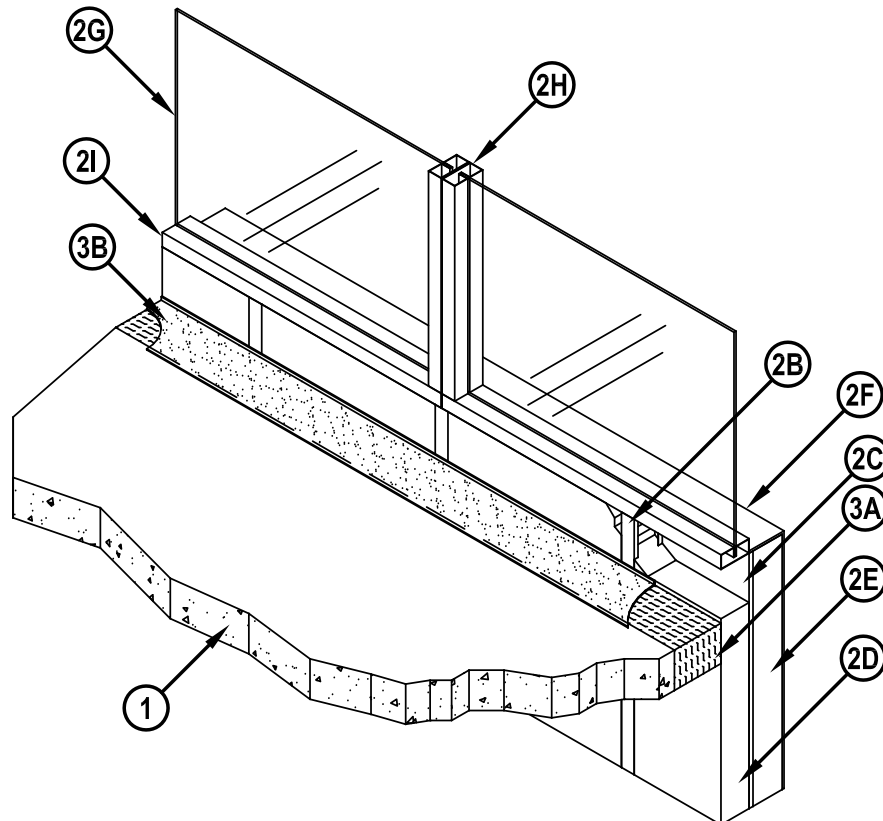
Design No. CEJ 315 P (HI/BP 165-02)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2 3/4-HR.	2 3/4-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 8.3 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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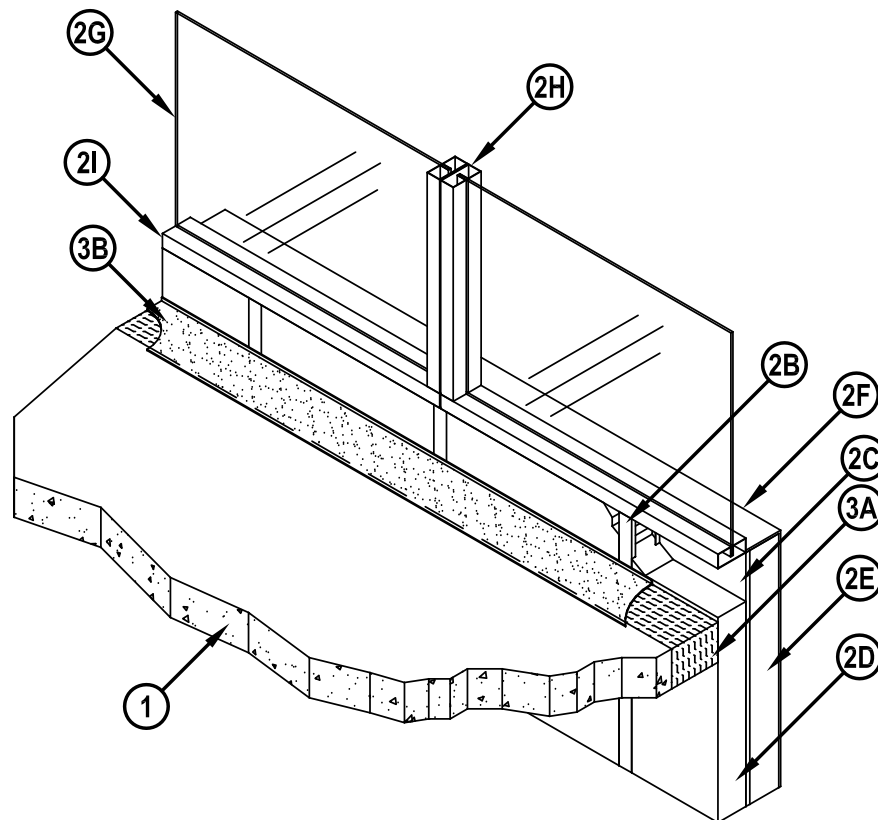
Design No. CEJ 316 P (HI/BP 165-03)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2 3/4-HR.	2 3/4-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	± 8.3 ± 5	± 7.5 ± 5

L-Rating <1.0 SCFM/LF



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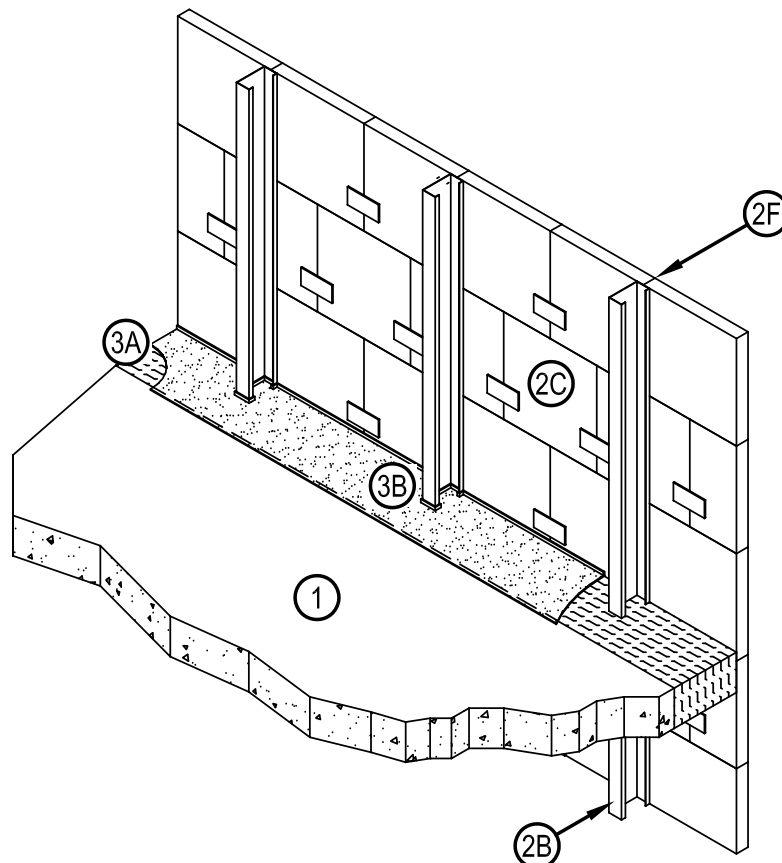


Design No. CEJ 400 P (HI/BP 120-02)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
 ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	0-HR. OR 45-MIN. (SEE ITEM 2C)	0-HR. OR 1-HR. (SEE ITEM 2C)
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	±9.25 NONE	±7.5 NONE



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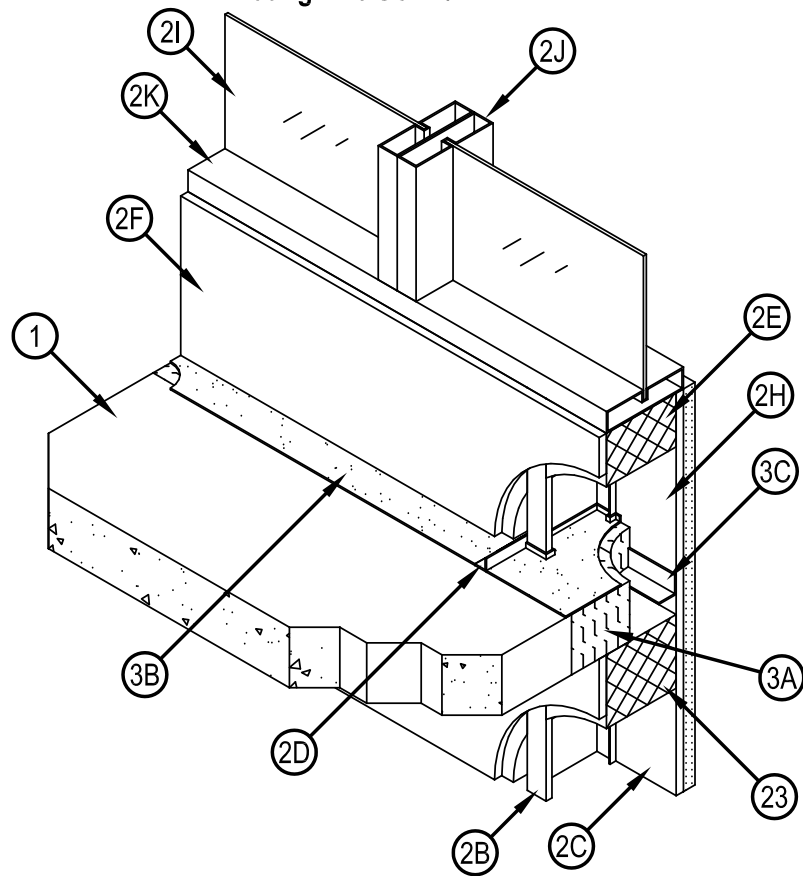
Design No. CEJ 421 P (HI/BP 120-03)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	NONE NONE	NONE NONE

L-Rating <1.0 SCFM/LF



Design No. CEJ 425 P (HI/BP 120-04)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE NOTE 1	NONE NONE	NONE NONE

HEAD OF WALL JOINT SYSTEM

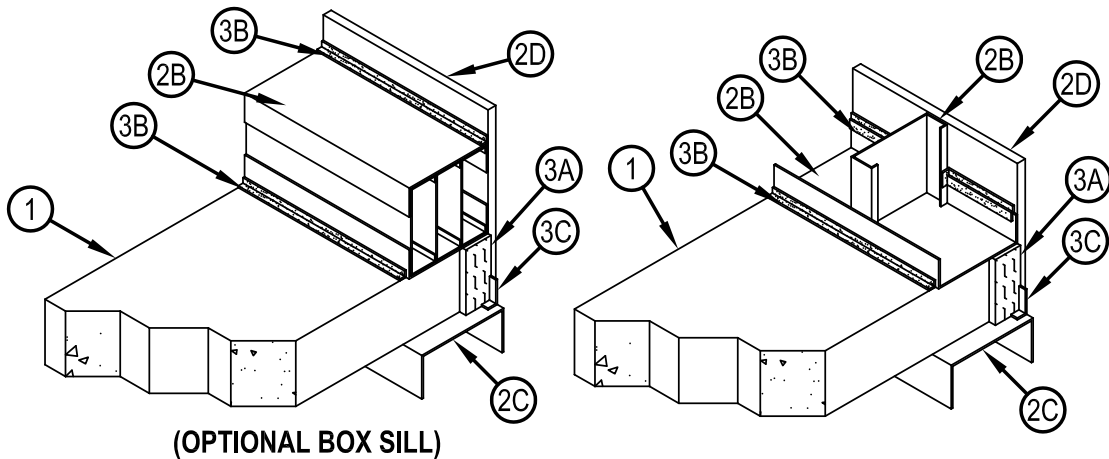
ASTM E 2307-04 Section 14.1 Movement

L-Rating <1.0 SCFM/LF

Rated for ± 0 % horizontal movement

Rated for - 100% downward vertical shear movement (3/4 in.) Class II 500 Cycles

Rated for + 0% upward vertical shear movement



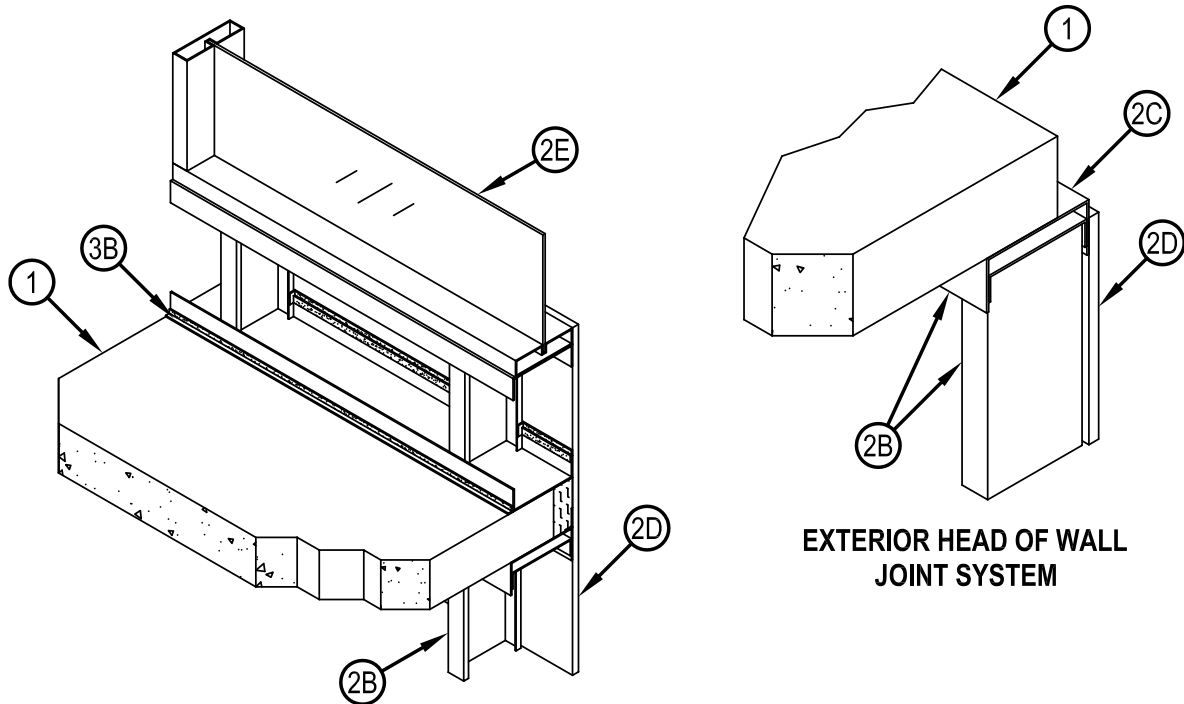
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Design No. CEJ 425 P (HI/BP 120-04)

CEJ 425 P



EXTERIOR HEAD OF WALL JOINT SYSTEM

1. CONCRETE FLOOR ASSEMBLY: Min. two-hour rated concrete floor assembly (Item 1) made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4 to 4-1/2 in., respectively, at the slab edge (joint face). Optional – Provided the two-hour concrete floor assembly (Item 1) rating is not compromised, the overall slab thickness may vary to accommodate various blackout depths (longitudinal recesses) formed in the concrete, to house an optional architectural joint system. The blackout width may also vary without restriction.
2. CURTAIN WALL ASSEMBLY: The curtain wall assembly shall incorporate the following construction features:
 - A. Mounting Attachment: (Not shown) Attach the steel-stud framing to the structural framing according to the curtain wall manufacturer's instructions. When required, connect the mounting attachments to the concrete floor assembly (Item 1) at the slab edge (joint face), according to the curtain wall manufacturer's instructions. Use a max. 10 ft. distance between mounting attachments.
 - B. Steel-Stud Framing: Use min. 6 in. by 1-5/8 in., 16 GA steel "C" studs cut to length as vertical framing members spaced a max. of 16 in. on center (oc), secure the ends of the steel studs in compatible sized 20 GA steel tracks, using min. #6 x -1/2 in. pan or hex head screws. Cantilever the floor track nominally 2 in. past the vertical face of the concrete floor assembly (Item 1). Secure the floor track to the top of the concrete floor assembly (Item 1) with 1/4 in. diameter x 2 in. long concrete screws (or either powder actuated fasteners or steel expansion bolts having equivalent strength and performance) spaced a max. of 24 in. oc. Insert the ceiling track inside the "slip-track (deflection channel)" to create a 3/4 in. gap between channels to allow for downward movement. Alternate Lighter Gauge Slotted Ceiling Track: Alternate to ceiling track above, use min. 24 GA galvanized steel channel with slotted flanges sized to accommodate min. 6 in. by 1-5/8 in., 16 GA steel "C" studs. Alternate Framing Box Sill: Alternate to steel-stud framing (Item 2B) created between window assembly and top of the concrete floor assembly (Item 1), use multiple min. 16 GA galvanized structural steel tracks or steel studs placed horizontally and secured together using min. #6 x 1/2 in. pan or hex head screws or welds and capped top and bottom with floor and ceiling tracks or use multiple min. 16 GA galvanized punched steel tracks or steel studs with all openings sealed with mineral wool placed horizontally and secured together using min. #6 x 1/2 in. pan or hex head screws or welds and capped top and bottom with floor and ceiling tracks.

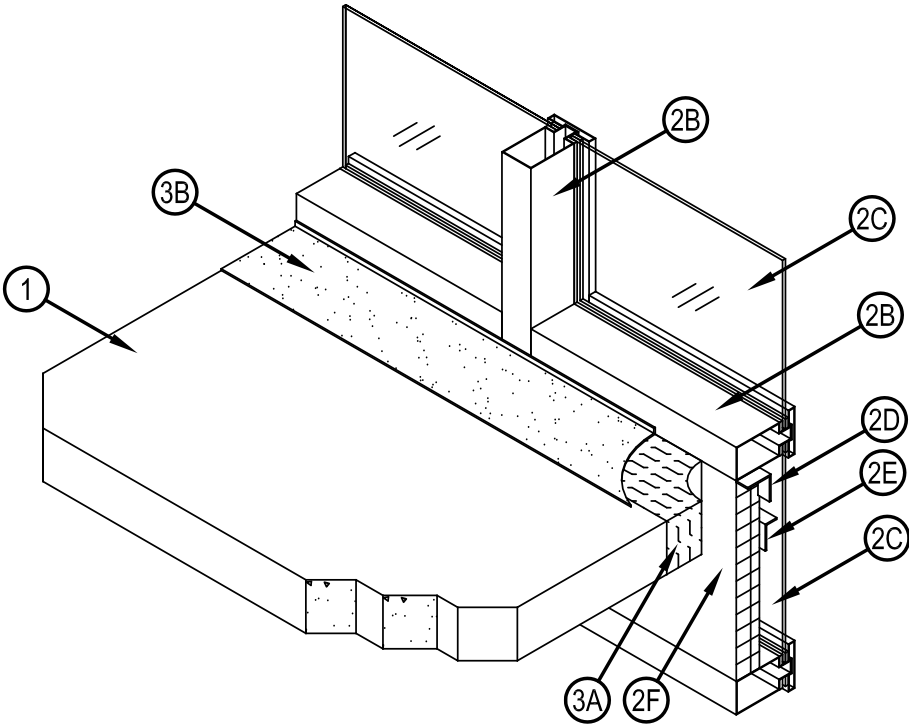
Design No. CEJ 526 P (HI/BP 60-01)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	1-HR.	1-HR.
T-RATING	54-MIN.	54-MIN.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) VERTICAL SEE NOTE 1	±5	±5

CEJ 526 P



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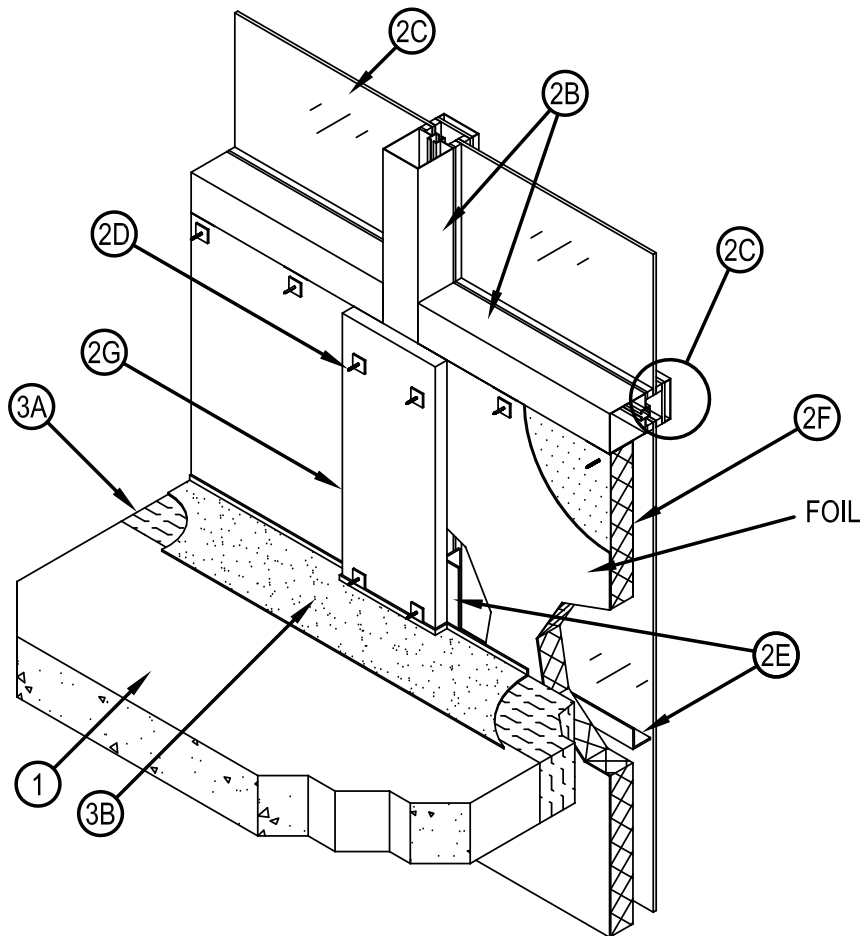


Design No. CEJ 529 P (HI/JS 120-04)
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1 1/2-HR.	1 1/2-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL SEE ITEM 3A	NONE ±25 (25% COMPRESSION)	NONE ±25 (25% COMPRESSION)



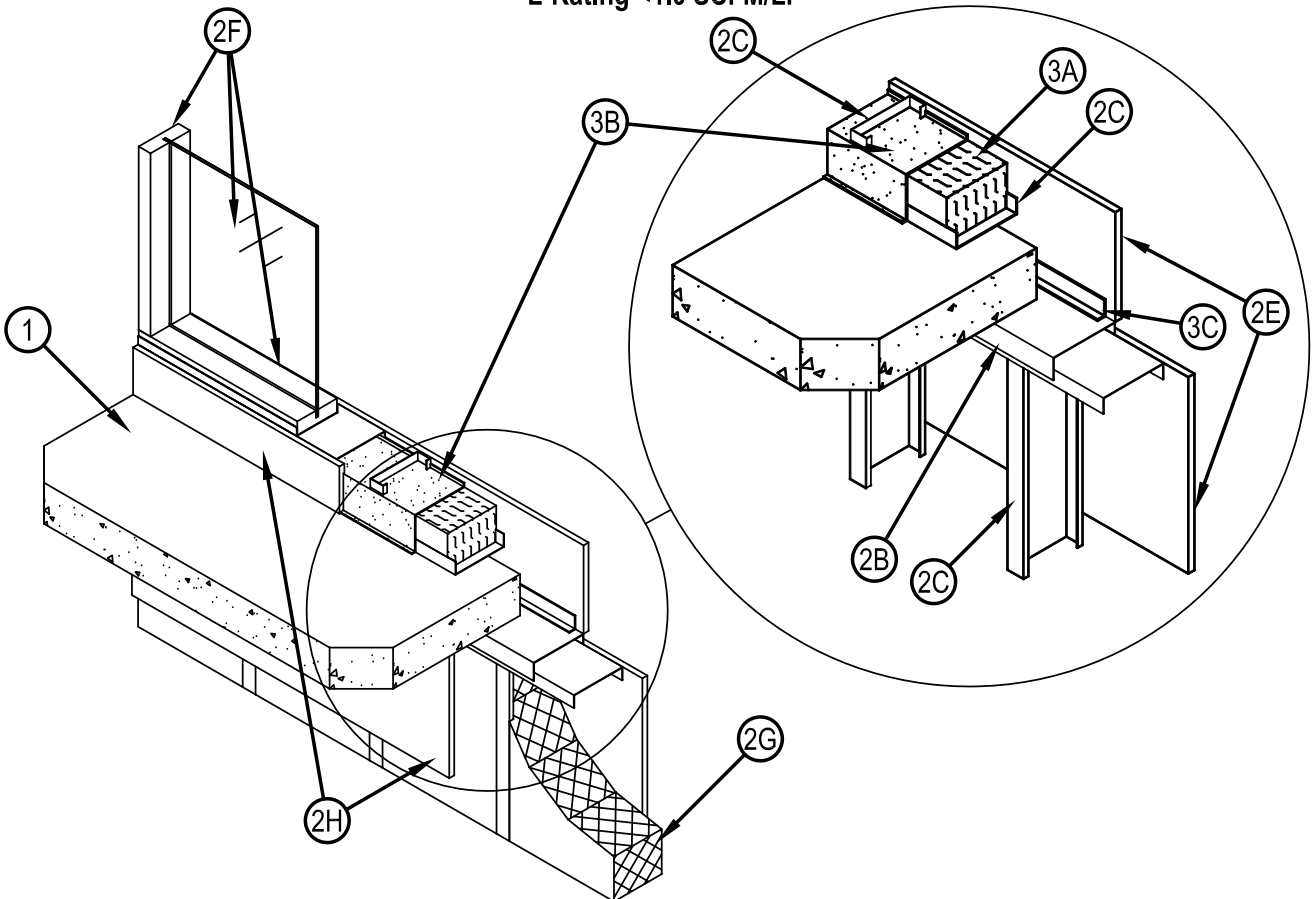
**Design No. HI/BP 120-05
PERIMETER FIRE BARRIER SYSTEM**

**Hilti, Inc.
ASTM E 2307**

Table 1

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	2-HR.	2-HR.
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM

Rated for ± 0 % horizontal movement
Rated for - 100% downward vertical shear movement (3/4 in.) Class II 500 Cycles
Rated for + 0% upward vertical shear movement
UL 2079
L-Rating <1.0 SCFM/LF



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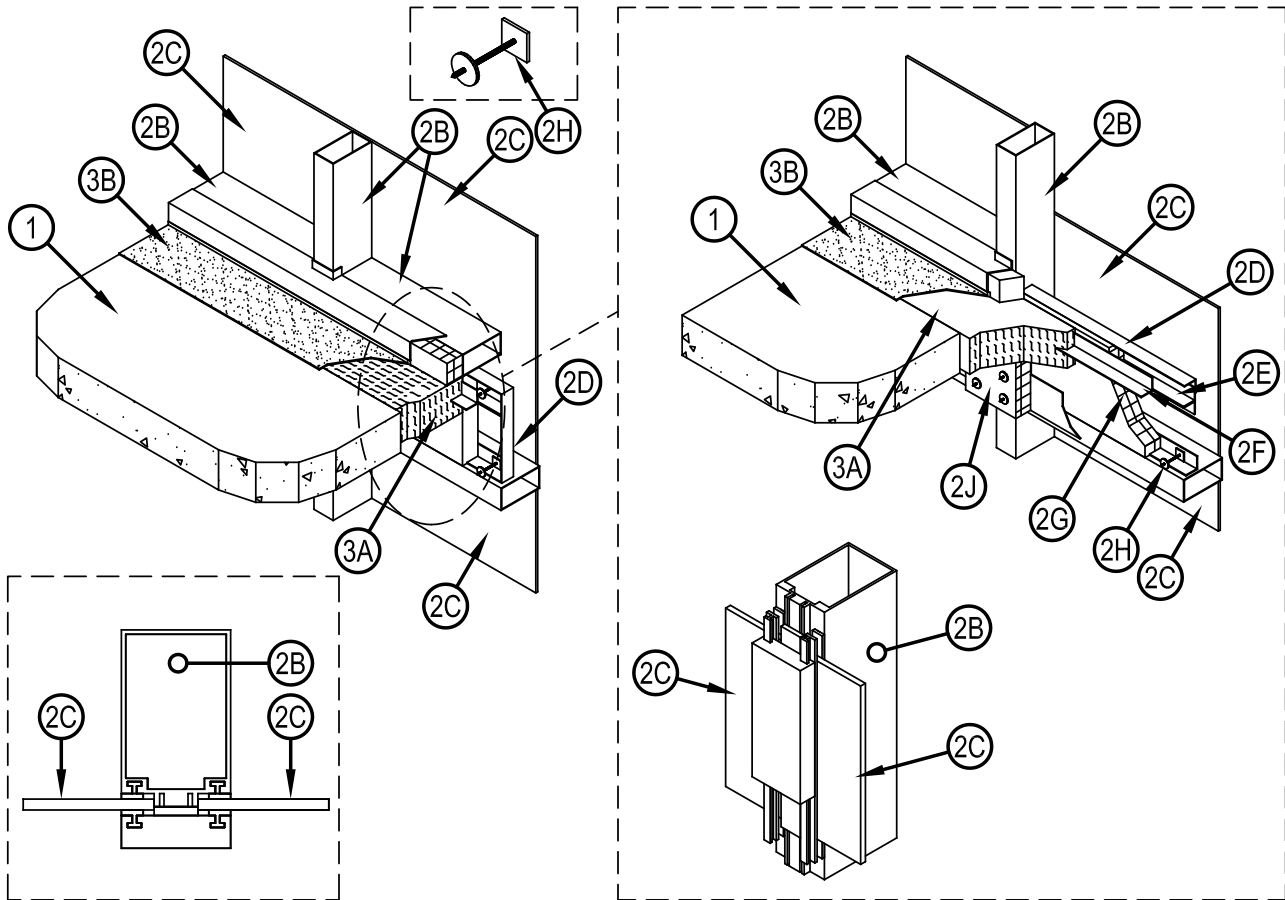
Design No. HI/BP 150-01
PERIMETER FIRE BARRIER SYSTEM

Hilti, Inc.
ASTM E 2307
Table 1

HI/BP 150-01

	FIRESTOP JOINT SPRAY CFS-SP WB	SILICONE JOINT SPRAY CFS-SP SIL
F-RATING	150 MINUTES	150 MINUTES
T-RATING	1-HR.	1-HR.
APPLICATION THICKNESS	1/8" WET FILM (1/16" DRY)	2mm (0.079") WET FILM
CYCLING (%) HORIZONTAL VERTICAL	± 12.5 ± 5	± 7.5 ± 5

ASTM E 2307/ASTM E 1399 Cycling
Class IV: 500 cycles @ 30 cpm
UL 2079L-Rating <1.0 SCFM/LF



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